Airplane Greenhouse Gas Standards

Response to Comments

United States Environmental Protection Agency

Airplane Greenhouse Gas Standards

Response to Comments

Assessment and Standards Division
Office of Transportation and Air Quality
U.S. Environmental Protection Agency

United States Environmental Protection Agency

EPA-420-R-20-027
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Table of Contents

Table of Commenters and Docket Documents

Airplane and Airplane Engine GHG Emission Standards – EPA-HQ-OAR-2018-0276

Organization	Comment Document(s)
350 Seattle	EPA-HQ-OAR-2018-0276-0108-A1.pdf EPA-HQ-OAR-2018-0276-0108.html
Aerospace Industries Association (AIA)	EPA-HQ-OAR-2018-0276-0080-A1.pdf EPA-HQ-OAR-2018-0276-0080.html EPA-HQ-OAR-2018-0276-0087-A1.pdf EPA-HQ-OAR-2018-0276-0087.html EPA-HQ-OAR-2018-0276-0167-A1.pdf EPA-HQ-OAR-2018-0276-0167-A2.pdf EPA-HQ-OAR-2018-0276-0167.html
Aerospace Industries Association of Canada (AIAC)	EPA-HQ-OAR-2018-0276-0082-A1.pdf EPA-HQ-OAR-2018-0276-0082.html
Airbus S.A.S. (Airbus)	EPA-HQ-OAR-2018-0276-0077-A1.pdf EPA-HQ-OAR-2018-0276-0077.html EPA-HQ-OAR-2018-0276-0148-A1.pdf EPA-HQ-OAR-2018-0276-0148.html
Airline Pilot's Association's Air Safety Organization	Hearing Comment
Airlines for America (A4A)	EPA-HQ-OAR-2018-0276-0088-A1.pdf EPA-HQ-OAR-2018-0276-0088.html EPA-HQ-OAR-2018-0276-0115-A1.pdf EPA-HQ-OAR-2018-0276-0115.html
Airlines for America (A4A) and Air Line Pilots Association, International (ALPA)	EPA-HQ-OAR-2018-0276-0161-A1.pdf EPA-HQ-OAR-2018-0276-0161.html
Alternative Fuels & Chemicals Coalition (AFCC)	EPA-HQ-OAR-2018-0276-0180-A1.pdf EPA-HQ-OAR-2018-0276-0180-A2.pdf EPA-HQ-OAR-2018-0276-0180.html
Anonymous Public Comment 1	EPA-HQ-OAR-2018-0276-0079.html
Anonymous Public Comment 2	EPA-HQ-OAR-2018-0276-0101.html
Anonymous Public Comment 3	EPA-HQ-OAR-2018-0276-0102.html
Anonymous Public Comment 4	EPA-HQ-OAR-2018-0276-0106.html
Anonymous Public Comment 5	EPA-HQ-OAR-2018-0276-0112.html
Anonymous Public Comment 6	EPA-HQ-OAR-2018-0276-0120.html
Anonymous Public Comment 7	EPA-HQ-OAR-2018-0276-0124.html
Anonymous Public Comment 8	EPA-HQ-OAR-2018-0276-0125.html
Anonymous Public Comment 9	EPA-HQ-OAR-2018-0276-0126.html
Anonymous Public Comment 10	EPA-HQ-OAR-2018-0276-0127.html
Anonymous Public Comment 11	EPA-HQ-OAR-2018-0276-0128.html
Anonymous Public Comment 12	EPA-HQ-OAR-2018-0276-0129.html
Anonymous Public Comment 13	EPA-HQ-OAR-2018-0276-0130.html
Anonymous Public Comment 14	EPA-HQ-OAR-2018-0276-0131.html

Anonymous Public Comment 15	EPA-HQ-OAR-2018-0276-0132.html
Anonymous Public Comment 16	EPA-HQ-OAR-2018-0276-0133.html
Anonymous Public Comment 17	EPA-HQ-OAR-2018-0276-0134.html EPA-HQ-OAR-2018-0276-0135.html
Anonymous Public Comment 18	EPA-HQ-OAR-2018-0276-0138.html
Anonymous Public Comment 19	EPA-HQ-OAR-2018-0276-0146.html
Anonymous Public Comment 20	EPA-HQ-OAR-2018-0276-0163.html
Anonymous Public Comment 21	EPA-HQ-OAR-2018-0276-0170.html
Anonymous Public Comment 22	EPA-HQ-OAR-2018-0276-0171.html
Arlington Chamber of Commerce	EPA-HQ-OAR-2018-0276-0139-A1.pdf EPA-HQ-OAR-2018-0276-0139.html
Baxter, Cindy	Hearing Comment
Boeing Company (Boeing)	EPA-HQ-OAR-2018-0276-0089-A1.pdf EPA-HQ-OAR-2018-0276-0089.html EPA-HQ-OAR-2018-0276-0160-A1.pdf EPA-HQ-OAR-2018-0276-0160.html EPA-HQ-OAR-2018-0276-0181-A1.pdf EPA-HQ-OAR-2018-0276-0181-A2.pdf EPA-HQ-OAR-2018-0276-0181-A3.pdf EPA-HQ-OAR-2018-0276-0181-A4.pdf EPA-HQ-OAR-2018-0276-0181-A5.pdf EPA-HQ-OAR-2018-0276-0181-A6.pdf EPA-HQ-OAR-2018-0276-0181.html EPA-HQ-OAR-2018-0276-0182-A1.pdf EPA-HQ-OAR-2018-0276-0182-A2.pdf EPA-HQ-OAR-2018-0276-0182-A3.pdf EPA-HQ-OAR-2018-0276-0182-A4.pdf EPA-HQ-OAR-2018-0276-0182-A5.pdf EPA-HQ-OAR-2018-0276-0182-A6.docx EPA-HQ-OAR-2018-0276-0182.html
Bombardier Aviation	EPA-HQ-OAR-2018-0276-0076-A1.pdf EPA-HQ-OAR-2018-0276-0076.html
California Air Resources Board (CARB)	EPA-HQ-OAR-2018-0276-0169-A1.pdf EPA-HQ-OAR-2018-0276-0169-A2.pdf EPA-HQ-OAR-2018-0276-0169-A3.pdf EPA-HQ-OAR-2018-0276-0169-A4.pdf EPA-HQ-OAR-2018-0276-0169-A5.pdf EPA-HQ-OAR-2018-0276-0169-A6.pdf EPA-HQ-OAR-2018-0276-0169-A7.pdf EPA-HQ-OAR-2018-0276-0169-A8.pdf EPA-HQ-OAR-2018-0276-0169.html EPA-HQ-OAR-2018-0276-0184-A1.pdf EPA-HQ-OAR-2018-0276-0184-A10.pdf EPA-HQ-OAR-2018-0276-0184-A11.pdf EPA-HQ-OAR-2018-0276-0184-A12.pdf EPA-HQ-OAR-2018-0276-0184-A13.pdf EPA-HQ-OAR-2018-0276-0184-A14.pdf

	EPA-HQ-OAR-2018-0276-0184-A15.pdf EPA-HQ-OAR-2018-0276-0184-A16.pdf EPA-HQ-OAR-2018-0276-0184-A17.pdf EPA-HQ-OAR-2018-0276-0184-A18.pdf EPA-HQ-OAR-2018-0276-0184-A19.pdf EPA-HQ-OAR-2018-0276-0184-A2.pdf EPA-HQ-OAR-2018-0276-0184-A20.pdf EPA-HQ-OAR-2018-0276-0184-A3.pdf EPA-HQ-OAR-2018-0276-0184-A4.pdf EPA-HQ-OAR-2018-0276-0184-A5.pdf EPA-HQ-OAR-2018-0276-0184-A6.pdf EPA-HQ-OAR-2018-0276-0184-A7.pdf EPA-HQ-OAR-2018-0276-0184-A8.pdf EPA-HQ-OAR-2018-0276-0184-A9.pdf EPA-HQ-OAR-2018-0276-0184.html
California Attorney General's Office and the California Air Resources Board (CARB) et al.	EPA-HQ-OAR-2018-0276-0176-A1.pdf EPA-HQ-OAR-2018-0276-0176-A10.pdf EPA-HQ-OAR-2018-0276-0176-A11.pdf EPA-HQ-OAR-2018-0276-0176-A12.pdf EPA-HQ-OAR-2018-0276-0176-A13.pdf EPA-HQ-OAR-2018-0276-0176-A14.pdf EPA-HQ-OAR-2018-0276-0176-A15.pdf EPA-HQ-OAR-2018-0276-0176-A16.pdf EPA-HQ-OAR-2018-0276-0176-A17.pdf EPA-HQ-OAR-2018-0276-0176-A18.pdf EPA-HQ-OAR-2018-0276-0176-A19.pdf EPA-HQ-OAR-2018-0276-0176-A2.pdf EPA-HQ-OAR-2018-0276-0176-A20.pdf EPA-HQ-OAR-2018-0276-0176-A3.pdf EPA-HQ-OAR-2018-0276-0176-A4.pdf EPA-HQ-OAR-2018-0276-0176-A5.pdf EPA-HQ-OAR-2018-0276-0176-A6.pdf EPA-HQ-OAR-2018-0276-0176-A7.pdf EPA-HQ-OAR-2018-0276-0176-A8.pdf EPA-HQ-OAR-2018-0276-0176-A9.pdf EPA-HQ-OAR-2018-0276-0176.html
Campbell, Trevor	EPA-HQ-OAR-2018-0276-0173-A1.pdf EPA-HQ-OAR-2018-0276-0173.html
Cargo Airline Association	EPA-HQ-OAR-2018-0276-0159-A1.pdf EPA-HQ-OAR-2018-0276-0159.html
Center for Biological Diversity, Earthjustice, on behalf of the Sierra Club and Friends of the Earth, and the Natural Resources Defense Council (NRDC)	EPA-HQ-OAR-2018-0276-0150-A1.pdf EPA-HQ-OAR-2018-0276-0150.html EPA-HQ-OAR-2018-0276-0151-A1.pdf EPA-HQ-OAR-2018-0276-0151.html
Campbell, Colin	EPA-HQ-OAR-2018-0276-0191.html
Center for Biological Diversity, et al.	EPA-HQ-OAR-2018-0276-0147-A1.pdf EPA-HQ-OAR-2018-0276-0147.html EPA-HQ-OAR-2018-0276-0154-A1.pdf EPA-HQ-OAR-2018-0276-0154.html
CERES	EPA-HQ-OAR-2018-0276-0075-A1.docx EPA-HQ-OAR-2018-0276-0075.html

Ceres BICEP (Business for Innovative Climate and Energy Policy) Network	EPA-HQ-OAR-2018-0276-0165-A1.pdf EPA-HQ-OAR-2018-0276-0165.html
Chaisson, Dan	EPA-HQ-OAR-2018-0276-0103.html
Chesapeake Bay Foundation, Inc. (CBF)	EPA-HQ-OAR-2018-0276-0093-A1.pdf EPA-HQ-OAR-2018-0276-0093-A2.pdf EPA-HQ-OAR-2018-0276-0093-A3.xlsx EPA-HQ-OAR-2018-0276-0093-A4.pdf EPA-HQ-OAR-2018-0276-0093.html
Davis, Lauren and Nguyen, Johnnie Q.	EPA-HQ-OAR-2018-0276-0145-A1.pdf EPA-HQ-OAR-2018-0276-0145.html
Dicks, John	EPA-HQ-OAR-2018-0276-0192.html
Ducolon, Fred	EPA-HQ-OAR-2018-0276-0193.html
Eastie Farm	Hearing Testimony
Embraer Commercial Aviation	EPA-HQ-OAR-2018-0276-0090-A1.pdf EPA-HQ-OAR-2018-0276-0090.html EPA-HQ-OAR-2018-0276-0174-A1.docx EPA-HQ-OAR-2018-0276-0174.html
Eminence Manufacturing Inc.	EPA-HQ-OAR-2018-0276-0105.html
Environmental Defense Fund	EPA-HQ-OAR-2018-0276-0158-A1.pdf EPA-HQ-OAR-2018-0276-0158.html
Environmental Defense Fund, Institute for Policy Integrity at New York University School of Law, Montana Environmental Information Center, Natural Resources Defense Council, Sierra Club, Union of Concerned Scientists	EPA-HQ-OAR-2018-0276-0183-A1.pdf EPA-HQ-OAR-2018-0276-0183-A10.pdf EPA-HQ-OAR-2018-0276-0183-A11.pdf EPA-HQ-OAR-2018-0276-0183-A12.pdf EPA-HQ-OAR-2018-0276-0183-A13.pdf EPA-HQ-OAR-2018-0276-0183-A14.pdf EPA-HQ-OAR-2018-0276-0183-A15.pdf EPA-HQ-OAR-2018-0276-0183-A16.pdf EPA-HQ-OAR-2018-0276-0183-A17.pdf EPA-HQ-OAR-2018-0276-0183-A18.pdf EPA-HQ-OAR-2018-0276-0183-A19.pdf EPA-HQ-OAR-2018-0276-0183-A2.pdf EPA-HQ-OAR-2018-0276-0183-A3.pdf EPA-HQ-OAR-2018-0276-0183-A4.pdf EPA-HQ-OAR-2018-0276-0183-A5.pdf EPA-HQ-OAR-2018-0276-0183-A6.pdf EPA-HQ-OAR-2018-0276-0183-A7.pdf EPA-HQ-OAR-2018-0276-0183-A8.pdf EPA-HQ-OAR-2018-0276-0183-A9.pdf EPA-HQ-OAR-2018-0276-0183.html
Environmental Protection Network (EPN)	EPA-HQ-OAR-2018-0276-0155-A1.pdf EPA-HQ-OAR-2018-0276-0155.html
Fadden, Delmar	EPA-HQ-OAR-2018-0276-0186.html
Federal Express Corporation	EPA-HQ-OAR-2018-0276-0178-A1.pdf EPA-HQ-OAR-2018-0276-0178.html
Ferrara, John	EPA-HQ-OAR-2018-0276-0185.html
Frontier Electronic Systems Corporation	EPA-HQ-OAR-2018-0276-0104.html

Gannon, Brian	Hearing Testimony
General Aviation Manufacturers Association (GAMA)	EPA-HQ-OAR-2018-0276-0143-A1.pdf EPA-HQ-OAR-2018-0276-0143.html
General Electric Company (GE)	EPA-HQ-OAR-2018-0276-0157-A1.pdf EPA-HQ-OAR-2018-0276-0157.html
Gubser, Brian	EPA-HQ-OAR-2018-0276-0187.html
Gulfstream Aerospace Corporation	EPA-HQ-OAR-2018-0276-0078-A1.pdf EPA-HQ-OAR-2018-0276-0078.html
Hahnel, Tanya	Hearing Testimony
Hayward, Eric	EPA-HQ-OAR-2018-0276-0194.html
Heuscher, Rene	EPA-HQ-OAR-2018-0276-0195.html
Hobart Machined Products, Inc.	EPA-HQ-OAR-2018-0276-0119.html
Hollander, Ann	EPA-HQ-OAR-2018-0276-0085-A1.pdf EPA-HQ-OAR-2018-0276-0085.html
International Co-ordinating Council of Aerospace Industries Associations (ICCAIA)	EPA-HQ-OAR-2018-0276-0096-A1.pdf EPA-HQ-OAR-2018-0276-0096.html EPA-HQ-OAR-2018-0276-0083-A1.pdf EPA-HQ-OAR-2018-0276-0083.html EPA-HQ-OAR-2018-0276-0175-A1.pdf EPA-HQ-OAR-2018-0276-0175-A2.pdf EPA-HQ-OAR-2018-0276-0175.html
International Council on Clean Transportation (ICCT)	EPA-HQ-OAR-2018-0276-0168-A1.pdf EPA-HQ-OAR-2018-0276-0168-A2.pdf EPA-HQ-OAR-2018-0276-0168-A3.pdf EPA-HQ-OAR-2018-0276-0168-A4.pdf EPA-HQ-OAR-2018-0276-0168-A5.pdf EPA-HQ-OAR-2018-0276-0168-A6.pdf EPA-HQ-OAR-2018-0276-0168-A7.pdf EPA-HQ-OAR-2018-0276-0168-A8.pdf EPA-HQ-OAR-2018-0276-0168.html
Killdeer Mountain MFG	EPA-HQ-OAR-2018-0276-0107.html
Kroeker, Anne	EPA-HQ-OAR-2018-0276-0162.html
Lerch, David	EPA-HQ-OAR-2018-0276-0121.html
Life:Powered, an initiative of the Texas Public Policy Foundation	EPA-HQ-OAR-2018-0276-0172-A1.pdf EPA-HQ-OAR-2018-0276-0172.html
Marshall, Kristin	EPA-HQ-OAR-2018-0276-0196.html
Maryland Department of the Environment	EPA-HQ-OAR-2018-0276-0153-A1.pdf EPA-HQ-OAR-2018-0276-0153.html
Mercy Investment Services	Hearing Comment
Mira's Garden	Hearing Testimony
Morgan, Jennifer	EPA-HQ-OAR-2018-0276-0110.html
Morrison, Kirk	EPA-HQ-OAR-2018-0276-0113.html

National Association of Clean Air Agencies	EPA-HQ-OAR-2018-0276-0177-A1.pdf EPA-HQ-OAR-2018-0276-0177.html
National Association of Manufacturers	EPA-HQ-OAR-2018-0276-0149-A1.pdf EPA-HQ-OAR-2018-0276-0149.html
National Business Aviation Association (NBAA)	EPA-HQ-OAR-2018-0276-0091-A1.pdf EPA-HQ-OAR-2018-0276-0091.html EPA-HQ-OAR-2018-0276-0117-A1.pdf EPA-HQ-OAR-2018-0276-0117.html
National Tribal Air Association	EPA-HQ-OAR-2018-0276-0179-A1.pdf EPA-HQ-OAR-2018-0276-0179.html
Normand, Eugene	EPA-HQ-OAR-2018-0276-0188.html
Northeast States for Coordinated Air Use Management (NESCAUM)	EPA-HQ-OAR-2018-0276-0152-A1.pdf EPA-HQ-OAR-2018-0276-0152.html
Office of the Comptroller of New York City, et al.	EPA-HQ-OAR-2018-0276-0164-A1.pdf EPA-HQ-OAR-2018-0276-0164.html EPA-HQ-OAR-2018-0276-0166-A1.pdf EPA-HQ-OAR-2018-0276-0166.html
Ohio Chamber of Commerce	EPA-HQ-OAR-2018-0276-0116-A1.pdf EPA-HQ-OAR-2018-0276-0116.html
Ohio Manufacturers' Association (OMA)	EPA-HQ-OAR-2018-0276-0136-A1.pdf EPA-HQ-OAR-2018-0276-0136.html
Parazzoli, Claudio	EPA-HQ-OAR-2018-0276-0197.html
Petri, Viriginia	EPA-HQ-OAR-2018-0276-0198.html
PM Testing Laboratory, Inc.	EPA-HQ-OAR-2018-0276-0137.html
Pursell, Jason	EPA-HQ-OAR-2018-0276-0199.html
Quiet Skies Coalition	EPA-HQ-OAR-2018-0276-0081-A1.docx EPA-HQ-OAR-2018-0276-0081-A2.png EPA-HQ-OAR-2018-0276-0081.html
Raymond, Miles	EPA-HQ-OAR-2018-0276-0189.html
Rynevald, Adrian	EPA-HQ-OAR-2018-0276-0190.html
Salim, Nadia	Hearing Testimony
Sata, Gordon	EPA-HQ-OAR-2018-0276-0200.html
Schmidt, Ann	EPA-HQ-OAR-2018-0276-0201.html
Shell Oil Products US (Shell)	EPA-HQ-OAR-2018-0276-0097-A1.pdf EPA-HQ-OAR-2018-0276-0097.html
Solvay	EPA-HQ-OAR-2018-0276-0123.html
South Coast Air Quality Management District (South Coast AQMD)	EPA-HQ-OAR-2018-0276-0144-A1.pdf EPA-HQ-OAR-2018-0276-0144.html
State of Colorado , Planning and Policy Program, State Implementation Plan - Technical Development Unit	EPA-HQ-OAR-2018-0276-0092-A1.pdf EPA-HQ-OAR-2018-0276-0092.html
Stimson, Donald	EPA-HQ-OAR-2018-0276-0109.html
Temper Inc.	EPA-HQ-OAR-2018-0276-0111.html

Transport Canada, Civil Aviation (TCCA)	EPA-HQ-OAR-2018-0276-0084-A1.pdf EPA-HQ-OAR-2018-0276-0084-A2.pdf EPA-HQ-OAR-2018-0276-0084.html
U.S. Chamber of Commerce	EPA-HQ-OAR-2018-0276-0142-A1.pdf EPA-HQ-OAR-2018-0276-0142.html
Uribe, Daniela and Molnar, Timothy	EPA-HQ-OAR-2018-0276-0156-A1.pdf EPA-HQ-OAR-2018-0276-0156.html
Virginia Chamber of Commerce	EPA-HQ-OAR-2018-0276-0114-A1.pdf EPA-HQ-OAR-2018-0276-0114.html
Washington State Department of Ecology (Ecology)	EPA-HQ-OAR-2018-0276-0140-A1.pdf EPA-HQ-OAR-2018-0276-0140.html
Washington State House of Representatives	EPA-HQ-OAR-2018-0276-0086-A1.pdf EPA-HQ-OAR-2018-0276-0086-A2.pdf EPA-HQ-OAR-2018-0276-0086-A3.pdf EPA-HQ-OAR-2018-0276-0086.html
Wicket, Scott	EPA-HQ-OAR-2018-0276-0202.html
Zamore, Wig	Hearing Testimony

1. General Comments

<u>Comments:</u>

1.1. Generally Supports Notice of Proposed Rulemaking

Organization: Aerospace Industries Association (AIA)

AIA is strongly supportive of the EPA's proposal to adopt greenhouse gas emissions standards and test procedures for airplanes and airplane engines based on the International Civil Aviation Organization (ICAO) CO_2 standard agreed at the tenth meeting of the Committee on Aviation Environmental Protection (CAEP) in 2016, while affording sufficient flexibility to address the needs of U.S. manufacturers – particularly to ensure their continuing ability to support the needs of US domestic operators and assure that the standards are implemented in a cost-effective manner, as we continue our economic recovery from COVID-19. [EPA-HQ-OAR-2018-0276-0167-A1, pp.1-2]

The tiered applicability dates of this standard – applying initially to 'new-type' aircraft from January 1 2020, aircraft that undergo a significant change from January 1, 2023, and eventually other inproduction aircraft from January 1, 2028 – will set a de facto production cut-off of the least fuel efficient aircraft and facilitate replacement with new, more-advanced, and cleaner aircraft. These increases in the fuel efficiency of new aircraft – combined with the other basket of measures that will apply to older, in-service aircraft, will help to significantly reduce aviation's emissions over the coming decades. [EPA-HQ-OAR-2018-0276-0167-A1, p.4]

Conclusion

AIA strongly welcomes the EPA's proposal to introduce domestic regulations consistent with the ICAO CO_2 standard which will both help reduce the climate change impacts of aviation and maintain the competitiveness of U.S. manufacturers of aircraft. We urge the EPA to address the specific discrepancies between the ICAO standard and the EPA's proposed rule that AIA has highlighted in these comments – as well as the concerns on the reporting requirements provided in our comments to OMB – and to seek to finalize these rules by the end of this year. [EPA-HQ-OAR-2018-0276-0167-A1, p.14]

Organization: Airlines for America (A4A)

We were pleased to testify at the Agency's recent public hearing in strong support of the Agency's proposal to adopt GHG emissions standards for certain aircraft engines that are equivalent to the CO_2 Certification Standards for aircraft adopted by the International Civil Aviation Organization ("ICAO") in 2017, and will file written comments with EPA reiterating and reinforcing that support. [EPA-HQ-OAR-2018-0276-0088-A1, p.1]

[The following comments were submitted as testimony at the virtual public hearing on September 17, 2020.]

We appreciate this opportunity to testify in strong support of EPA's proposed adoption of internationally agreed greenhouse gas emission standards for new aircraft engines and urge the agency to proceed expeditiously towards its finalization consistent with the law.

Our commitment to building on a record of environmental responsibility and improving the sustainability of our industry is unwavering. It is in that spirit that we are pleased to strongly support EPA's proposed GHG emissions standards for aircraft engines.

In sum, A4A and our members remain committed to limiting and reducing our GHG emissions. We strongly support this proposed rule as an important part of that commitment and urge the agency to proceed expeditiously toward its finalization with the law.

Organization: Airlines for America (A4A) and Air Line Pilots Association, International (ALPA)

The U.S. airlines are a critical engine of prosperity and progress in the national and international communities. Importantly, the airlines and their pilots recognize that continued progress depends on protecting our environment and strengthening the sustainability of our economies. We acknowledge and embrace our responsibility to address climate change. Accordingly, A4A and ALPA were pleased to testify at the Agency's recent public hearing in strong support of the Proposed Rule4 and we are equally pleased to provide these written comments explaining the reasons for that strong support in more detail. As noted in A4A's testimony, we do have some concerns about some of the details of the Agency's proposal. [EPA-HQ-OAR-2018-0276-0161-A1, p.1]

We emphasize, as A4A did in its testimony at the public hearing, that we believe these concerns can be addressed constructively as the rule is finalized and do not undermine the validity of EPA's core proposal to adopt the ICAO CO_2 Standards into U.S. law. Indeed, in our view addressing our concerns as we suggest would strengthen the justification for incorporating the ICAO CO_2 Aircraft Standards into U.S. law.[6] Perhaps most critically, adoption of GHG Standards equivalent to ICAO CO_2 Aircraft Standards will ensure that aviation safety is maintained even as environmental progress continues. [EPA-HQ-OAR-2018-0276-0161-A1, p.2]

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[4] A4A's testimony, as written, has been submitted to the Docket for this rulemaking. See EPA-HQ-OAR- 2018-0276-0115.

[6] We note that we do oppose the proposed Reporting and Recordkeeping provisions (§§1030.90 and 1030.95), which the Agency acknowledges go "beyond what ICAO will request" for purposes of populating the ICAO CO_2 Certification Database and are not part of the ICAO Aircraft CO_2 Standards. 85 Fed. Reg at 51589. Before the Agency can adopt these provisions, pursuant to the Paperwork Reduction Act, they must be approved by the Office of Management and Budget ("OMB"). A4A submitted comments to OMB opposing EPA's Information Collection Request ("ICR") supporting adoption of these provisions and urging OMB to deny approval of these provisions. A4A's comments (EPA-HQ-OAR-2018-0276-0088) are incorporated herein by reference.

Organization: Anonymous Public Comment 10

I'm voicing my support for the EPA's proposed rule for aircraft CO_2 emissions regulations. This rule would ensure the reduction of our carbon footprint, make air travel more efficient and environmentally friendly, and set a new sustainability standard that will move us forward toward cleaner air for years to come. [EPA-HQ-OAR-2018-0276-0127, p.1]

Organization: Anonymous Public Comment 11

I'm voicing my support for the EPA's proposed rule for aircraft CO_2 emissions regulations. This rule would ensure the reduction of our carbon footprint, make air travel more efficient and environmentally friendly, and set a new sustainability standard that will move us forward toward cleaner air for years to come. [EPA-HQ-OAR-2018-0276-0128, p.1]

Organization: Anonymous Public Comment 12

I'm voicing my support for the EPA's proposed rule for aircraft CO_2 emissions regulations. This rule would ensure the reduction of our carbon footprint, make air travel more efficient and environmentally friendly, and set a new sustainability standard that will move us forward toward cleaner air for years to come. [EPA-HQ-OAR-2018-0276-0129, p.1]

Organization: Anonymous Public Comment 13

I encourage the EPA to support for the proposed rule for aircraft CO_2 emissions regulations. This rule would ensure the reduction of our carbon footprint, make air travel more efficient and environmentally friendly, and set a new sustainability standard that will move us forward toward cleaner air for years to come. [EPA-HQ-OAR-2018-0276-0130, p.1]

Organization: Anonymous Public Comment 14

I am very much in favor of this proposed rule change. I whole-heartedly support good air quality for the future of not only my children and family, but for the human race world-wide. It will make a difference to the future, and is a part of our legacy. [EPA-HQ-OAR-2018-0276-0131, p.1]

Please do all that you can to fight this forward and bring it to fruition. [EPA-HQ-OAR-2018-0276-0131, p.1]

Organization: Anonymous Public Comment 15

I do agree with the proposed rule on controlling air pollution from airplanes and airplane engines by using test procedures and greenhouse gas emission standards. The proposed rule will help limit greenhouse gas emissions in the atmosphere and is a great rule to help with climate change. [EPA-HQ-OAR-2018-0276-0132, p.1]

Organization: Anonymous Public Comment 16

I am in favor of EPA's proposed rule for Control of Air Pollution From Airplanes and Airplane Engines: GHG Emission Standards and Test Procedures. This rule is important for the environment. It will lead to a reduction in carbon footprint and efficient travel. Setting a longlasting, sustainable standard will move us towards having cleaner air for the future. [EPA-HQ-OAR-2018-0276-0133, p.1]

Organization: Anonymous Public Comment 18

The EPA should go forward with the proposed rule of aircraft CO_2 emission regulations. As they are closely related to ICAO's already in place and proven standards. Since the aviation industry is on schedule to triple by 2050, regulations now will help with reduced emissions of GHG. Additionally, since the regulations will only apply to future aircraft or current aircraft in production, there will be little to none financial burdens on companies. [EPA-HQ-OAR-2018-0276-0138, p.1]

Organization: Anonymous Public Comment 21

I'm voicing my support for the EPA's proposed rule for aircraft CO_2 emissions regulations. This rule would ensure the reduction of our carbon footprint, make air travel more efficient and environmentally friendly, and set a new sustainability standard that will move us forward toward cleaner air for years to come. [EPA-HQ-OAR-2018-0276-0170 p. 1]

Organization: Anonymous Public Comment 4

I'm voicing my support for the EPA's proposed rule for aircraft CO_2 emissions regulations. This rule would ensure the reduction of our carbon footprint, make air travel more efficient and environmentally friendly, and set a new sustainability standard that will move us forward toward cleaner air for years to come. [EPA-HQ-OAR-2018-0276-0106, p.1]

Organization: Anonymous Public Comment 5

I'm voicing my support for the EPA's proposed rule for aircraft CO_2 emissions regulations. This rule would ensure the reduction of our carbon footprint, make air travel more efficient and environmentally friendly, and set a new sustainability standard that will move us forward toward cleaner air for years to come. [EPA-HQ-OAR-2018-0276-0112, p.1]

Organization: Arlington Chamber of Commerce

The Arlington Chamber of Commerce supports the proposed Control of Air Pollution From Airplanes and Airplane Engines: GHG Emission Standards and Test Procedures rule implementing carbon dioxide emissions standards for aircraft. Completion of this rule is critical for the environment, the regulated industry, and the United States economy. [EPA-HQ-OAR-2018-0276-0139-A1, p.1]

Organization: Baxter, Cindy

[The following comments were submitted as testimony at the virtual public hearing on September 17, 2020.]

I believe that the EPA action is an important first step, and I want to emphasize first step. I thought about it a lot. Do I want to say that as a resident in East Boston, a heavily impacted community, that I am concerned that this is not good enough? When I put my other hat on, having worked for four different large corporations, I feel strongly that we have got to start somewhere. And the EPA is the group that can help us do that.

Organization: Boeing Company (Boeing)

During these challenging economic times as businesses fight to recover from the pandemic, certainty in the regulatory landscape is more important than ever before while continuing to take action to protect the environment. Finalizing this rule is an essential step for environmental protection, the aerospace industry, and the U.S. economy. Boeing supports EPA's proposed rule for airplanes and airplane engines with the modifications described in the attachments.[EPA-HQ-OAR-2018-0276-0181-A1, p.1]

Commercial aviation accounts for approximately 2.4 percent of global CO_2 emissions. Boeing is dedicated to reducing greenhouse gas emissions, and this regulation is a major step forward for supporting sustainable growth of the commercial aviation industry which has improved airplane fuel efficiency by 50% since 1990. A CO_2 emissions rule will encourage our efforts to continue efficiency improvements in new generations of our commercial airplanes through technological innovation. Continued technological innovation is essential to maintain U.S. leadership in aerospace and to help the industry meet its ambitious goal of cutting global commercial aviation emissions to half of what they were in 2005 by 2050. [EPA-HQ-OAR-2018-0276-0181-A1, p.1]

The Boeing Company (Boeing) welcomes the proposed rulemaking by the Environmental Protection Agency (EPA), published at 85 Fed. Reg. 51,556 et seq. (Aug 20, 2020), to promulgate regulations under section 231 of the Clean Air Act ("CAA" or "Act"), 42 U.S.C. § 7571, to align the EPA regulations governing emissions from aircraft engines with the aircraft carbon dioxide (CO_2) emission standard adopted by the International Civil Aviation Organization (ICAO). That standard (the "ICAO CO_2 standard" or "ICAO standard") controls emissions of CO_2 from aircraft engines by specifying minimum fuel-efficiency requirements for commercial airplanes. The proposed rule reflects U.S. efforts to secure the highest practicable degree of uniformity in aviation regulations and standards under the Chicago Convention of 1944, and implements EPA's obligations under the CAA. [EPA-HQ-OAR-2018-0276-0181-A2, p.1]

The proposed rule reflects the steady progress that has been made in improving the fuel efficiency of commercial aircraft, resulting in reduced emissions of CO_2. Promulgation of final regulations consistent with the proposed rule will ensure compliance with CAA requirements regarding the establishment of standards for emissions from aircraft engines, and follows the past practices of EPA and the Federal Aviation Administration (FAA) that extend back to the early 1970s. Further, by issuing standards (with the limited modifications requested herein), EPA will achieve the highest practicable degree of uniformity with the ICAO CO_2 standard that is feasible under the present economic circumstances, thus ensuring recognition of airworthiness and type certificates issued by FAA and by other civil aviation authorities to the maximum extent practicable, in accordance with the Chicago Convention. [EPA-HQ-OAR-2018-0276-0181-A2, p.2]

Boeing therefore urges EPA to finalize the proposed rule with "such modifications as the Administrator deems appropriate"[4] (and specifically those modifications requested in these comments) after the opportunity to review and respond to the comments submitted in response to the proposal. [EPA-HQ-OAR-2018-0276-0181-A2, p.4]

[The following comments were submitted as testimony at the virtual public hearing on September 17, 2020.]

Boeing supports the EPA CO_2 standard for aircraft. Boeing is dedicated to reducing greenhouse gas emissions. And this proposed regulation is a major step forward for protecting the environment and supporting sustainable growth of commercial aviation and the United States economy.

A CO_2 standard also dovetails strongly with the commercial aviation's business and environmental goals because the airlines have always wanted more fuel-efficient airplanes.

Commercial aviation's climate action strategy requires a strong commitment from all stakeholders, including governments. And we are proud to see that the United States has put forward a standard that does just that. By enabling transparency through an apples-to-apples comparison in environmental performance for airplane manufacturers, this regulation will strengthen the commercial aerospace manufacturing sector by creating a level playing field for original equipment manufacturers around the world.

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[4] CAA § 231(a)(3), 42 U.S.C. § 7571(a)(3).

Organization: Campbell, Colin

I'm voicing my support for the EPA's proposed rule for aircraft CO_2 emissions regulations. This rule would ensure the reduction of our carbon footprint, make air travel more efficient and environmentally friendly, and set a new sustainability standard that will move us forward toward cleaner air for years to come. As an added benefit, it will spur on innovation and drive US technology leadership.

Organization: Chaisson, Dan

Please consider this as my support for the EPA's proposed rule for reduced aircraft CO_2 emissions regulations. This rule would contribute to the reduction of our carbon footprint and make air travel more efficient and environmentally friendly, for the benefit of future generations. [EPA-HQ-OAR-2018-0276-0103,p.1]

Organization: Dicks, John

I'm voicing my support for the EPA's proposed rule for aircraft CO_2 emissions regulations. This rule would ensure the reduction of our carbon footprint, make air travel more efficient and environmentally friendly, and set a new sustainability standard that will move us forward toward cleaner air for years to come. We must do everything in our power to stop the progression of climate change.

Organization: Fadden, Delmar

I'm voicing my support for the EPA's proposed rule for aircraft CO_2 emissions regulations. This rule would ensure the reduction of our carbon footprint, make air travel more efficient and environmentally friendly, and set a new sustainability standard that will move us forward toward cleaner air for years to come. This is a positive step forward.

Organization: Embraer Commercial Aviation

As international aviation is a global industry, with Embraer's products used on every continent, the definition of a single set of standards and recommended practices worldwide is essential to ensure that we have one set of design and performance standards to work from, thus avoiding conflictual requirements from patchworks of individual national measures. [EPA-HQ-OAR-2018-0276-0174-A1, p.1]

Embraer is supportive of the EPA's proposal to adopt greenhouse gas emissions standards and test procedures for airplanes and airplane engines based on the International Civil Aviation Organization (ICAO) aircraft CO_2 standard agreed at the tenth meeting of Committee on Aviation Environmental Protection (CAEP) in 2016. [EPA-HQ-OAR-2018-0276-0174-A1, p.1]

Embraer strongly welcomes the EPA's proposal to introduce domestic regulations consistent with the ICAO CO_2 standard which will both help reduce the climate change impacts of aviation and lead to a single Standard applicable to all internationally operated transport category airplanes in production across the world. Embraer urges the EPA to address the specific discrepancies between the ICAO standard and the EPA's proposed rule that Embraer has highlighted in these comments and as well as the concerns on the reporting requirements provided in our comments to OMB, and to seek to finalize these requirements by the end of this year. [EPA-HQ-OAR-2018-0276-0174-A1, p.5]

Organization: Eminence Manufacturing Inc.

We are voicing our support for the EPA's proposed rule for aircraft CO_2 emissions regulations. This rule would ensure the reduction of our carbon footprint, make air travel more efficient and environmentally friendly, and set a new sustainability standard that will move us forward toward cleaner air for years to come. [EPA-HQ-OAR-2018-0276-0105, p.1]

Organization: Ferrara, John

I'm voicing my support for the EPA's proposed rule for aircraft CO_2 emissions regulations. This rule would ensure the reduction of our carbon footprint, make air travel more efficient and environmentally friendly, and set a new sustainability standard that will move us forward toward cleaner air for years to come.

Organization: Frontier Electronic Systems Corporation

I'm voicing my support for the EPA's proposed rule for aircraft CO_2 emissions regulations. This rule would ensure the reduction of our carbon footprint, make air travel more efficient and environmentally friendly, and set a new sustainability standard that will move us forward toward cleaner air for years to come. [EPA-HQ-OAR-2018-0276-0104, p.1]

Organization: General Aviation Manufacturers Association (GAMA)

We are pleased to see the EPA proceed with this rulemaking effort and hope that it will be finalized in the very near future. We support the EPA's proposed standards that are equivalent to the airplane CO_2 standards adopted by the International Civil Aviation Organization (ICAO) in 2017, but we have a couple of concerns regarding Reporting Requirements which are additional to those which ICAO requests. [EPA-HQ-OAR-2018-0276-0143-A1, p.1]

To summarize, GAMA supports EPA's proposed rules which match the standards adopted by ICAO in 2017.

As mentioned earlier, GAMA and its members have been long-time contributors to helping regulate aviation CO_2 emissions on an international scale. We are pleased to see EPA propose these rules and we will continue to lead the way in advancing efforts to reduce carbon emissions in our industry. [EPA-HQ-OAR-2018-0276-0143-A1, p.3]

Organization: General Electric Company (GE)

GE commends EPA for its leadership with this NPRM and appreciates the opportunity to comment on the NPRM. EPA's CO_2 standards for aircraft are a major step forward for protecting the environment and supporting sustainable growth of commercial aviation and the U.S. economy. [EPA-HQ-OAR-2018-0276-0157-A1, p.11]

[The following comments were submitted as testimony at the virtual public hearing on September 17, 2020.]

In short, GE in general supports EPA's proposal, which we believe is a win, both for the competitiveness of the American aviation industry and for the environment. This proposal if adopted promptly would enable GE to continue to innovate ways to reduce greenhouse gas emissions.

Organization: Gubser, Brian

I am a retired aerospace engineer and I'm voicing my support for the EPA's proposed rule for aircraft CO_2 emissions regulations. This rule would ensure the reduction of our carbon footprint, make air travel more efficient and environmentally friendly, and set a new sustainability standard that will move us forward toward cleaner air for years to come.

Organization: Gulfstream Aerospace Corporation

Gulfstream applauds the Environmental Protection Agency (EPA) for demonstrating leadership with this NPRM that will enable U.S. manufacturers to lead the way in producing environmentally responsible aircraft. Gulfstream has worked closely with the Aerospace Industries Association (AIA) and supports the comments provided by them with the following points of emphasis. [EPA-HQ-OAR-2018-0276-0078-A1, p.1]

Gulfstream views the establishment of GHG emission standards as a crucial step toward creating an equitable marketplace for world-leading American aircraft and believes the EPA's new rule will reinforce the technical capabilities of our industry in the manufacture of some of the world's most efficient aircraft. [EPA-HQ-OAR-2018-0276-0078-A1, p.1]

Gulfstream supports the collaborative, data driven approach the EPA has taken to align this proposed rule with the international community and believes that such a regulation strikes a reasonable balance of being technologically feasible and economically reasonable while promoting development of more efficient aircraft. [EPA-HQ-OAR-2018-0276-0078-A1,p.1]

Gulfstream supports the timeframe in the EPA's NPRM, which will cover all new and in-production aircraft by 2028. [EPA-HQ-OAR-2018-0276-0078-A1, p.1]

Organization: Hayward, Eric

Aircraft emissions are a major contributer to rising CO_2 levels, and strict standards should be implemented for all producers.

I'm voicing my support for the EPA's proposed rule for aircraft CO_2 emissions regulations. This rule would ensure the reduction of our carbon footprint, make air travel more efficient and environmentally friendly, and set a new sustainability standard that will move us forward toward cleaner air for years to come.

Organization: Hobart Machined Products, Inc.

Today I'm voicing my support for the EPA's proposed rule for aircraft CO_2 emissions regulations. This rule would ensure the reduction of our carbon footprint, make air travel more efficient and environmentally friendly, and set a new sustainability standard that will move us forward toward cleaner air for years to come. [EPA-HQ-OAR-2018-0276-0119, p.1]

As a manufacturer of aircraft parts, and assemblies it is vital we work together for a cleaner and safer environment. [EPA-HQ-OAR-2018-0276-0119, p.1]

Organization: International Co-ordinating Council of Aerospace Industries Associations (ICCAIA)

As international aviation is a global industry, with ICCAIA members' products used on every continent, the definition of a single set of standards and recommended practices worldwide is essential to ensure that companies have one set of design and performance standards to work from, thus avoiding conflictual requirements from patchworks of individual national measures. [EPA-HQ-OAR-2018-0276-0175-A1, p.1]

ICCAIA is supportive of the EPA's proposal to adopt greenhouse gas emissions standards and test procedures for airplanes and airplane engines based on the International Civil Aviation Organization (ICAO) aircraft CO_2 standard agreed at the tenth meeting of Committee on Aviation Environmental Protection (CAEP) in 2016. [EPA-HQ-OAR-2018-0276-0175-A1, pp.1-2]

ICCAIA strongly welcomes the EPA's proposal to introduce domestic regulations consistent with the ICAO CO_2 standard which will both help reduce the climate change impacts of aviation and lead to a single Standard applicable to all internationally operated transport category airplanes in production across the world. ICCAIA urges the EPA to address the specific discrepancies between the ICAO standard and the EPA's proposed rule that ICCAIA has highlighted in these comments and as well as the concerns on the reporting requirements provided in our comments to OMB, and to seek to finalize these requirements by the end of this year. [EPA-HQ-OAR-2018-0276-0175-A1, p.7]

Organization: Killdeer Mountain MFG

I'm voicing my support for the EPA's proposed rule for aircraft CO_2 emissions regulations. This rule would ensure the reduction of our carbon footprint, make air travel more efficient and environmentally friendly, and set a new sustainability standard that will move us forward toward cleaner air for years to come. [EPA-HQ-OAR-2018-0276-0107,p.1]

Organization: Marshall, Kristin

I'm voicing my support for the EPA's proposed rule for aircraft CO_2 emissions regulations. This rule would ensure the reduction of greenhouse gases, make air travel more efficient and environmentally friendly, and set a new sustainability standard that will move us forward toward cleaner air for years to come. The rulemaking also supports the US economy. Adoption of this standard is important to the aerospace sector.

Organization: Morgan, Jennifer

I'm voicing my support for the EPA's proposed rule for aircraft CO_2 emissions regulations. This rule would ensure the reduction of our carbon footprint, make air travel more efficient and environmentally friendly, and set a new sustainability standard that will move us forward toward cleaner air for years to come.[EPA-HQ-OAR-2018-0276-0110, p.1]

Organization: Morrison, Kirk

I'm voicing my support for the EPA's proposed rule for aircraft CO_2 emissions regulations. This rule would ensure the reduction of our carbon footprint, make air travel more efficient and environmentally friendly, and set a new sustainability standard that will move us forward toward cleaner air for years to come. [EPA-HQ-OAR-2018-0276-0113,p.1]

Organization: National Association of Manufacturers

Manufacturers are dedicated to the communities in which they live and serve, and we are taking bold steps ensure the health of air, water, land and people. As we build a stronger, more inclusive future together, it is essential that environmental regulations improve our lives and protect our planet while fostering economic growth. Understanding this and taking strategic action will create jobs, spur domestic investment and produce a healthier and more sustainable world for all of us. This is why manufacturers are committed to smart, strong environmental protections that improve the lives of all Americans and why we support this proposal. [EPA-HQ-OAR-2018-0276-0149-A1, p.3]

[The following comments were submitted as testimony at the virtual public hearing on September 17, 2020.]

EPA's proposal to establish greenhouse gas emissions standards and test procedures for airplanes used in commercial aviation and large business jets would lead to even greater reductions in hazardous air pollutants and set an important precedent in our critical fight against climate change. Given our strong commitment to clean air, we support this thoughtful proposal.

Organization: Northeast States for Coordinated Air Use Management (NESCAUM)

NESCAUM supports EPA's efforts to establish greenhouse gas (GHG) emission standards for certain classes of new type design and in-production airplanes used in commercial and business aviation.[1] [EPA-HQ-OAR-2018-0276-0152-A1, p.1]

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[1] The EPA specifies the proposed standards would apply to certain classes of engines used by certain civil subsonic jet airplanes with a maximum takeoff mass greater than 5,700 kilograms and by certain civil larger subsonic propeller-driven airplanes with turboprop engines having a maximum takeoff mass greater than 8,618 kilograms.

Organization: Ohio Chamber of Commerce

The Ohio Chamber of Commerce supports the proposed Control of Air Pollution from Airplanes and Airplane Engines: GHG Emission Standards and Test Procedures rule implementing carbon dioxide emissions standards for aircraft. [EPA-HQ-OAR-2018-0276-0116-A1, p.1]

Completion of this rule is critical for the environment, the regulated industry, and the United States economy. [EPA-HQ-OAR-2018-0276-0116-A1, p.1]

Organization: Ohio Manufacturers' Association (OMA)

The OMA supports the proposed Control of Air Pollution From Airplanes and Airplane Engines: GHG Emission Standards and Test Procedures rule implementing carbon dioxide emissions standards for aircraft. [EPA-HQ-OAR-2018-0276-0136-A1, p.1]

Completion of this rule is critical for the environment, the regulated industry, and the Ohio – and broader – economy. [EPA-HQ-OAR-2018-0276-0136-A1, p.1]

Organization: Parazzoli, Claudio

I'm voicing my support for the EPA's proposed rule for aircraft CO_2 emissions regulations. This rule would ensure the reduction of our carbon footprint, make air travel more efficient and environmentally friendly, and set a new sustainability standard that will move us forward toward cleaner air for years to come. Please give to our children and grandchildren a chance!!!

Organization: PM Testing Laboratory, Inc.

We support the proposed rule for aircraft CO_2 emissions. [EPA-HQ-OAR-2018-0276-0137, p.1]

Organization: Raymond, Miles

I'm voicing my support for the EPA's proposed rule for aircraft CO_2 emissions regulations. This rule would ensure the reduction of our carbon footprint, make air travel more efficient and environmentally friendly, and set a new sustainability standard that will move us forward toward cleaner air for years to come. Please support our future, a clean future for generations to come.

Organization: Rynevald, Adrian

I’m voicing my support for the EPA’s proposed rule for aircraft CO_2 emissions regulations. This rule would ensure the reduction of our carbon footprint, make air travel more efficient and environmentally friendly, and set a new sustainability standard that will move us forward toward cleaner air for years to come. This is necessary legislation; our children depend on it.

Organization: Sata, Gordon

Of course this would be a great idea so we can fly like birds, not garbage cans.

I’m voicing my support for the EPA’s proposed rule for aircraft CO_2 emissions regulations. This rule would ensure the reduction of our carbon footprint, make air travel more efficient and environmentally friendly, and set a new sustainability standard that will move us forward toward cleaner air for years to come.

Organization: Schmidt, Ann

I’m voicing my support for the EPA’s proposed rule for aircraft CO_2 emissions regulations. This rule would ensure the reduction of our carbon footprint, make air travel more efficient and environmentally friendly, and set a new sustainability standard that will move us forward toward cleaner air for years to come.

Hopefully this will happen quickly.

Organization: Solvay

Solvay supports EPA's proposed rule for aircraft CO_2 emissions regulations. This rule would encourage the design and manufacture of more efficient and environmentally friendly aircraft and engines. Our composite materials will be key enablers thanks to their light weight, the ability to create aerodynamic designs and opportunities for structural integration. The composite industry is heavily engaged in contributing to cleaner skies. [EPA-HQ-OAR-2018-0276-0123, p.1]

Organization: Temper Inc.

I'm voicing our support for the EPA's proposed rule for aircraft CO_2 emissions regulations, from all those who work for Temper. This rule would ensure the reduction of our carbon footprint, make air travel more efficient and environmentally friendly, and set a new sustainability standard that will move us forward toward cleaner air for years to come. [EPA-HQ-OAR-2018-0276-0111, p.1]

Organization: U.S. Chamber of Commerce

The U.S. Chamber of Commerce supports the proposed rule, “Control of Air Pollution From Airplanes and Airplane Engines: GHG Emission Standards and Test Procedures,” implementing carbon dioxide emissions standards for aircraft. [EPA-HQ-OAR-2018-0276-0142-A1, p.1]

This critical rule would give equipment manufacturers the predictability they need to get back on their feet and reduce emissions in the most cost-effective manner, while maintaining their competitiveness in world markets. The Chamber supports comments made by the Aerospace Industries Association providing more details on the importance to the aviation sector of finalizing the rule in short order. [EPA-HQ-OAR-2018-0276-0142-A1, p.2]

[The following comments were submitted as testimony at the virtual public hearing on September 17, 2020.]

The chamber supports the proposed rule on implementing carbon dioxide emissions standards for aircraft. Completion of this rule is critical for the environment, the regulated industry, and the U.S. economy.

Organization: Virginia Chamber of Commerce

The Virginia Chamber of Commerce supports the proposed Control of Air Pollution from Airplanes and Airplane Engines: GHG Emission Standards and Test Procedures rule implementing carbon dioxide emissions standards for aircraft. Completion of this rule is critical for the environment, the regulated industry, and the United States economy. [EPA-HQ-OAR-2018-0276-0114-A1, p.1]

Organization: Washington State House of Representatives

[The following comments were submitted as testimony at the virtual public hearing on September 17, 2020.]

And I appreciate the rules that have come forward. I hope you also look at the CO2 emissions as they look at new aircraft and those in production.

Organization: Wickett, Scott

I'm voicing my support for the EPA's proposed rule for aircraft CO_2 emissions regulations. This rule would ensure the reduction of our carbon footprint, make air travel more efficient and environmentally friendly, and set a new sustainability standard that will move us forward toward cleaner air for years to come. The rule would be a win-win for the environment, the economy, and the flying public.

Response

EPA acknowledges all of these comments expressing general support for the proposed rule, which we are finalizing with small modifications as described in the Preamble. In cases where commenters raise additional issues, we include and respond to those issues in the appropriate sections below.

1.2. Generally Opposes Notice of Proposed Rulemaking

Organization: Anonymous Public Comment 22

Having concluded that there are no statutorily-relevant benefits for the proposed standards, EPA should fulfill its obligation under Section 231(a)(B)(3) and finalize a rule, modified "as [the Administrator] deems appropriate" by adopting no standards on November 20, 2020. [EPA-HQ-OAR-2018-0276-0171 p. 1]

EPA notes that manufacturers will comply based on their anticipation of EPA's adoption of ICAO standards. A regulatory agency threatening new standards and taking market responses to that threat as evidence of a trend is the worst form of paternalism, and the result is EPA does not examine costs, benefits, cost-effectiveness, alternatives, or justifications. [EPA-HQ-OAR-2018-0276-0171 p. 1]

Organization: California Attorney General's Office and the California Air Resources Board (CARB) et al.

Under this baseline case, global and domestic GHG emissions from the aviation sector continue to rise at an increasing pace through 2040. EPA, Draft Airplane Greenhouse Gas Standards Technical Support Document, at 105 (July 2020) ("Draft TSD"). Such a scenario wholly fails to meet the danger of climate change: according to the IPCC, in order to stave off the most catastrophic harm, the United States and other nations must reduce GHG emissions by 45 percent by 2030 and achieve net zero emissions by 2050.[134] Reduction of U.S. aviation emissions is a necessary feature of any mitigation effort given the significant share of those emissions in the total global inventory. [EPA-HQ-OAR-2018-0276-0176-A1, pp.26-27]

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[134] IPCC 2018 Summary at 14.

Organization: Center for Biological Diversity, et al.

On behalf of our millions of members and supporters, we write to urge you to withdraw the Environmental Protection Agency's ("EPA") do-nothing proposed rule for greenhouse emissions from commercial aircraft, 85 Fed. Reg. 51,556 ("Proposed Rule"). While a rule to regulate the aviation industry's growing share of greenhouse gas emissions is long overdue, the Proposed Rule will not protect public health and fails to address the unfolding climate emergency. The proposed standards mirror standards adopted by the International Civil Aviation Organization ("ICAO") in 2017 following an industry-controlled process designed to maintain business as usual. In fact, EPA acknowledges that the Proposed Rule does nothing to reduce emissions.

For the following reasons, we call on you to withdraw the proposed rule and quickly replace it with strong, technology-forcing standards that rapidly decarbonize the aviation industry in line with what climate science and equity demand. [EPA-HQ-OAR-2018-0276-0147-A1, p.1]

The undersigned organizations agree that we must immediately and significantly reduce carbon emissions from the aviation sector to prevent devastating warming of our planet and protect the public from harmful air pollution. We therefore urge you to withdraw this Proposed Rule and commit to a rule that will avoid climate catastrophe. [EPA-HQ-OAR-2018-0276-0147-A1, p.3]

Organization: CERES

[The following comments were submitted as testimony at the virtual public hearing on September 27, 2020.]

I am here today to express our strong opposition to EPA's proposed rule, which is equivalent to the wholly inadequate International Civil Aviation Organization standards and thus clearly inconsistent with Paris climate goals. [EPA-HQ-OAR-2018-0276-0075-A1, p.1]

Reducing emissions from the aviation sector is enormously challenging, and it is critical that we accelerate our efforts now. Unfortunately, the proposed rule will only exacerbate that challenge. Accordingly, we strongly oppose EPA's proposed rule. [EPA-HQ-OAR-2018-0276-0075-A1, pp.1-2]

Organization: Chesapeake Bay Foundation, Inc. (CBF)

III. CBF Opposes the Proposed Airplane GHG Emissions Standards and Test Procedures Rule Because This Rule Is Legally Inadequate and Does Nothing but Formalize a Business-as-usual Scenario.

A. The Proposed GHG Emission Standards Do Nothing to Curb Rising Aircraft GHG Emissions.

Section IV.C then explains that EPA is proposing standards that follow its baseline (but still mirror ICAO's standards), and it does not foresee any costs or benefits from the proposed standards since the industry is already on track to meet them (or phase out old models). EPA even explicitly states that it "project[s] zero reduction in GHG emissions" from these standards.46 Accordingly, aside from an added reporting requirement, the proposed standards will have no effect on aircraft manufacturers, and they do nothing to address rising GHG emissions and resulting climate change impacts. [EPA-HQ-OAR-2018-0276-0093-A1 pp.6-7]

Organization: Ducolon, Fred

I am okay with regulating for cleaner air and water. but not shutting down the airline industry! Or regulating our military aircraft, by reducing their performance, And also any new EPA regulation, should be imposed on foreign counties entering the USA.

Organization: Environmental Defense Fund, Institute for Policy Integrity at New York University School of Law, Montana Environmental Information Center, Natural Resources Defense Council, Sierra Club, Union of Concerned Scientists

EPA's proposal would finalize standards that have no effect on emissions and require no technological improvements; instead, it would adopt as a matter of domestic U.S. regulations international standards that themselves are a decade behind what the industry will achieve absent any regulatory effort.Accordingly, EPA finds that the Proposed Rule would result in "limited costs" ($16,000 per year in annual reporting costs) and no monetized benefits, including greenhouse gas emissions reductions, because "all U.S. airplane models (in-production and in-development…) should be in compliance with the proposed standards" when they go into effect. [EPA-HQ-OAR-2018-0276-0183-A1, p. 1]

Organization: Heuscher, Rene

I'm voicing my opposition for the EPA's proposed rule for aircraft CO_2 emissions regulations. This rule is not needed as CO_2 emissions are less of a green house gas than the water vapor emitted by aircraft. This rule will make air travel more expensive, less available and less efficient, as cars will be used as substitute. This is just a ploy by big corporations to use government power to interfere in the free market and transfer wealth from consumer to big corporate bottom line.

Organization: Life:Powered, an initiative of the Texas Public Policy Foundation

On behalf of Life:Powered, an initiative of the Texas Public Policy Foundation, I want to express our opposition to the EPA's current proposal to regulate greenhouse gas (GHG) emissions from airplanes and airplane engines. [EPA-HQ-OAR-2018-0276-0172-A1, p.1]

Given the flaws mentioned in these comments and numerous others, we strongly encourage the EPA to rescind this rule in its entirety and to review and ultimately repeal the endangerment finding for GHG emissions from U.S. aircraft. [EPA-HQ-OAR-2018-0276-0172-A1, p.3]

Organization: Normand, Eugene

I am voicing my disagreement with the EPA's proposed rule for aircraft CO_2 emissions regulations. While this rule would lead to additional reduction of the carbon footprint, it would only apply to the US. Most of the atmospheric contamination around the world comes from other countries, not the US. In particular, according to worldometer data, the US is second, accounting for 14% and China is the top CO_2 polluter, accounting for 29%, twice as much as the US, and all other countries combined account for 86%. Further, the CO_2 from India, Russia and Japan combine to produce 15%. In addition, the US CO_2 production includes various industries. Why should we hamstring the US aircraft industry while completely ignoring the major sources of CO_2 in the world and within the US from other sources such as the operations of heavy and light industry and farming.

Organization: Pursell, Jason

I'm voicing my concern regarding the EPA's proposed rule for aircraft CO_2 emissions regulations. This regulation would hinder the aerospace companies in the United States at this volatile economic time. This would also give an unfair advantage to our international competitors such as the Chinese government. I feel the responsibility is on the companies to regulate themselves based on consumer demand.

Organization: Washington State Department of Ecology (Ecology)

The proposed rule will not reduce GHG pollution

In EPA's own words, the proposed standards will have no net impact on GHG pollution from aircraft. According to the draft language, "the proposed GHG standards are not expected to result in reductions in fuel burn and GHG emissions beyond the baseline."[1] We cannot afford to squander this critical opportunity to make meaningful, environmental, technological, and economic progress. In proposing a rule that is no more than a regulatory exercise, EPA is not only wasting invaluable time, it is locking in decades of unnecessary, harmful, and easily preventable pollution from a sector anticipated to have significant growth in emissions. [EPA-HQ-OAR-2018-0276-0140-A1, pp.1-2]

Aircraft, comprising nine percent of U.S. transportation emissions, are currently the largest domestic GHG-emitting transportation source unregulated by federal standards.[2] The International Civil Aviation Organization (ICAO) estimates that emissions from international aviation will increase between 200 and 400 percent by 2050.[3] According to EPA, U.S. domestic aviation emissions increased by 18 percent between 1990 and 2018, despite increases in fuel efficiency, and are expected to increase by 43 percent between 2010 and 2043.[4,5] [EPA-HQ-OAR-2018-0276-0140-A1, p.2]

If EPA promulgates this rule as proposed, the agency will cement these trends. Even if commercial aircraft fleet efficiency gradually rises, a rule that does not mandate real and substantive emissions reductions will ensure that higher-polluting aircraft remain in service for decades to come. Currently, the average age of domestically-produced aircraft in service for major U.S. carriers is about 16 years, with some operational aircraft dating back to the 1970s.[6] Knowing that the aircraft produced today could be in service past 2060, EPA must act now to secure meaningful and lasting GHG reductions. [EPA-HQ-OAR-2018-0276-0140-A1,p.2]

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[1] Control of Air Pollutants from Airplanes and Airplane Engines: GHG Emission Standards and Test Procedures, 85 Fed. Reg. 51,583 (August, 20, 2020).
[2] United States Environmental Protection Agency. 2020. "Inventory of U.S. Greenhouse Gas Emissions and Sinks." https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks
[3] International Civil Aviation Organization. "Environmental Trends in Aviation to 2050." P 23. https://www.icao.int/environmental-protection/Documents/EnvironmentalReports/2019/ENVReport2019_pg17-23.pdf
[4] United States Environmental Protection Agency. 2020. "Inventory of U.S. Greenhouse Gas Emissions and Sinks." https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks
[5] Federal Aviation Administration. (2016). "FAA Aerospace Forecast Fiscal Years 2016-2036." P. 94.
[6] United States Department of Transportation, Bureau of Transportation Statistics. (2020). Average age of aircraft 2019 data. https://www.bts.gov/average-age-aircraft-2019

Response:

EPA acknowledges all of these comments expressing general opposition to the proposed rule. Commenters offered different reasons for opposing the rule ranging from views that no aircraft GHG standards should be finalized to views that the standards should be more stringent. EPA's general reasons for finalizing the proposed standards, with only small modifications, are described in the Preamble §IV.I.1. In cases where commenters raise additional issues and specific points above, we include and respond to those issues and points in the appropriate sections below.

1.3. Requests to Consider Additional Items

Comments:

In addition to what the EPA considered for the airplane GHG standards, numerous commenters requested that the EPA contemplate further items such as the following: other programs, additional technologies, more stringent standards, technology forcing standards (instead of technology following standards), sustainable aviation fuels (or alternative fuels), all electric airplanes, hydrogen-fueled commercial aircraft, alternative compliance mechanisms, etc. These comments are included verbatim throughout this document.

Response:

The EPA did not gather data, could not conduct necessary analyses of such data, or otherwise develop a record that considered many of these items sufficiently to propose standards reflecting many of these items; therefore, the public has not been provided an opportunity to evaluate and comment upon these programs. Furthermore, such a record would include new analyses (and/or assessment) of technological feasibility, costs, and environmental benefit (e.g., emission reductions and monetized benefits). To effectively assess these items, the EPA would need more time to gather information on them, and the EPA currently does not have the time in order for the United States to meet its obligations under the Chicago Convention. The EPA is now late in issuing its GHG standards applicable to new type designs, as the January 1, 2020, applicability date under the international CO2 standards has already passed, and the ICAO applicability date of January 1, 2023 for modified airplane types (changes for non-GHG Certificated Airplane Types) is fast approaching. Also, the U.S. airplane manufacturers are urging the EPA to promptly promulgate this final rulemaking to adopt ICAO's standards, which were adopted back in 2017, because decisions are now being made by air carriers on airplane deliveries through the end of this decade.[1] Furthermore, the EPA understands that U.S. airplane manufacturers need time to certify their airplanes, after the subsequent FAA rulemaking to enforce the standards, to ensure the airplanes comply with the in-production standards by the applicability date of January 1, 2028. Since we have not yet provided that opportunity for public comment on these additional items, and attempting to do so now would in the EPA's view unacceptably slow down this rulemaking, in the interests of expediency and of bringing U.S. domestic law into conformity with our obligations under the Chicago Convention, we have decided that the most appropriate course for now, under CAA section 231, is to simply adopt airplane GHG standards that are harmonized with the standards adopted by ICAO in 2017 (in terms of stringency level, timing, scope, etc.).

2. International Regulations and U.S. Obligations

<u>Comments:</u>

2.1. Aligning with International Standards

Organization: Aerospace Industries Association (AIA)

Importance of equivalent aircraft CO_2 rules for the U.S. aerospace industry’s competitiveness

For previous aircraft engine emission standards, the EPA has adopted the international ICAO standards into U.S. domestic law under Section 231 of the Clean Air Act. AIA is pleased that the EPA is intending to continue with this well-established and proven approach for the ICAO CO_2 standard with this rulemaking activity, by adopting rules that are equivalent in scope, stringency and timing to the ICAO CO_2 standard. [EPA-HQ-OAR-2018-0276-0087-A1, p.4]

Adoption of this standard into domestic rules is vital for the competitiveness of the US aerospace industry. When airlines make decisions about the aircraft they purchase, a key consideration is the assurance that an aircraft will meet the required standard to be allowed to operate in an airline’s jurisdiction – which outside of the U.S. will be demonstrated by compliance with the ICAO CO_2 standard. Without relevant domestic regulations in place from the EPA, the FAA are unable to certificate an aircraft as meeting the ICAO CO_2 standard and U.S. manufacturers would be at a serious competitive disadvantage to those based elsewhere.[EPA-HQ-OAR-2018-0276-0087-A1, p.4]

General Observations on proposed rule

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[1] AIA, 2020: *Aerospace Industries Association comments on Control of Air Pollution from Airplanes and Airplane Engines: Greenhouse Gas Emission Standards and Test Procedures, Docket: EPA–HQ–OAR–2018–0276*, October 19, 2020.

As the representative of the American aerospace industry, AIA wants to ensure that the U.S. has a framework consistent with the internationally-proven ICAO approach that will allow our members to continue to design environmental efficiency improvements into aircraft. As U.S. manufacturers build aircraft that will be used all over the world, harmonization with ICAO rules is important for ensuring the intended environmental benefit of these rules is realized – as well as for the competitiveness of the U.S. aerospace industry and the health of the international aviation system. When airlines make decisions about the aircraft they purchase, a key consideration is the assurance that an aircraft will meet the required standard to be allowed to operate in an airline's jurisdiction – which outside of the U.S. will be demonstrated by compliance with the ICAO CO_2 standard. Without relevant domestic regulations in place from the EPA, the FAA are unable to certificate an aircraft as meeting the ICAO CO_2 standard and U.S. manufacturers would be at a serious competitive disadvantage to those based elsewhere. [EPA-HQ-OAR-2018-0276-0167-A1, pp.4-5]

The impact of a scenario where the U.S. fails to introduce equivalent domestic rules to the ICAO CO_2 standard in a timely fashion could jeopardize sales of U.S. aircraft to the effect of tens of billions of dollars. This could have catastrophic impacts on the future strength and competitiveness of the U.S. aerospace sector, especially in conjunction with the unprecedented downturn in activity that the sector is currently facing as a result of the COVID-19 pandemic. As our industry supported 920,000 direct jobs, a further 1.28 million jobs throughout the shared aerospace and defense supply chain and contributed a positive trade balance of $79 billion in 2019, this would also be extremely detrimental to the national security and prosperity of the United States.[10] [EPA-HQ-OAR-2018-0276-0167-A1, p.5]

Given the importance of having equivalent domestic rules to ICAO's CO_2 standard in place, AIA is pleased that the EPA is intending to continue with its established approach of adopting emissions standards agreed through ICAO into domestic law under Section 231 of the Clean Air Act. AIA also welcomes the EPA's intention to adopt rules that are equivalent in scope, stringency and timing to the ICAO CO_2 standard. The parameters of the ICAO standard – which were negotiated by the EPA and FAA on behalf of the U.S. Government and with technical input provided by AIA member companies – were carefully selected after many years' of robust analysis within CAEP to deliver the maximum environmental benefit when current technological feasibility and economic reasonableness are considered. [EPA-HQ-OAR-2018-0276-0167-A1, p.5]

[The following comments were submitted as testimony at the virtual public hearing on September 27, 2020.]

Traditionally, the EPA has adopted emissions standards agreed through ICAO into domestic law under Section 231 of the Clean Air Act. [EPA-HQ-OAR-2018-0276-0080-A1, p.1]

Given the success to date, AIA is pleased that EPA is intending to continue this approach for ICAO's first ever aircraft CO_2 standard, which AIA, the EPA, and the FAA helped negotiate and which was ratified at the 39th ICAO General Assembly in 2016. [EPA-HQ-OAR-2018-0276-0080-A1, p.1]

Agreement of this standard was a key step for ensuring aviation builds on its sustainability achievements. [EPA-HQ-OAR-2018-0276-0080-A1, p.1]

The ICAO standard will eventually apply to all in-production aircraft from January 1, 2028 – setting a de-facto production cut-off date of the least fuel-efficient aircraft and facilitating replacement with more-advanced and cleaner aircraft. [EPA-HQ-OAR-2018-0276-0080-A1, p.2]

Continuing improvements in aircraft fuel-efficiency is a key component of aviation's strategy for reducing net CO_2 emissions to 50% of 2005 levels by 2050. [EPA-HQ-OAR-2018-0276-0080-A1, p.2]

As a representative of aerospace manufacturers, AIA wants to ensure that the U.S. has a framework consistent with the internationally-proven approach, that will allow our members to continue to design environmental efficiency improvements into aircraft. [EPA-HQ-OAR-2018-0276-0080-A1, p.2]

US manufacturers build aircraft that will be used all over the world, using the same standard as that developed through ICAO is therefore vital for the competitiveness of the US aerospace industry, and the health of the global aviation system. [EPA-HQ-OAR-2018-0276-0080-A1, p.2]

We are therefore pleased that the EPA is proposing to adopt rules that are equivalent in scope, stringency and timing to the ICAO CO_2 standard. [EPA-HQ-OAR-2018-0276-0080-A1, p.2]

The ICAO standard came into effect on January 1, 2020 for aircraft applying for a new type-certificate. [EPA-HQ-OAR-2018-0276-0080-A1, p.2]

AIA members have already taken steps to ensure compliance with this standard – including making plans to end production of the least fuel-efficient aircraft. [EPA-HQ-OAR-2018-0276-0080-A1, p.2]

The majority of aircraft will not be subject to the standard until January 1, 2028. Nevertheless, we urge the EPA to finalize the domestic adoption of these rules by the end of this year. [EPA-HQ-OAR-2018-0276-0080-A1, p.2]

Airlines purchase aircraft several years in advance. They are currently deciding on aircraft that will be delivered through the end of this decade. When making these decisions, airlines will require assurances that aircraft meet the standard to operate in international markets. [EPA-HQ-OAR-2018-0276-0080-A1, p.2]

Without domestic regulations in place, the FAA would be unable to certify an aircraft as meeting the ICAO CO_2 standard. In this situation, U.S. manufacturers would be at a serious competitive disadvantage if airlines were to seek greater regulatory certainty by opting to purchase aircraft manufactured elsewhere that meet the requirements of their certifying authority's equivalent rules, which have already been implemented in some cases. [EPA-HQ-OAR-2018-0276-0080-A1, p.2]

If this was to occur, it could jeopardize tens of billions of dollars in sales for the U.S aerospace industry. [EPA-HQ-OAR-2018-0276-0080-A1, p.2]

To avoid this scenario, the EPA should ensure that final domestic regulations are adopted by the end of 2020, so that aircraft manufacturers and the FAA have sufficient time to perform the required processes. [EPA-HQ-OAR-2018-0276-0080-A1, p.2]

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[10] Aerospace Industry Association (2020), Facts and Figures: Aerospace and Defense

Organization: Aerospace Industries Association of Canada (AIAC)

AIAC applauds the US Government's adoption of new environmental requirements for civil aviation which are based on ICAO standards. We note the strong commitment and involvement of the US Government and US manufacturers in ICAO processes. [EPA-HQ-OAR-2018-0276-0082-A1, p.1]

AIAC is convinced that the cornerstone of global improvements to civil aviation's environmental footprint is uniform global emissions and noise standards; these are developed by ICAO's Committee on Aviation Environmental Protection (CAEP). The US Government has a leading role at CAEP. [EPA-HQ-OAR-2018-0276-0082-A1, p.1]

Organization: Air Line Pilots Association's Air Safety Organization

[The following comments were submitted as testimony at the virtual public hearing on September 17, 2020.]

We believe it is essential that the global aviation equipment-manufacturing community and airline industry compete on a level playing field, which is what the proposed rule will help establish in the area of emissions. A patchwork of various engine emissions standards by countries around the world would create confusion, higher costs, and a potential increase in emissions, plus endanger the economic viability of the airline industry.

Organization: Airbus S.A.S. (Airbus)

Airbus is fully committed to eco-efficiency and supports global collaborative efforts aimed at creating regulatory uniformity. With the global scope of aviation, what we are always trying to avoid is having a patchwork of regulations of varying stringencies. As such, Airbus does not believe that the EPA should impose rules that are different from or in excess of, whether in scope or in stringency, the requirements that have been adopted by the International Civil Aviation Organization ("ICAO"), which has been studying issues surrounding aircraft emissions for many years through the Committee on Aviation Environmental Protection ("CAEP"). Most significantly, it is important for EPA to recognize how much Airbus and its partners have strived to manufacture technically advanced and innovative aircraft that are as fuel-efficient as safety will allow. Reducing the fuel consumption of our products is a business imperative. Thus, EPA's regulation should consider these factors, whilst maintaining the ICAO principles of technical feasibility, economic reasonableness and environmental benefit. [EPA-HQ-OAR-2018-0276-0148-A1, p.2]

Organization: Airlines for America (A4A)

[The following comments were submitted as testimony at the virtual public hearing on September 17, 2020.]

Critically, it is really important to realize that this is critical to the competitiveness of the U.S. aircraft and aircraft manufacturers that the U.S. follow these international standards, which, in turn, will improve the airlines' ability to acquire U.S.-manufactured aircraft and help foster competitive market prices. Even more critically, the standards will ensure that aviation safety is maintained, even as environmental progress is ensured.

Organization: Airlines for America (A4A) and Air Line Pilots Association, International (ALPA)

We also are mindful of the importance of this rulemaking to the continued vitality and competitiveness of U.S. aircraft and aircraft engine manufacturers. Adopting the ICAO CO_2 Aircraft Standards into U.S. law will ensure U.S.-manufactured aircraft and engines are available to U.S. airlines, while fostering global competition and enabling our airlines to acquire aircraft and aircraft engines at market-driven, competitive prices. Especially given that, as the Agency itself notes, "other ICAO member states that certify airplanes" have already adopted the ICAO CO_2 Aircraft Standards,[7] the Agency needs to act to put U.S. aircraft and aircraft engine manufacturers on the same footing as their foreign counterparts. Again, we do have concerns about the details of this proposal but want to make perfectly clear that we believe these concerns can be addressed without delaying its finalization. [EPA-HQ-OAR-2018-0276-0161-A1, p.2]

1. A4A AND ALPA STRONGLY SUPPORT INCORPORATION OF THE ICAO CO_2 AIRCRAFT STANDARDS INTO U.S. LAW

A4A and ALPA very strongly support the proposal to adopt the ICAO CO_2 Aircraft Standards into U.S. law for several reasons. [EPA-HQ-OAR-2018-0276-0161-A1, p.4]

A. Adoption of GHG Aircraft Engine Standards that are Equivalent to the ICAO CO_2 Aircraft Standards into U.S. Law is Consistent with the Authority Conferred to EPA Under Section 231 of the Clean Air Act

The ICAO CO_2 Aircraft Standards clearly meet the criteria for adoption of aircraft engine standards set out in Section 231 of the Clean Air Act. As EPA highlights in the preamble to the Proposed Rule, the ICAO CO_2 Aircraft Standards resulted from an intense, multi-year effort within ICAO to assess aircraft and aircraft engine technologies, develop a metric for evaluating CO_2 emissions from aircraft, and agree on the applicability, timing and stringency of the standards. The technical grounding for the standards was established through many meetings of the ICAO Committee on Aviation Environmental Protection ("CAEP"). Upon recommendation of the standards by CAEP in 2016, the ICAO Council reviewed and voted to adopt the standards, a proposal that was endorsed by the ICAO Assembly (ICAO's governing authority). After a final review period involving all ICAO Member States, in early 2017 the ICAO CO_2 Aircraft Standards were formally adopted into ICAO's Standards and Recommended Practices ("SARPs") and codified in Annex 16, Volume III of the Convention on International Civil Aviation (commonly referred to as the "Chicago Convention").

Importantly, the U.S. government plays a leading role within ICAO and its leadership within CAEP is particularly strong. The FAA serves as the U.S. representative to CAEP (also referred to as the "CAEP Member"), with EPA serving as an advisor to FAA "on aviation emissions, technology, and environmental policy matters" throughout the CAEP process.[11] As EPA recounts, both FAA and EPA worked over an eight-year period "from 2009 to 2016 within the ICAO/CAEP standard-setting process on the development of" the ICAO CO_2 Aircraft Standards.[12] Indeed, both FAA and EPA served as leaders of key technical working groups and task groups, as CAEP worked to collect data, and complete comprehensive technical and economic analyses to inform development of the standards. In addition, EPA often contributed technical analyses and data for the CAEP's consideration. A4A was privileged to be included on the International Air Transport Association's delegation, which serves as an "observer" to CAEP. ALPA also participated as an observer as part of the International Federation of Air Line Pilots' Associations. As observers, A4A and ALPA were able to provide input into the process and – like EPA and FAA – devoted many, many hours and resources to the effort. Other organizations representing industry stakeholders and non-governmental organizations ("NGOs") also served as observers and contributed data and analyses. In the end, with the U.S FAA and EPA playing key leading roles, it was only after dozens of in-person meetings and many more teleconferences in which hundreds of formal analytical papers authored by some 170 aviation experts from government, industry and environmental organizations were painstakingly considered, that CAEP agreed to the ICAO CO_2 Aircraft Standards. [EPA-HQ-OAR-2018-0276-0161-A1, pp.4-7]

B. Significant Policy Reasons Support EPA's Expeditious Adoption of GHG Aircraft Engine Standards that are Equivalent to the ICAO CO_2 Aircraft Standards

The adoption of GHG Aircraft Engine Standards that are equivalent to the ICAO CO_2 Aircraft Standards will advance the goals of the Chicago Convention and the United States' continued leadership role within ICAO/CAEP to achieve important environmental objectives. The Chicago Convention is intended to ensure "international aviation is developed in a safe and orderly manner" and promote global harmonization and international aviation commerce and growth, through collaboration among its member States aimed at "securing the highest practicable degree of uniformity in regulations, standards, procedures and organization in relation to aircraft."[25] ICAO's adoption of the ICAO CO_2 Aircraft Standards represents a consensus reached among its 193 member States consistent with the ideals memorialized in the Chicago Convention after exhaustive analysis and deliberation. The result is a strong standard that will achieve GHG emissions reductions and support U.S. policies to combat climate change consistent with maintaining the "highest practicable degree of uniformity" in international requirements. This uniformity is vital given that the nature of international aviation, where U.S. aircraft enter the airspace of and operate at airports in other countries hundreds of times per day. Aircraft and the international airspace system simply could not function if aircraft and aircraft engines were subject to disparate regulatory requirements and standards.

As such, we have long supported and actively participated together with EPA and FAA in "the standard-setting process of ICAO's CAEP to help establish international emission standards and related requirements, which individual member States adopt into domestic law and regulations."[26] As EPA rightly affirms, "[h]istorically . . . international emissions standards have first been adopted by ICAO, and subsequently the EPA has initiated rulemakings under CAA section 231 to establish domestic standards that are" consistent with ICAO standards.[27] As expressed in our comments on the 2016 Findings and ANPR, we believe the Agency should not go beyond ICAO standards as a general matter and, consistent with long standing U.S. policy, that regulation of GHGs should be consistent with the Chicago Convention and reflect international consensus developed through ICAO.[28] We emphatically agree with EPA's decision here to "continue [its] historical rulemaking approach" and adopt GHG Aircraft Engine Emissions Standards equivalent to international consensus reflected in the ICAO Aircraft CO_2 Standards.[29] [EPA-HQ-OAR-2018-0276-0161-A1, p.8]

We also emphatically agree that adoption of GHG Aircraft Engine Emission Standards that are equivalent to the ICAO standards is critically important to competitiveness of U.S. aircraft and aircraft engine manufacturers. EPA is correct to highlight that adoption of GHG aircraft engine standards equivalent to the ICAO CO_2 Aircraft Standards will ensure U.S. aircraft and aircraft engine manufacturers are able to obtain FAA certification of their products, in turn ensuring that these products will be accepted in the world marketplace. This will remove the potential that U.S. OEMs will be at a competitive disadvantage with foreign aircraft and engine manufactures with better or more favorable access to foreign certificating authorities. We also agree with EPA's observation that "compliance with international standards (via FAA type certification) is a critical consideration in airlines' purchasing decisions."[30] As noted above, adopting the ICAO CO_2 Aircraft Standards into U.S. law will ensure U.S.-manufactured aircraft and engines are available to U.S. airlines, while fostering global competition and enabling our airlines to acquire aircraft and aircraft engines at market-driven, competitive prices. This is critical to the continued competitiveness of U.S. airlines across the globe and helps ensure that we will have access to advanced aircraft and aircraft engines we will need to attain our environmental goals and fulfill our commitments to address climate change. It also helps preserve the vitality of the U.S. aircraft and aircraft engine manufacturing sector, which not only is a very large component of our country's exports but is supported by a vast eco-system of smaller businesses, manufacturers and service providers that employ thousands in their own right. Of course, economic and social factors like these take on even greater significance in the current economic crisis brought on by the COVID-19 pandemic.

The COVID-19 crisis also underscores the need to act as expeditiously as possible to approve the adoption of GHG Aircraft Engine Emissions Standards that are equivalent to the ICAO CO_2 Aircraft Standards.[31] Again, as noted above, EPA itself notes, "other ICAO member states that certify airplanes" have already adopted the ICAO CO_2 Aircraft Standards.[32] Accordingly, the Agency needs to act to put U.S. aircraft and aircraft engine manufacturers, as well as U.S. carriers and other entities that rely on these OEMs to maintain and modernize their fleets, on the same footing as their foreign counterparts. [EPA-HQ-OAR-2018-0276-0161-A1, pp.8-9]

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[7] 85 Fed. Reg. at 51557.
[11] 85 Fed. Reg at 51560.
[12] 85 Fed. Reg at 51561.
[25] Convention on International Civil Aviation ("Chicago Convention"), Article 37, available at https://www.icao.int/publications/Documents/7300_9ed.pdf.
[26] 85 Fed. Reg at 51559.
[27] 85 Fed. Reg at 51559.
[28] Joint A4A-ALPA Comments, EPA-HQ-OAR-2014-0828-0747 at 42-44.
[29] 85 Fed. Reg. at 51559.
[30] 85 Fed. Reg at 51584.

31 We recognize that while some technical accommodations must be made to incorporate the ICAO CO_2 Aircraft Standards into the U.S. regulatory scheme, the requirements applicable to aircraft to be used in international service must be substantively equivalent. Should the United States conclude that the unprecedented and devastating effects of the COVID-19 virus support adoption of provisions that are less stringent than international standards, those provisions should apply to aircraft dedicated to domestic service.

32 85 Fed. Reg. at 51557.

Organization: Anonymous Public Comment 1

The CO_2 standards, set by the International Civil Aviation Organization, should apply to the applicable classes of engines established in this proposed rule. The U.S should be leaders in the aviation industry and not being uniform with other international aviation entities only worsens the capabilities of the United States to compete with other countries in regards to aviation production and emissions standards. [EPA-HQ-OAR-2018-0276-0079, p.1]

Organization: Arlington Chamber of Commerce

The EPA standard is consistent with the standards agreed to by 190 countries and the U.N. International Civil Aviation Organization (ICAO). A U.S. standard in alignment with the ICAO standards is an important step in creating a level international playing field for American airplane manufacturers, which means that aircraft designed and built in the U.S. should be more competitive in the global marketplace. [EPA-HQ-OAR-2018-0276-0139-A1, p.1]

The ICAO standards are an important part of the industry's strategy to cut net global aviation carbon dioxide emissions to half of what they were in 2005 by 2050. These ambitious emission standards would formalize technology improvements into the airplane certification process that, until now, have been purely voluntary. We believe that when finalized, this rule will reduce emissions in the most cost-effective way. [EPA-HQ-OAR-2018-0276-0139-A1,p.1]

Organization: Boeing Company (Boeing)

Because ICAO tends to re-examine its emissions standards every two to four action cycles of the Committee on Aviation Environmental Protection (CAEP), we anticipate that ICAO could adopt a more stringent CO_2 standard within the next six to twelve years (depending, of course, on advancements in safe, proven technology). At that time, EPA could consider whether to revise its own standard pursuant to CAA section 231. [EPA-HQ-OAR-2018-0276-0181-A2,pp.3-4]

A. EPA's and FAA's Coordinated Roles Representing the U.S. in the ICAO Standard Development Process Align with the Collaborative Process for Adopting Standards for Emissions from Aircraft Engines Pursuant to Clean Air Act Section 231.

Historically, EPA has closely worked with FAA and within ICAO to establish aircraft emission standards. As EPA noted in the 2015 Advance Notice of Proposed Rulemaking (2015 ANPRM), "[t]he EPA and [FAA] traditionally work within the standard-setting process of ICAO's CAEP to establish international emission standards and related requirements. [U]nder this approach, international emission standards have first been adopted by ICAO, and subsequently the EPA has initiated rulemakings under CAA section 231 to establish domestic standards equivalent to ICAO's standards."[20] This approach has been affirmed as reasonable by the U.S. Court of Appeals for the D.C. Circuit.[21] [EPA-HQ-OAR-2018-0276-0181-A2, p.10]

The ICAO process aligns with the collaborative EPA/FAA process mandated by Congress for setting standards under CAA section 231 for emissions from aircraft engines and schedules for implementing those standards. While EPA is charged with proposing standards applicable to emissions from aircraft engines, those standards may only take effect after EPA has consulted with the FAA on several matters, including safety, noise and the time necessary "to permit the development and application of the requisite technology, giving appropriate consideration to the cost of compliance within such period."[22] This collaborative process has been defined in law since the "modern" CAA was enacted in 1970. CAA section 231(b) as originally enacted[23] is identical to the language contained in the current CAA. Thus, parallel to the process followed during the ICAO standard-setting process, EPA and FAA must coordinate during the rulemaking process to produce CAA section 231 emission standards. [EPA-HQ-OAR-2018-0276-0181-A2, p.10]

EPA need not, and should not, adopt a different approach in this rulemaking addressing CO_2 emissions than it has taken in prior CAA section 231 rulemakings addressing other pollutants. In its past development and support of section 231 standards, EPA has relied on CAEP assessments regarding the technical feasibility and costs of new standards, noting that the Agency had "participated in these analyses and supported the results."[24] This process maintains the close coordination with FAA that is demanded under CAA section 231 and that has been affirmed by that Agency.[25] Past examples of this FAA coordination and concurrence in CAA section 231 rulemaking extend back decades and include the following CAA section 231 rulemakings to adopt ICAO-equivalent standards: [EPA-HQ-OAR-2018-0276-0181-A2, p.10]

- 1997 adoption of ICAO nitrogen oxides ("NOx") and carbon monoxide ("CO") requirements for gas turbine (turbofan and turbojet) engines;[26]
- 2005 adoption of ICAO NOx standards for gas turbine engines;[27] and
- 2012 adoption of ICAO NOx standards for gas turbine engines.[28] [EPA-HQ-OAR-2018-0276-0181-A2, p.11]

The proposed rule properly recognizes FAA's role in international aviation matters affecting the environment as a member of ICAO's CAEP.[29] EPA, which assisted and advised the FAA in the CAEP proceedings, is now following a process for the adoption of CAA section 231 standards for CO_2 emissions from aircraft engines that is identical[30] or nearly identical[31] to the processes it has followed in the past. FAA will consult with EPA in the CAA section 231 rulemaking process, and then adopt certification requirements to enforce the standard, as required by CAA section 232.[32] Such an approach is reasonable and permissible under the CAA and fully consistent with how EPA and FAA have previously addressed the proposal, promulgation and enforcement of new CAA section 231 standards.[33] [EPA-HQ-OAR-2018-0276-0181-A2, p.11]

B. The Substantive Criteria Considered in the ICAO Standard Development Process Align with the Criteria for Standards for Emissions from Aircraft Engines Under Clean Air Act Section 231.

EPA proposes to adopt standards equivalent to ICAO's Aeroplane CO_2 Emissions, First Edition, July 2017 (the ICAO CO_2 standard). The ICAO CO_2 standard was approved by the 10th Meeting of the CAEP in 2016, and by the 36-state ICAO Council in 2017.[34] It is incorporated within Annex 16 of the Convention on International Civil Aviation, Volume III.[35] [EPA-HQ-OAR-2018-0276-0181-A2, pp.11-12]

Under CAEP's "terms of reference," aircraft emissions standards are to be based on considerations of environmental effectiveness, technical feasibility, economic reasonableness, environmental interdependencies (such as trade-offs between noise and emissions and trade-offs between emissions of different air pollutants such as CO_2, NOx, and PM), developments in other fields, and international and national programs.[36] All of these factors were considered in developing the ICAO CO_2 standard; the CAEP engaged in a "modeling exercise involv[ing] several analytical tools, including fleet evolution modeling, environmental benefits, recurring costs, non-recurring costs, costs per metric tonne of CO_2 avoided, certification costs, applicability scenarios and various sensitivity studies to inform the decision making process."[37] And a "key criterion" was that "[t]he certification standard must not compromise safety."[38] [EPA-HQ-OAR-2018-0276-0181-A2, p.12]

EPA's duty under CAA section 231 is to "from time to time" set standards "applicable to the emission of any air pollutant from any class or classes of aircraft engines" causing or contributing to an endangerment of public health or welfare.[39] Unlike other provisions of the CAA, section 231 does not dictate an explicit performance standard. Section 231 simply requires that any standard promulgated pursuant to it may take effect only after such time as needed "to permit the development and application of the requisite technology giving appropriate consideration to the cost of compliance within such period."[40] [EPA-HQ-OAR-2018-0276-0181-A2, p.12]

As noted above, CAA section 231 also expressly requires that EPA consult with the FAA when promulgating an emission standard, and it directs that considerations of safety and noise – considerations that are within the province of the FAA to resolve – are paramount. Section 231 makes clear that CAA standards cannot be changed if the resulting standards would significantly increase noise or have an adverse effect on safety,[41] and further provides that already promulgated standards may be disapproved by the President on the basis of a finding by the Secretary of Transportation that such standards "create a hazard to aircraft safety."[42] [EPA-HQ-OAR-2018-0276-0181-A2, pp.12-13]

In sum, CAEP's terms of reference considering environmental effectiveness, technical feasibility, economic reasonableness, and environmental interdependencies (such as trade-offs between noise and emissions and trade-offs between emissions of different air pollutants), and the key criterion of safety are highly correlated with the statutory criteria of section 231 which consider safety, noise timing, and costs in determining the "requisite technology" and arriving at a standard that EPA "deems appropriate." [EPA-HQ-OAR-2018-0276-0181-A2, p.13]

C. EPA, in Consultation with FAA, has Thoroughly Considered Safety, Noise, Timing, and Costs Through the ICAO Process, the 2015 ANPRM, and in the Preparation of the Proposed Rule.

1. The ICAO Process.

Because the FAA is the expert agency with respect to aircraft design and function and is also directly charged with assessing aircraft safety and noise issues,[43] the FAA has worked closely with EPA in developing proposed standards for CO_2 emissions[44] that do not compromise those important statutory factors. EPA, in turn, worked together with FAA in its representation of the U.S. in the ICAO/CAEP standard-setting process. The CAEP is part of the ICAO standard-setting process, and the United States is a member of the CAEP along with 26 other Member States. The CAEP is supported by the work of 600 international experts and includes various working groups, including specific groups addressing aircraft noise and emissions technical issues.[45] The CAEP developed its CO_2 emissions certification standard (later adopted by ICAO) over the course of six years, including Phase 1 work to develop the regulatory metric and Phase 2 work to assess the environmental effectiveness, technical feasibility, and economic reasonableness of the standard.[46] The resulting ICAO standard was unanimously recommended by the international experts serving on the CAEP emissions technical issues work group.[47] [EPA-HQ-OAR-2018-0276-0181-A2, pp.13-14]

The ICAO process examines both technological feasibility and economic reasonableness in developing new standards and setting their applicability dates, thereby necessarily including consideration of the CAA section 231 criteria by which EPA and FAA must consider the time necessary for the "development and application of the requisite technology" and "the cost of compliance" with new standards.[48] EPA was "involved in CAEP's effort to analyze the CO_2 stringency options and the potential costs and environmental impacts that would result from both new type and in-production international standards."[49] The ICAO process also considered the interdependencies between noise and emissions[50] resulting in information that is directly relevant to EPA's and FAA's duty to ensure that CAA section 231 standards do not "significantly increase noise."[51] [EPA-HQ-OAR-2018-0276-0181-A2, p.14]

Most importantly, both ICAO and the CAA give primacy to safety in the development of standards for emissions from aircraft engines. A “key criterion” in the development of the ICAO CO_2 standard was that “[t]he certification standard must not compromise safety.”[52] As stated more generally in ICAO’s 2019 Environmental Report:

Any decision on environmental management should result from a careful evaluation of all the possible environmental impacts. This means identifying interdependencies and trade-off [sic] among environmental impacts (e.g., noised and greenhouse gas emissions), or between environment and other strategic areas of aviation operations, such as capacity, safety, and economics. Sound guidance has been developed and documented by ICAO’s CAEP group on this matter. …

[I]t is important to recognize that all aviation stakeholders have worked hard to achieve an enviable level of safety within the sector. In this respect, safety must always be the overriding consideration in all civil aviation operations … .”[53] [EPA-HQ-OAR-2018-0276-0181-A2, pp.14-15]

The ICAO process assures safety through its technical review. As explained by EPA in the 2015 ANPRM: “CAEP determined in 2012 that all technology responses would have to be based on technology that would be in common use by the time the standard was to be decided upon in 2016 or shortly thereafter. This generation of technology was defined within CAEP as a Technology Readiness Level (TRL) 8 - an actual system completed and ‘flight qualified’ through test and demonstration - by 2016 or shortly thereafter.”[54] Thus, by designing standards that can be met through the application of “flight qualified” technologies, and setting applicability dates that allow even further maturation of those technologies, ICAO purposely avoids airworthiness risks. ICAO’s approach to safety is fully consistent with CAA section 231’s prohibition of EPA’s promulgation of an emission standard that would “adversely affect safety,”[55] as well as the President’s authority to disapprove a proposed or promulgated standard based on a finding by the Secretary of Transportation that the standard would “create a hazard to aircraft safety.”[56] [EPA-HQ-OAR-2018-0276-0181-A2, p.15]

EPA and FAA therefore thoroughly considered safety, noise, timing, and the costs of the proposed standards in the ICAO process, consistent with the requirements of CAA section 231. EPA may properly rely on ICAO’s CO_2 standard in this rulemaking given: (a) ICAO’s consideration of environmental effectiveness, technical feasibility, economic reasonableness, and environmental interdependencies (such as trade-offs between noise and emissions and trade-offs between emissions of different air pollutants); (b) EPA’s and FAA’s direct participation in that process; and (c) EPA’s discretion, when promulgating regulations to control CO_2 emissions from aircraft engines that EPA “deems appropriate,”[57] to consider the “manner, timing, content, and coordination of its regulations with those of other agencies.”[58] [EPA-HQ-OAR-2018-0276-0181-A2, p.15]

In sum, a final rule paralleling the ICAO CO_2 standard is substantially supported by the technical assessments made by an expert, organization through a process in which EPA and the FAA were deeply involved. ICAO’s adopted standard and the independent assessments of aircraft technology made by EPA are further supported by information included in the docket for this rulemaking.[59] [EPA-HQ-OAR-2018-0276-0181-A2, p.15]

2. The 2015 ANPRM and Proposed Rule.

The ICAO process and its preliminary outcomes were extensively discussed in EPA’s 2015 ANPRM,[60] and the Agency received public comment on both the CO_2 standard being developed by ICAO and whether the U.S. should adopt an international standard or take a different approach for controlling aircraft CO_2 emissions. In addition, the ANPRM sought comment on the types of aircraft (in-production or new type only) to which a standard should apply.[61] Boeing and many other manufacturers, public officials, and interest groups have already commented on the alternatives considered by ICAO and EPA.[62] [EPA-HQ-OAR-2018-0276-0181-A2, p.16]

The proposed rule furthers explains why adoption of the international CO_2 metric[63] and associated "stringency levels"[64] are appropriate within the time frames[65] specified by ICAO. As a result, there is a substantial administrative record supporting the adoption of an ICAO-equivalent CO_2 standard – a standard that is already being globally applied in practice through existing international mechanisms shaping the market for commercial airplanes. [EPA-HQ-OAR-2018-0276-0181-A2, p.16]

III. The Proposed Rule Fulfills U.S. Treaty Commitments and Addresses Important Public Policy Objectives While Also Complying with the Clean Air Act

A. EPA's Adoption of ICAO-Equivalent Standards Under CAA Section 231 is Consistent With the Chicago Convention and Past U.S. Practice

The U.S. is a party to the Chicago Convention and has maintained this status for more than seven decades. Pursuant to the Convention, "[e]ach contracting State undertakes to collaborate in securing the highest practicable degree of uniformity in regulations, standards, procedures, and organization in relation to aircraft, personnel, airways and auxiliary services in all matters in which such uniformity will facilitate and improve air navigation. …"[72] While Articles 37 and 38 of the Convention allow for variation in regulation by individual Member States on the basis of impracticability or necessity, otherwise implementing ICAO's standards as fully as is practicable carries with it a double benefit. First, it ensures compliance with U.S. treaty commitments. Second, it avoids creating a disadvantage to U.S. manufacturers who must complete in a highly competitive international market; adherence to ICAO standards ensures that the same rules apply regardless of where an aircraft was manufactured or is flown. In other words, conformity ensures a level playing field. Mutual recognition by contracting States (i.e., countries that are party to the Chicago Convention) of the validity of each country's certification of an aircraft or aircraft engine as meeting ICAO standards also carries with it substantial benefits in terms of regulatory certainty and the overall cost-effectiveness of EPA emission regulations; parties to the Chicago Convention may rely on airworthiness certificates granted by other nations and thereby avoid duplicative costs.[73] [EPA-HQ-OAR-2018-0276-0181-A2, p.18]

EPA has previously given great weight to the Chicago Convention and the ICAO standard-setting process. Following issuance of ICAO standards in 1981, EPA promptly acted to align U.S. standards under CAA section 231 with those approved by ICAO; the Agency withdrew some standards it had previously established and promulgated revised standards that conformed to the new international standards.[74] In the same rule, EPA indicated that "the U.S. now has an obligation to frame national standards to be as compatible as possible with the ICAO standard, consistent with U.S. environmental goals and with EPA's responsibilities under section 231 of the Clean Air Act."[75] This same perspective should hold true today. [EPA-HQ-OAR-2018-0276-0181-A2, p.18]

EPA additionally noted the close connection between the Chicago Convention and the exercise of the Agency's CAA section 231 authority in a 2012 rulemaking when it addressed compliance with Executive Order 13690: Promoting International Regulatory Cooperation. EPA stated:

These final standards are identical to the international standards developed through EPA's active participation in the United Nation's International Civil Aviation Organization (ICAO) activities. EPA has historically been a principal participant in the development of U.S. policy in various ICAO working groups and other international venues, assisting and advising the Federal Aviation Administration on aviation emissions, technology, and policy matters. These provisions provide a means by which the United States can meet its obligations under the Chicago Convention and ensure that engine manufacturers maintain worldwide acceptability of their products.[76] [EPA-HQ-OAR-2018-0276-0181-A2, p.18]

EPA has further observed that "since aircraft and their engines operate throughout the world on a daily basis, one standard may be the most efficient mechanism for meeting international environmental goals."[77] In the context of this proposed rule, EPA is not required to turn a blind eye to such benefits;

nothing in section 231 requires EPA to do so. Rather, EPA may take note of these international benefits when acting in accordance with its CAA authority. And EPA may properly note the limits of its authority as it would pertain to aircraft manufactured or certified in other countries to the ICAO standard, which are, by virtue of such foreign certification and the terms of the Chicago Convention, allowed to freely operate in U.S. airspace – even if they do not comply with a broader, more stringent or otherwise different CAA section 231 standard. [EPA-HQ-OAR-2018-0276-0181-A2, p.19]

Congress has said nothing suggesting that it expects EPA to go beyond ICAO standards in setting its standards under CAA section 231. Given EPA's longstanding practice of adopting ICAO-equivalent standards under CAA section 231 (with reasonable exceptions, exemptions, and/or extensions of compliance dates to assure economic feasibility pursuant to CAA section 231(b), which is also consistent with Articles 37 and 38 of the Chicago Convention), a Congressional preference for this approach can be fairly implied. This is affirmed by the continued statutory silence of section 231 concerning the stringency and form of standards adopted under that section. Indeed, the facts that CAA section 231 was amended after EPA had already established the consistent practice of adopting ICAO-equivalent standards pursuant to section 231,[78] and that the provisions of section 231 were retained unaltered in the comprehensive CAA Amendments of 1990,[79] demonstrates that EPA's approach of conforming its standards to ICAO's is consistent with Congress's intent. "[W]hen uncertainty or ambiguity ... is found in a statute, great weight will be given to the contemporaneous construction by department officials who were called upon to act under the law and to carry its provisions into effect, especially where such construction has been long continued. … The reenactment … without substantial change … amounts to an implied legislative recognition and approval of the executive construction of the statute."[80] Thus, in this instance, EPA may presume that Congress was aware of EPA's administrative interpretation of CAA section 231 and adopted that interpretation when it reenacted that section without change in 1990.[81] [EPA-HQ-OAR-2018-0276-0181-A2, p.19]

B. U.S. Certification Requirements Should be Compatible with ICAO Standards, Particularly Given That ICAO Standards Are Now In Force and Being Implemented by Other Major Manufacturing Countries.

As Boeing and other aircraft manufacturers continue to make progress in improving the environmental performance of their aircraft, the main goal of EPA's final rule should be to align the U.S. standards to the greatest extent practicable with the ICAO CO_2 standard, which will be implemented over the next decade. ICAO exists, in part, to ensure "the safe and orderly growth of international civil aviation … [and to] encourage the arts of aircraft design and operation for peaceful purposes."[82] The steady progress and emphasis on the development of safe, new technologies implemented internationally through the ICAO standard-setting process serve as important touchstones for EPA in promulgating a domestic regulation under section 231. [EPA-HQ-OAR-2018-0276-0181-A2, p.20]

Given the timing of this rulemaking, it is also relevant that Boeing and other U.S. commercial aerospace manufacturers have already made business decisions and investments based on the development and finalization of the ICAO CO_2 standard. As recognized by EPA in the 2012 rulemaking to adopt an ICAO-equivalent NOx standard:

[E]ngine manufacturers respond to ... market reality by designing and building engines that conform to ICAO international standards and practices. This normal business practice means that engine manufacturers are compelled to make the necessary business decisions and investments to maximize their international markets even in the absence of U.S. regulations that would otherwise codify ICAO standards and practices…. [T]he recommended practices, e.g., test procedures, needed to demonstrate compliance are being adhered to by manufacturers during current engine certification tests, or will be even in the absence [the 2012 final] rule.[83] [EPA-HQ-OAR-2018-0276-0181-A2, p.20]

U.S. commercial aerospace manufacturers have long needed to plan for and address the implications of the ICAO CO_2 standard. Consistent with EPA's assessments and actions during the 2012 rulemaking, EPA should recognize that manufacturers have made business decisions and investments needed to respond to the reality of an international standard that is now in place, and that is being implemented in other countries with major aircraft manufacturing industries.[84] Therefore, EPA should not unnecessarily interfere with these decisions and investments by imposing a broader or more stringent standard than the ICAO CO_2 standard. EPA and FAA may properly account for these decisions and investments when exercising their CAA authority and specifically consider the economic and public policy value of conforming U.S. standards to the international standards promulgated through ICAO. This does not mean that EPA and FAA cannot continue to work within the ICAO process to determine when advancements in safe, proven technology justify revising the ICAO CO_2 standard, and thereafter, CAA section 231 and 232 regulations. But it should mean that in the context of this rulemaking, the current effectiveness of the ICAO CO_2 standard and the efforts already undertaken to implement the standard worldwide should be given great weight. [EPA-HQ-OAR-2018-0276-0181-A2,pp.20-21]

C. There are Substantial Benefits to Adopting a CAA Section 231 Standards That Ensures International Reciprocity and Consistency.

Reciprocity and consistency – i.e., the global mutual recognition of the sufficiency of ICAO's environmental standards and the avoidance of any unnecessary deviation from those standards in each Member State's law – are critical. Aviation is a global industry that requires global standards. Aircraft are mobile assets that are designed to fly anywhere in the world, transporting persons and cargo across state, regional, and international borders. In this context, reciprocity and consistency among national and international standards provides a level playing field for industry participants, and it ensures that financial resources can be focused on innovation for environmental benefit (including investments creating CO_2 emissions reductions through the implementation of non-aircraft-technology elements of ICAO's basket of measures). Reciprocity and consistency also reduce administrative complexity for aircraft manufacturers and operators. EPA has previously considered and acted to preserve the commercial benefit that is derived from maintaining "consistency between U.S. and international emission standards and control program requirements," as well as "test procedures."[85] As EPA has noted, "international regulatory cooperation can … reduce, eliminate, or prevent unnecessary differences in regulatory requirements."[86] [EPA-HQ-OAR-2018-0276-0181-A2,p.21]

Adopting an ICAO-equivalent CO_2 emission standard into U.S. regulations will help ensure that U.S. commercial aerospace manufacturers benefit from these efficiencies and are not placed at a competitive disadvantage compared to their international competitors. It is also important to note again in this context that, as a signatory to the Chicago Convention, the U.S. could not enforce against foreign manufactured/certified airplanes any part of the adopted CAA section 231 standard that is broader or more stringent that the ICAO standard. Any such additional or more stringent requirements would apply only to U.S. manufactured/certified aircraft, clearly placing domestic manufacturers at a competitive disadvantage compared to their international competitors. [EPA-HQ-OAR-2018-0276-0181-A2, p.21]

In addition, if EPA and FAA do not act promptly, U.S. manufacturers could be forced to seek certification of U.S.-manufactured aircraft in other countries.[87] Boeing estimates that it could need to certify around 19 airframe/engine combinations to the in-production requirements before 2028, and that Cessna and Gulfstream together could need to certify approximately 14 airframe/engine combinations within the same timeframe. Companies could therefore need to start working with FAA on the certification process very soon. We note that FAA has indicated an intent to implement the CAA section 232 certification requirements concurrently with EPA's CAA section 231 rulemaking schedule.[88] We encourage EPA and FAA to pursue this coordinated rulemaking effort in order to timely achieve the considerable benefits cited above concerning reciprocity and consistency with international standards. [EPA-HQ-OAR-2018-0276-0181-A2,pp.21-22]

The administrative record for this rulemaking, including the 2015 ANPRM and comments received on the same, supports EPA's finalization of the proposed rule adopting ICAO-equivalent standards pursuant to CAA section 231. Between the 2015 ANPRM and the NPRM, EPA has provided a thorough discussion of the technical basis of the standards and the required considerations of safety, noise, timing, and costs with respect to the available technologies. [EPA-HQ-OAR-2018-0276-0181-A2,p.47]

[The following comments were submitted as testimony at the virtual public hearing on September 17, 2020.]

By enabling transparency through an apples-to-apples comparison in environmental performance for airplane manufacturers, this regulation will strengthen the commercial aerospace manufacturing sector by creating a level playing field for original equipment manufacturers around the world.

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[20] 80 Fed. Reg. 37,758, 37,765 (July 1, 2015). See also 85 Fed. Reg. at 51,559.

[21] See Nat'l Assoc. of Clean Air Agencies v. EPA, 489 F.3d 1221, 1230-32 (D.C. Cir. 2007) ("NACAA v. EPA").

[22] CAA § 231(b), 42 U.S.C. § 7571(b).

[23] Pub. L. No. 91-604, § 11(a)(1) (Dec. 31, 1970).

[24] Id. at 36,375.

[25] Current FAA policy is to conform to ICAO standards "to maximum extent practicable." 77 Fed. Reg. 76,842, 76,849 (Dec. 31, 2012).

[26] 62 Fed. Reg. 25,356 (May 8, 1997).

[27] 70 Fed. Reg. 69,664 (Nov 17, 2005).

[28] 77 Fed. Reg. 36,342 (June 18, 2012). This rule adopted NOx standards previously adopted by ICAO in 2005 and 2008 that included a requirement that newly manufactured engines meet at least "Tier 6" NOx standards. It also contained exemptions to the production cut-off requirement with regard to several engines. Id. at 36,343, 36,352-36,360.

[29] See 85 Fed. Reg. at 51,560 ("The FAA plays an active role in ICAO/CAEP, including serving as the representative (member) of the United States at annual ICAO/CAEP Steering Group meetings, as well as the ICAO/CAEP triennial meetings, and contributing technical expertise to CAEP's working groups.").

[30] See 70 Fed. Reg. 69,663 (Nov. 17, 2005); 89 Fed. Reg. 25,356 (May 8, 1997).

[31] See 47 Fed. Reg. 58,462 (Dec. 30, 1982). The 1982 rule amended existing U.S. aircraft engine emission standards (adopted in 1973) in order to make them compatible with ICAO's first-time standards for gaseous pollutants adopted in June 1981. Id. at 58,464. In the rule, EPA noted that the Agency had "worked with the International Civil Aviation Organization (ICAO) on the development of international aircraft emission standards" since publication of EPA's earlier standards. Id. EPA additionally deleted some U.S. standards (e.g., hydrocarbon standards applicable to newly certified engines) in order to "continue to work with ICAO towards the establishment of international standards based on the ICAO design goals." Id. at 58,468.

[32] Under CAA § 232, 42 U.S.C. § 7572, FAA is tasked with prescribing regulations to "insure compliance" with EPA's section 231 emission standards through the aircraft certification process. These regulations are to include provisions making the standards applicable "in the issuance, amendment, modification, suspension, or revocation of any certificate authorized by part A of subtitle VII of Title 49 [of] the Department of Transportation Act." CAA § 232(a), 42 U.S.C. § 7572(a).

[33] Under CAA § 232, 42 U.S.C. § 7572, FAA is tasked with prescribing regulations to "insure compliance" with EPA's section 231 emission standards through the aircraft certification process. These regulations are to include provisions making the standards applicable "in the issuance, amendment, modification, suspension, or revocation of any certificate authorized by part A of subtitle VII of Title 49 [of] the Department of Transportation Act." CAA § 232(a), 42 U.S.C. § 7572(a).

[34] The ICAO CO_2 standard became effective on July 21, 2017, and applicable on January 1, 2018. Convention on International Civil Aviation, Annex 16, Volume III, Table A. Available at http://www.icao.int/publications/.

[35] The ICAO CO_2 standard applies to new aircraft type designs beginning in 2020, and to aircraft type designs already in-production beginning in 2023. Those in-production aircraft which by 2028 do not meet the ICAO standard will no longer be able to be produced unless their designs are sufficiently modified to meet the standard or they are granted relief under the under a Member State's implementation of the standard.

[36] See ICAO, CAEP Terms of Reference, available at https://www.icao.int/environmental-protection/Pages/Caep.aspx#ToR. See also ; 85 Fed. Reg. at 51,560.
[37] ICAO, 2016 Environmental Report, The CAEP/10 Recommendation on New ICAO Aeroplane CO_2 Emissions Standard (2016), at 113, available at https://www.icao.int/environmental-protection/Documents/EnvironmentalReports/2016/ENVReport2016_pg112-114.pdf.
[38] CAEP/10 Report, Appendix C, § 3.1.5 (Feb. 2016).
[39] CAA § 231(a)(2)(A), 42 U.S.C. § 7571(a)(2)(A).
[40] CAA § 231(b), 42 U.S.C. § 7571(b).
[41] Id. § 231(a)(2)(B)(ii), 42 U.S.C. § 7571(a)(2)(B)(ii). While first incorporated within the Clean Air Act of 1970, CAA section 231 was amended in 1977 and 1996. The 1977 Clean Air Act Amendments added section 231(c) providing that the President may make a disapproval finding based on a "hazard to aircraft safety." Pub. L. No. 95-95, § 225. The requirement for EPA to consult with the FAA on aircraft engine emission standards and a prohibition of changing such standards "if such change would significantly increase noise and adversely affect safety" was adopted as part of the Federal Aviation Reauthorization Act of 1996, which amended CAA section 231(a)(2). Pub. L. No. 104-264, § 406.
[42] Id. § 231(c), 42 U.S.C. § 7571(c).
[43] See 14 C.F.R. Part 36, Noise Standards: Aircraft Type and Airworthiness Certification; Pub. L. No. 85-726, Title VI; Pub. L. No. 103-272.
[44] "The EPA has worked diligently over the past six years within the ICAO/CAEP process on a range of technical issues regarding aircraft CO_2 emission standards." 81 Fed. Reg. at 54,430. EPA and FAA attended over 30 meetings of the CAEP and its various subgroups (Steering Groups, Working Groups and Task Groups) from September 2010 to January 2016.
[45] See "WG1" and "WG3" cited at .
[46] ICAO, 2016 Environmental Report, The CAEP/10 Recommendation on New ICAO Aeroplane CO_2 Emissions Standard (2016), available at https://www.icao.int/environmental-protection/Documents/EnvironmentalReports/2016/ENVReport2016_pg112-114.pdf. Environmental effectiveness, economic reasonableness, technological feasibility, consideration of interdependencies, developments in other fields; and international and national programs are "terms of reference" utilized by the CAEP in developing standards. See ICAO: CAEP Terms of Reference, available at https://www.icao.int/environmental-protection/Pages/Caep.aspx#ToR. See also 85 Fed. Reg. at 51,560; CAEP SG (Sao Paolo, 2001), WP/2, 9.1.
[47] New ICAO Aircraft CO_2 Standard One Step Closer to Final Adoption, ICAO Newsroom (Feb. 8, 2016), available at https://www.icao.int/Newsroom/Pages/New-ICAO-Aircraft-CO2-Standard-One-Step-Closer-To-Final-Adoption.aspx.
[48] CAA § 231(b), 42 U.S.C. § 7571(b).
[49] 80 Fed. Reg. at 37803. The CAEP, in fact, responded to input from EPA concerning its cost estimates and incorporated a "bottom-up approach" to model smaller incremental changes to aircraft design versus a "top down approach" for estimating the total cost of new aircraft designs and partial aircraft redesigns. Id.
[50] Assessing Current Scientific Knowledge, Uncertainties and Gaps in Quantifying Climate Change, Noise and Air Quality Aviation Impacts. Final Report of the International Civil Aviation Organization (ICAO) Committee on Aviation and Environmental Protection (CAEP) Workshop, U.S. Federal Aviation Administration and Manchester Metropolitan University (2009), available at https://www.icao.int/environmental-protection/Documents/CaepImpactReport.pdf.
[51] CAA § 231(a)(2)(B)(ii), 42 U.S.C. § 7571(a)(2)(B)(ii).
[52] ICAO, 2016: Tenth Meeting Committee on Aviation Environmental Protection Report, Doc 10069, CAEP/10, Appendix C, §3.1.5, available at https://www.icao.int/publications/Pages/catalogue.aspx ("CAEP/10 Report"). The CAEP/10 Report is found on page 27 of the English Edition 2020 catalog and is copyright protected; Order No. 10069.
[53] See ICAO, 2019 Environmental Report, Aviation and Environment, at 88 (emphasis added), available at https://www.icao.int/environmental-protection/Documents/ICAO-ENV-Report2019-F1-WEB%20(1).pdf, citing https://www.icao.int/environmental-protection/Pages/CAEP-Operational-InterdependencyTask.aspx.
[54] 80 Fed. Reg. 37,758, 37,794 n.228 (July 1, 2015). "TRL is a scale from 1 to 9, TRL1 is the conceptual principle, and TRL9 is the 'actual system 'flight proven' on operational flight.' The TRL scale was originally developed by NASA." Id. at 37804 n.261, citing ICF International, CO_2 Analysis of CO_2-Reducing Technologies for Aircraft, Final Report, EPA Contract Number EP–C–12–011, at 40 (Mar. 17, 2015).
[55] CAA § 231(a)(2)(B)(ii), 42 U.S.C. § 7571(a)(2)(B)(ii).
[56] CAA § 231(c), 42 U.S.C. § 7571(a)(2)(B)(c).

[57] CAA § 231(a)(3).
[58] Massachusetts v. EPA, 549 U.S. 497, 533 (2007).
[59] EPA Technical Report on Aircraft Emissions Inventory and Stringency Analysis (March 2019): Peer Review. EPA-HQ-OAR-2018-0276-0051, ICF, 2018: Aircraft CO_2 Cost and Technology Refresh and Industry Characterization Final Report, EPA-HQ-OAR-2018-0276-0027; EPA, Draft Airplane Greenhouse Gas Standards Technical Support Document, July 2020, EPA_HQ-OAR-2018-0276-0024; EPA Memo to Docket, Methods Used in Calculations for Costs and Monetized Benefits of Scenario 3 (Alternative) for Airplane GHG Standards Proposed Rule, EPA_HQ-OAR-2018-0276-0052.
[60] 80 Fed. Reg. 37758, 37790-37805.
[61] Id.
[62] ICAO/CAEP determined, and the U.S. agreed, that the future standard should not be applied to the in-service fleet. That decision is appropriate and should be maintained as the U.S. considers adopting the ICAO standard into U.S. law.
[63] 85 Fed. Reg. at 51,564. See also ICAO Circular 337-AT/192, CAEP/9 Agreed Certification Requirement For The Aeroplane CO_2 Emissions Standard at 2, available at https://www.icao.int/publications/catalogue/cat_2020_en.pdf.
[64] 85 Fed. Reg. at 51,557, 52,564 and 51,578.
[65] 85 Fed. Reg. 51,584 - 87. The ICAO standard and proposed rule apply to new aircraft type designs beginning in 2020, and to changed aircraft type designs for already in-production aircraft beginning in 2023. Those in-production aircraft which by 2028 do not meet the ICAO standard will no longer be able to be produced unless their designs are sufficiently modified to meet the standard or they are granted relief under a Member State's implementation of the standard. Thus, an orderly phase-in of the standard is allowed, consistent with EPA's longstanding approach to section 231 and other mobile source rules.
[72] Chicago Convention, Art. 37.
[73] British Caledonian Airways Ltd. v. Bond, 665 F.2d 1153 (1981).
[74] 47 Fed. Reg. 58,462, 58,464-5 (Dec. 30, 1982).
[75] Id. at 58,464.
[76] 77 Fed. Reg. 36342, 36379 (June 18, 2012).
[77] Emission Standards and Test Procedures for Aircraft and Aircraft Engines, Summary and Analysis of Comments, EPA 420-R-05-004, at 6 (Nov. 2005).
[78] "Since publication of the 1973 standards, EPA has worked with the International Civil Aviation Organization (ICAO) on the development of international aircraft standards. ... With the establishment of the international standards, the U.S. now has an obligation to frame national standards to be as compatible as possible with the ICAO standards, consistent with U.S. environmental goals and with EPA's responsibilities under Section 231 of the Clean Air Act." 47 Fed. Reg. 58,462, 58,464 (Dec. 30, 1982). In the Federal Aviation Reauthorization Act of 1996 (Pub. L. No. 104-264, § 406), which amended CAA section 231(a)(2), Congress added a requirement that EPA consult with the FAA on aircraft engine emission standards and a prohibition against changing such standards "if such change would significantly increase noise and adversely affect safety," but Congress did not act to further specify requirements related to, or constrain EPA's discretion in, the selection of emission-reducing technologies pursuant to the statutory factors of safety, noise, timing and costs.
[79] Clean Air Act Amendments of 1990, Pub. L. No. 101-549. Following enactment of the 1990 amendments, EPA continued to adopt, in large part, aircraft engine emission standards approved by ICAO. "Since the EPA stressed the desirability of commonality with ICAO, the FAA, with the concurrence of the EPA, adopted the compliance procedure defined in Appendix 6 to ICAO Annex 16, Volume II—Aircraft Engine Emissions, First Edition, June 1981." 55 Fed. Reg. 32856 (Aug. 10, 1997).
[80] National Lead Co. v. United States, 252 U.S. 140, 145, 146 (1920).
[81] Lorillard v. Pons, 434 U.S. 575 (1978) ("Congress is presumed to be aware of an administrative ... interpretation of a statute and to adopt that interpretation when it reenacts a statute without change.") (citing Albemarle Paper Co. v. Moody, 422 U.S. 405, 414 n.8 (1975); NLRB v. Gullett Gin Co., 340 U.S. 361, 366 (1951); and National Lead at 147).
[82] Convention on International Civil Aviation, Art. 44 (Dec. 7, 1944).
[83] 77 Fed. Reg. at 36,376 (June 18, 2012).
[84] Europe (EASA – including France and Germany) and Brazil have already implemented the ICAO CO_2 standard. Other countries with major aircraft manufacturing industries have indicated their intent to implement the ICAO CO_2 standard, including the United States, Canada, China, Japan, the Russian Federation, and Ukraine. Fully 119 parties, to date, have submitted to ICAO a "State Action Plan on CO_2 Reduction Activities." Available at https://www.icao.int/environmental-protection/Pages/ClimateChange_ActionPlan.aspx.

[85] 70 Fed. Reg. at 69,664.
[86] 77 Fed. Reg. at 36,379. These objectives as expressed by EPA were in the context of CAA section 231 standards controlling emissions of conventional, "local," air pollutants from aircraft engines, but are no less valid or less important in the context of the ICAO CO_2 standard.
[87] 85 Fed. Reg. at 51,557 ("These proposed standards would allow U.S. manufacturers of covered airplanes to remain competitive in the global marketplace. In the absence of U.S. standards for implementing the ICAO Airplane CO_2 Emission Standards, U.S. civil airplane manufacturers could be forced to seek CO_2 emissions certification from an aviation certification authority of another country (not the Federal Aviation Administration (FAA)) in order to market and operate their airplanes internationally.").
[88] Report on DOT Significant Rulemakings, at 31 (Feb. 2020), available at https://www.transportation.gov/regulations/february-2020-significant-rulemaking-report-1.

Organization: Bombardier Aviation

The proposed standards in the referenced US EPA NPRM, after a quick review, are found to be relatively equivalent to the applicable ICAO standards but would still need a further in-depth review for completeness. [EPA-HQ-OAR-2018-0276-0076-A1, p.1]

Organization: Cargo Airline Association

SUPPORT FOR HARMONIZATION WITH ICAO STANDARDS AND ICAO PROCESS

The all-cargo airline industry fully supports the EPA's proposed rulemaking. Harmonization of global standards ensures uniformity and consistency among a global aviation marketplace. The adoption of this rulemaking, with the modifications discussed below, will help ensure that U.S. manufacturers, and the industry as a whole, are not placed at a competitive disadvantage with respect to international air commerce. [EPA-HQ-OAR-2018-0276-0159, p.2]

The United States, along with 190 other countries, is party to the Convention on International Civil Aviation -- a convention that established ICAO and charged it with the establishment and policy for international aviation. In today's aviation world, in which airlines compete not only domestically, but globally, the standards set by ICAO are crucial to the fair and efficient provision of international air transportation throughout the world. In the context of this proceeding, the members of the United States all-cargo industry routinely fly not only within the U.S., but across national borders and thus depend on a system in which aircraft intended for international use will be recognized and allowed entry by the various host countries. This is why the U.S. aviation industry as a whole, including the all-cargo carriers, have demonstrated global leadership in setting and achieving environmental sustainability objectives and will continue to do so, by participating in the FAA's program implementing ICAO's Carbon Off-Setting and Reduction Scheme for International Aviation, investing in the development of sustainable aviation fuels, and evaluating new technologies through the FAA's Continuous Lower Energy, Emissions and Noise (CLEEN) program. [EPA-HQ-OAR-2018-0276-0159, p.2-3]

Organization: Embraer Commercial Aviation

Embraer reiterates its support for the EPA's proposal to adopt rules consistent with the ICAO CO_2 standard. [EPA-HQ-OAR-2018-0276-0174-A1, p.2]

Embraer would like to highlight that rules consistent with ICAO CO_2 standard have already been implemented by the European Union Aviation Safety Agency (EASA) in Europe, as well as by the Agência Nacional de Aviação Civil (ANAC) in Brazil[4]. [EPA-HQ-OAR-2018-0276-0174-A1, p.5]

[4] European Union Commission Delegated Regulation (EU) 2019/897, March 12, 2019, Amending Regulation (EU) No 748/2012 as regards the inclusion of risk-based compliance verification in Annex I and the implementation of requirements for environmental protection. Agência Nacional de Aviação Civil (ANAC) Regulamento Brasileiro da

Aviação Civil RBAC n°38, Emenda 0 - Requisitos para emissões de CO_2 de aviões (Aeroplane CO_2 emissions requirements).

Organization: General Aviation Manufacturers Association (GAMA)

As an international organization, GAMA is most concerned with ensuring that a single set of environmental standards for aviation is adopted. International environmental standards for aviation have long been set by ICAO, then implemented by national authorities including, in the U.S., by EPA and FAA. Nothing could be worse for the health and vitality of the U.S. aviation industry or for the leadership of the U.S. around the world than having the U.S. or any other country or region impose unilateral and uncoordinated environmental standards for aviation. International aviation could not function if each country or region imposed its own environmental or other standards for aviation. [EPA-HQ-OAR-2018-0276-0143-A1, p.2]

Organization: General Electric Company (GE)

GE commends EPA for proposing CO_2 emissions standards that match the standards adopted by the International Civil Aviation Organization ("ICAO").We believe that the proposal would protect U.S. jobs and strengthen the American aviation industry by ensuring the worldwide acceptance of U.S. manufactured airplanes, which incorporate GE engines, and that EPA should finalize the rule promptly. The proposal satisfies the Clean Air Act's ("CAA") requirements, is consistent with the precedent for establishing aircraft emission standards in collaboration with ICAO, and is supported by the administrative record for this rulemaking. GE supports making certain changes to the proposed rule, as explained in greater detail by Boeing's comments. But in general, GE believes that EPA's proposal will protect the environment, while also providing the regulatory, market, and cost certainty that GE and other U.S. aviation companies need to continue leading the global aviation industry.

A. Greenhouse gas emissions standards that follow the standards adopted by ICAO are critical to ensure the preeminence of the U.S. aviation industry

Harmonization with ICAO's international standards ensures that all the world's manufacturers meet the same standards. The proposed standards, if adopted, would ensure the acceptance of U.S. manufactured airplanes, which incorporate GE engines, by countries and airlines around the world. Without this harmonization, countries may ban the use of any airplane within their airspace that does not meet ICAO standards. Also, if EPA adopted no standards or standards less stringent than ICAO's standards, U.S. airplane manufacturers could be forced to seek CO_2 emissions certification from a foreign aviation certification authority to market their airplanes for international operation, rather than from the Federal Aviation Administration ("FAA"). This would disrupt business and disadvantage U.S. firms. [EPA-HQ-OAR-2018-0276-0157-A1, pp.3-4]

An unequal regulatory environment would likely result in global market distortions. Efficient, safe, and effective airline operations rely on global consistency. Furthermore, the ability of airlines to seek lease or loan financing in support of their accelerated adoption of new aircraft technology will rely on the ability of financial partners to deploy and finance aircraft where they are most beneficial to travelers globally, without regulatory discrimination by political jurisdictions. [EPA-HQ-OAR-2018-0276-0157-A1, p.4]

[The following comments were submitted as testimony at the virtual public hearing on September 17, 2020.]

First, we commend the agency for proposing greenhouse gas emission standards that follow the standards adopted by the International Civil Aviation Organization, ICAO. Consistency with the ICAO standards is critical to ensure the preeminence of the U.S. aviation industry. By achieving consistency with the ICAO standards, the proposal will assure the worldwide acceptance of U.S.-manufactured airplanes and, thereby, protect U.S. jobs and strengthen the American aviation industry while also protecting the environment.

Fourth, we believe that the emission standards should not be set any more stringently than the ICAO standards that the U.S. is bound to meet through its treaty obligations under the Chicago Convention on International Civil Aviation. The standards as written already demand state-of-the-art technology. And they appropriately reflect the preeminence of safety in airline emission standards under the Clean Air Act.

Organization: Gulfstream Aerospace Corporation

Gulfstream also recognizes the importance of harmonization with international standards and supports the EPA on selecting an approach to their proposed rule that maximizes consistency with a standard agreed to by a wide range of international stakeholders at ICAO. [EPA-HQ-OAR-2018-0276-0078-A1, p.1]

Organization: International Co-ordinating Council of Aerospace Industries Associations (ICCAIA)

As international aviation is a global industry, with ICCAIA members' products used on every continent, the definition of a single set of standards and recommended practices worldwide is essential to ensure that companies have one set of design and performance standards to work from, thus avoiding conflictual requirements from patchworks of individual national measures. [EPA-HQ-OAR-2018-0276-0096-A1, p.1]

ICCAIA reiterates its support for the EPA's proposal to adopt rules consistent with the ICAO CO_2 standard. In reviewing the draft rule, we have identified some specific areas where the EPA's regulations would create inconsistency with what was developed through the ICAO. [EPA-HQ-OAR-2018-0276-0175-A1, p.2]

Organization: National Association of Manufacturers

Specifically, "[t]he standards proposed in this rule are the equivalent of the ICAO standards, consistent with U.S. efforts to secure the highest practicable the highest practicable degree of uniformity in aviation regulations and standards…" The proposed standards would, if finalized, also meet the EPA's obligation under section 231 of the Clean Air Act to adopt GHG standards for certain classes of airplanes . . . [EPA-HQ-OAR-2018-0276-0149-A1, pp.2-3]

The Convention on International Civil Aviation urges a high degree of uniformity by its Member States in the standards and guidance it adopts for its regulated entities. At the same time, Member States may adopt their own unique standards to govern domestic operations that may be less restrictive, or in some cases, more stringent than what is adopted by ICAO. These balanced protections ensure a consistent framework to enable international operations while also affording Member States the flexibility to address the unique needs of its domestic aviation industry. Given the devastating, continued impact of COVID-19 on the U.S. aviation industry, it would be appropriate for EPA to adopt the standards as proposed to ensure the U.S. aviation manufacturing industry can compete globally, while also ensuring the final rule affords sufficient flexibility to address the needs of U.S. domestic operations. Given our strong commitment to clean air, we support this thoughtful proposal and are excited to take the next steps forward.

Importantly, commercial airplane manufacturing accounted for nearly 8 percent of total U.S. exports and supported more than one million U.S. jobs. However, the COVID-19 pandemic has injected a significant amount of uncertainty into the aerospace industry and manufacturers are feeling the impact of this global health emergency. During these unprecedented times, it is critical to provide aerospace manufacturers with regulatory certainty. Aligning U.S. and International Civil Aviation Administration emission standards would further support domestic aircraft manufacturers by increasing their global competitiveness and creating a level playing field for original equipment manufacturers. [EPA-HQ-OAR-2018-0276-0149-A1, p.3]

[The following comments were submitted as testimony at the virtual public hearing on September 17, 2020.]

Aviation continues to be an American success story, contributing significantly to global economic activity and employment. And aligning U.S. and ICAO standards would further support domestic aircraft manufacturers by increasing their global competitiveness and creating a level playing field for original equipment manufacturers. Protecting the environment and improving public health are critical to improving air quality and tackling climate change. However, the choice between environmental protection and strong economy is not an either/or proposition. Americans deserve both. Understanding this and taking strategic action will create jobs for domestic investment and create a healthier and more sustainable world for all of us. This is why manufacturers are committed to strong, smart environmental protections that improve the lives of all Americans and why we support this proposal.

Organization: National Business Aviation Association (NBAA)

As noted in this proposed rule, the need for a single global standard is vitally important to promoting international harmonization. NBAA fully supports this mindset and would like to identify key subject areas that we submit for reconsideration. [EPA-HQ-OAR-2018-0276-0091-A1, p.2]

There are few subject areas that a global policy position is more important than that surrounding environment. Moving forward with this proposed rule will demonstration that the EPA supports this viewpoint. Aside from these few identified areas, NBAA supports the EPAs decision to implement this important rule. We applaud the EPA for continuing this work and taking the action to adopt the ICAO CO_2 standard. [EPA-HQ-OAR-2018-0276-0091-A1, p.2]

Organization: Ohio Chamber of Commerce

Aviation is one of only two industrial sectors that must comply with global carbon emissions goals and standards. The EPA standard is consistent with the standards agreed to by 190 countries and the UN International Civil Aviation Organization (ICAO). [EPA-HQ-OAR-2018-0276-0116-A1, p.1]

A US standard in alignment with the ICAO standards is an important step in creating a level international playing field for American airplane manufacturers, thus aircraft designed and built in the U.S. should be more competitive in the global marketplace. [EPA-HQ-OAR-2018-0276-0116-A1, p.1]

The ICAO standards are an important part of the industry’s strategy to cut net global aviation carbon dioxide emissions to half of what they were in 2005 by 2050. These ambitious emission standards would formalize technology improvements into the airplane certification process that, until now, have been purely voluntary. [EPA-HQ-OAR-2018-0276-0116-A1, p.2]

In conclusion, when finalized, this rule will reduce emissions in the most cost-effective way. [EPA-HQ-OAR-2018-0276-0116-A1, p.2]

Organization: Ohio Manufacturers' Association (OMA)

Aviation is one of only two industrial sectors that have global carbon emissions goals and standards to meet them. The EPA standard is consistent with the standards agreed to by 190 countries and the UN International Civil Aviation Organization (ICAO). [EPA-HQ-OAR-2018-0276-0136-A1, p.1]

A U.S. standard in alignment with the ICAO standards is an important step in creating a level international playing field for domestic airplane manufacturers, which means that aircraft designed and built in the U.S. should become even more competitive in the global marketplace. [EPA-HQ-OAR-2018-0276-0136-A1 p.1]

The ICAO standards are an important part of the industry’s strategy to cut net global aviation carbon dioxide emissions to half of what they were in 2005 by 2050. These ambitious emission standards would formalize technology improvements into the airplane certification process that, until now, have been purely voluntary. [EPA-HQ-OAR-2018-0276-0136-A1, p.2]

In conclusion, when finalized this rule will reduce emissions in the most cost-effective way. [EPA-HQ-OAR-2018-0276-0136-A1, p.2]

Organization: Shell Oil Products US (Shell)

EPA explains that these proposed standards are equivalent to the airplane CO_2 standards adopted by the International Civil Aviation Organization (ICAO) in 2017 and are consistent with U.S. efforts to secure the highest practicable degree of uniformity in aviation regulations and standards. [EPA-HQ-OAR-2018-0276-0097-A1, p.1]

Organization: U.S. Chamber of Commerce

A U.S. standard consistent with that agreed to by the UN International Civil Aviation Organization (ICAO) is an important first step in creating a level playing field for American airplane manufacturers, ensuring that aircraft designed and built in the U.S. continue to compete in the global marketplace. [EPA-HQ-OAR-2018-0276-0142-A1, p.1]

Environmental Rationale

The ICAO standards are an important part of the industry's strategy to cut net global aviation carbon dioxide emissions to half of their 2005 level by 2050. These emission standards would formalize ambitious technology improvements into the airplane certification process that, until now, have been purely voluntary. Today's aircraft are well over 70% more efficient than the first jets. Continued investment by manufacturers in new technologies promises to further improve efficiency and reduce emissions. [EPA-HQ-OAR-2018-0276-0142-A1, p.2]

[The following comments were submitted as testimony at the virtual public hearing on September 17, 2020.]

We thank EPA for your work on this standard, which, as many speakers have mentioned, is consistent with the standards agreed to by 190 countries in the U.N. International Civil Aviation Organization, or ICAO.

As the U.S. standard in alignment with ICAO standards is an important step in creating a level international playing field for American airplane manufacturers, which means that aircraft designed and built in the U.S. should be more competitive in the global marketplace.

Organization: Virginia Chamber of Commerce

Aviation is one of only two industrial sectors that have global carbon emissions goals and standards to meet them. The EPA standard is consistent with the standards agreed to by 190 countries and the UN International Civil Aviation Organization (ICAO). [EPA-HQ-OAR-2018-0276-0114-A1, p.1]

A US standard in alignment with the ICAO standards is an important step in creating a level international playing field for American airplane manufacturers, which means that aircraft designed and built in the U.S. should be more competitive in the global marketplace. [EPA-HQ-OAR-2018-0276-0114-A1,p.1]

The ICAO standards are an important part of the industry's strategy to cut net global aviation carbon dioxide emissions to half of what they were in 2005 by 2050. These ambitious emission standards would formalize technology improvements into the airplane certification process that, until now, have been purely voluntary. [EPA-HQ-OAR-2018-0276-0114-A1,p.2]

In conclusion, when finalized this rule will reduce emissions in the most cost-effective way. [EPA-HQ-OAR-2018-0276-0114-A1, p.2]

<u>Response</u>

For responses to general comments on aligning with the international airplane CO_2 standards adopted by ICAO in 2017, see the response to comments for stringency of the standards, which is described in Section IV.I.1 of the Preamble. Also, for further discussion on aligning with the ICAO standards see the introductory paragraphs of Preamble Section IV and Preamble Section VI.D.2. In cases where commenters raise additional issues and specific points above, we include and respond to those issues and points in the appropriate sections below.

2.2. Adopting more Stringent Standards

Organization: 350 Seattle

To avoid disaster, global temperature rise this century must be kept well below 2 degrees Celsius above pre-industrial levels. Unfortunately, the ICAO standards are much too weak to accomplish this--they do absolutely nothing to limit overall emissions. The proposed rule EPA-HO-OAR-2018-0276 should be withdrawn and replaced with a much stronger standard. [EPA-HQ-OAR-2018-0276-0108-A1, p.1]

Much of the industry-provided oral testimony at the September 17 hearing lauded the economic benefits of adopting ICAO standards. However, the mission of the EPA is to protect the environment, not to boost industry by adopting standards that fail to protect the environment. It is no surprise that industry likes these lax standards—they require no change! The average new aircraft delivered in 2016 already met the ICAO 2028 standard1. Indeed, Section II.C.1.II.3 it states “After analyzing the results of the approach/methodology, ICF estimated that all airplane models (in-production and in-development airplane models) would meet the levels of the proposed standard or be out of production by the time the standard would become effective.” [EPA-HQ-OAR-2018-0276-0108-A1, p.1]

Adopting the ICAO standard does nothing to fulfill the EPA mandate to protect public health or the environment. It will not reduce aircraft emissions in the least. As stated in I.C.[1], the EPA has authority to regulate GHG emissions from aircraft because of their danger to public health. Please use this authority to pass a rule that protects public health by reducing aircraft emissions to levels that align with targets well-established by current science, in a manner that aligns with environmental justice. This is what the EPA needs to do to truly protect the people of the United States. [EPA-HQ-OAR-2018-0276-0108-A1, p.2]

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[1] International Council on Clean Transportation https://theicct.org/publications/fuel-burn-new-comm-aircraft-1960-2019-sept2020.

Organization: Anonymous Public Comment 19

The EPA can set lower GHG standards for new and old airplanes so airplane manufactures have incentive to do more to reduce emissions.

Please make stricter standards for GHGs for airplanes, especially to meet or exceed the Paris goals. Please help protect that small blue ball. We and all the people of the world are dependent on you and other regulatory agencies to help meet the large challenges of global warming. [EPA-HQ-OAR-2018-0276-0146, p.2]

The EPA's proposal to set greenhouse gas (GHG) standards for airplanes and airplane engines does not do enough to address the increasing threat of the GHGs produced by airplanes. [EPA-HQ-OAR-2018-0276-0146, p.1]

Organization: Anonymous Public Comment 20

I am in support of regulating air pollution from the airline industries as they are quickly becoming one of the worst polluters in the world. My concern is that the regulations are not strong enough, nor is there an effective way to hold these companies responsible in the case that they do not meet the specified emission standards. I would like to see stricter regulations and a plan to ensure that they are being met, but a step up in standards for these major polluters is a step in the right direction. [EPA-HQ-OAR-2018-0276-0163 p. 1]

Organization: Anonymous Public Comment 7

Please withdraw the proposed rule and quickly replace it with strong, technology-forcing standards that rapidly decarbonize the aviation industry in line with what climate science and equity demand. We are in a climate emergency. Status quo operation of the aviation industry is incompatible with global efforts to avoid the worst impacts of climate change. [EPA-HQ-OAR-2018-0276-0124, p.1]

Organization: Boeing Company (Boeing)

By the same token, EPA would not be able to quickly adopt a CO_2 standard broader or more stringent than the ICAO standard, given the scope of EPA's underlying contribution finding[1] and the time that would be needed to properly evaluate and balance the CAA statutory factors of safety, noise, timing, and costs with respect to the technologies that might be required to meet a broader or more stringent standard. Of particular importance would be the need to evaluate the costs arising from the competitive disadvantages that would be unnecessarily imposed on the U.S. commercial aerospace manufacturing and aviation industries – industries that must compete globally – were EPA to impose a standard broader or more stringent than ICAO's on U.S. commercial aerospace manufacturers and operators of U.S. certified commercial aircraft. That is especially true because, under the Chicago Convention, such a standard could not be applied to aircraft manufactured and/or certified in other countries, placing U.S. commercial aerospace manufacturers and operators at a significant disadvantage. [EPA-HQ-OAR-2018-0276-0181-A2, p.3]

EPA is also under no statutory obligation to prioritize a rulemaking that would impose a broader or more stringent standard applying to CO_2 or other greenhouse gases. EPA may determine how to prioritize and sequence its rulemaking actions.[2] Prioritization is particularly important here because, after finalizing the adoption of an ICAO-equivalent CO_2 standard in this rulemaking, EPA will need to undertake another near-term rulemaking to consider, propose, and adopt an ICAO-equivalent particulate matter (PM) exhaust concentration standard. Because the PM exhaust concentration standard was established by ICAO at the same time as its CO_2 standard and also has a first implementation date of January 1, 2020, that rulemaking should take priority over the consideration of any broader or more-stringent-than-ICAO CO_2 standard. Similarly, ICAO has adopted PM "mass" and "number" standards, with first implementation dates of January 1, 2023, that EPA will also need to consider and implement through the CAA section 231 rulemaking process in the near future. [EPA-HQ-OAR-2018-0276-0181-A2, p.3]

Given the very challenging positions in which the airline and commercial aircraft manufacturing industries find themselves, now is not the time to impose further costs on these industries through the adoption of a standard that is broader or more stringent than the internationally-adopted ICAO CO_2 standard. [EPA-HQ-OAR-2018-0276-0181-A2, p.8]

IV. Broader or More Stringent Domestic Standards are Neither Required by Section 231 nor Warranted by the Record.

The commercial aviation industry has a strong environmental track record, including steady technological improvements reducing aircraft greenhouse gas emissions over time. Today's commercial aircraft are 70% more fuel-efficient than aircraft flying 50 years ago. Greater fuel-efficiency translates into reductions in aircraft fuel consumption and, as a consequence, greenhouse gas emissions (GHGs). Today, more than 3% of global gross domestic product is supported by aviation, yet only 2.4% of global anthropogenic CO_2 emissions are attributable to aviation,[89] and emissions of other greenhouse gases from aircraft engines are de minimis or non-existent.[90] Along with these environmental achievements, the industry has maintained an impressive safety record.[91] [EPA-HQ-OAR-2018-0276-0181-A2,p.22]

The aerospace manufacturing and aviation industries remain committed to reducing emissions through a "basket of measures" that, as discussed in Section I.C. of these comments, includes, but is far from limited to, fuel efficiency. As one of those measures is ensuring that the latest fuel-efficiency technologies that have been proven safe are being implemented into the latest airplane designs, the proposed rule greatly assists in the pursuit of this effort. But it is appropriate for EPA and FAA to additionally recognize other industry efforts to reduce aviation's carbon footprint in the proposed rule, including improving operational efficiency of flights through improved traffic control and airline operations, greater use of sustainable aviation fuel, and carbon offsetting of international aviation emissions through ICAO's CORSIA program and airline voluntary initiatives. The existence of other programs and initiatives aimed at reducing CO_2 from aircraft is a valid consideration in determining the stringency of standards for emissions from aircraft engine pursuant to CAA section 231. [EPA-HQ-OAR-2018-0276-0181-A2, p.22]

EPA cannot regulate in a vacuum, and must consider the potential diversion of resources from more cost-effective measures for reducing emissions that would result from imposing a section 231 standard that is broader or more stringent than the ICAO CO_2 standard. Such a balanced approach is required pursuant to Executive Order 12866, which provides among its principles of regulation that:

Each agency shall examine whether existing regulations (or other law) have created, or contributed to, the problem that a new regulation is intended to correct and whether those regulations (or other law) should be modified to achieve the intended goal of the regulation.

When an agency determines that a regulation is the best available method of achieving the regulatory objective, it shall design its regulations in the most cost-effective manner to achieve the regulatory objective. In doing so, each agency shall consider incentives for innovation, consistency, predictability, the costs of enforcement and compliance (to the government, regulated entities, and the public), flexibility, distributive impacts, and equity.

Each agency shall identify and assess alternative forms of regulation and shall, to the extent feasible, specify performance objectives, rather than specifying the behavior or manner of compliance that regulated entities must adopt.

Each agency shall tailor its regulations to impose the least burden on society … consistent with obtaining regulatory objectives, taking into account, among other things, and to the extent practicable, the costs of cumulative regulation.[92] [EPA-HQ-OAR-2018-0276-0181-A2, pp.22-23]

Considering other existing and planned measures to reduce aircraft CO_2 emissions when determining the stringency of CAA Section 231 fuel efficiency standards is thus consistent with the ICAO's approach, the CAA, and U.S. regulatory principles. [EPA-HQ-OAR-2018-0276-0181-A2, p.23]

A. CAA Section 231 Does Not Compel More Broader or Stringent Standards, and "Technology Forcing" Cannot Trump Flight Safety

Some commenters on the 2015 ANPRM have asserted that EPA has a broad obligation under the CAA to reduce or prevent pollution from the aviation sector consistent with the goal of protecting public health and welfare.[93] These commenters argue that, "[b]ecause of the ineffectiveness of the ICAO standard for reducing CO_2 emissions, simply incorporating an international standard in domestic law under section 231 of the Clean Air Act would be arbitrary, capricious and unlawful."[94] Thus, these commenters argue that EPA cannot adopt the ICAO standard but instead must "press for the development of improved technology rather than be limited by what exists today" – in other words, the commenters argue that EPA is required to impose "technology-forcing" standards for emissions from aircraft engines under section 231.[95] [EPA-HQ-OAR-2018-0276-0181-A2, p.23]

The CO_2 metric developed by ICAO and proposed to be incorporated within EPA's regulations uses multiple test points to represent the fuel consumption performance of an aircraft: (a) a specific air range (SAR) measuring distance flow per unit of fuel consumed in the cruise flight stage; (b) a reference geometry factor (RGF) to provide an adjustment based on the size of an aircraft fuselage; and (c) a maximum take-off mass (MTOM).[96] The ICAO CO_2 standard is based on considerations of environmental effectiveness, technical feasibility, economic reasonableness, and environmental interdependencies.[97] It recognizes the combined effects of engine technology, aerodynamics, and weight on the fuel consumption of, and hence on CO_2 emissions from, the engines propelling a particular size of aircraft. The stringency of the ICAO standard was further informed by modeling analyses considering costs and environmental benefits.[98] And a "key criterion" was that "[t]he certification standard must not compromise safety."[99] These are not the hallmarks of arbitrary and capricious decision-making, but rather reflect a careful balancing of factors relevant in this CAA section 231 rulemaking, and EPA may justifiably rely on this prior analysis to inform its own conclusions. [EPA-HQ-OAR-2018-0276-0181-A2, p.24]

With regard to "technology-forcing," the language of CAA section 231 stands in stark contrast to other provisions of the CAA that require technology-forcing standards – making clear that section 231 does not require technology-forcing. For example, emission standards for diesel motor vehicles must reflect the "greatest degree of emission reduction achievable through the application of technology which … will be available … ."[100] The legislative history confirms that this provision, among other elements in the CAA provisions regarding motor vehicles, was "designed … to force the state of the art."[101] Section 231, by contrast, requires that aircraft emission standards be "technologically feasible" and prohibits standards that would compromise noise or safety, recognizing the fact that aircraft operate in an environment where safety considerations are assessed under different constraints and challenges than other mobile sources regulated under Title II of the CAA.[102] [EPA-HQ-OAR-2018-0276-0181-A2, p.24]

Safety is not "just another factor" for EPA to consider in setting CAA section 231 standards; reducing emissions never takes precedence over ensuring the safety of an aircraft's passengers and crew. As the statute makes clear, safety cannot be disregarded in considering whether more stringent emission standards should be adopted. The aerospace manufacturing industry's deployment of its newest technologies in a quest to improve fuel-efficiency and thereby reduce CO_2 emissions of its airplanes has required significant effort to achieve without compromising flight safety. It would make no sense to adopt a technology-forcing approach to mandate even greater fuel-efficiency though this CAA section 231 rulemaking, as such requirements would require the deployment of technologies that are, at present, speculative and unproven. Because airframe and engine manufacturers cannot incorporate technologies into their products until those technologies are proven to be compliant with the airworthiness certification requirements and safe, adopting a technology-forcing standard could surely jeopardize manufacturers' ability to comply with the standard at all. [EPA-HQ-OAR-2018-0276-0181-A2, pp.24-25]

The standards adopted pursuant to section 231 of the CAA must be underpinned by what is technologically feasible.[103] Any adoption of a technology-forcing emission standard for CO_2 emissions from aircraft engines would be contrary to the CAA if it compromised safety or significantly increased noise.[104] Therefore, if EPA were to pursue a technology-forcing standard for CO_2, the Agency would need to demonstrate that such a standard would not adversely affect safety or significantly increase noise levels (and would be economically reasonable in relation to the time need for implementation). [EPA-HQ-OAR-2018-0276-0181-A2, p.25]

In sum, the considerations surrounding attempts to push industry forward – by promulgating standards for which new technologies will need to be developed and proven – are simply not the same under CAA section 231 as they are under other CAA provisions. Thus, it is not "arbitrary and capricious" for EPA to take a measured, or even conservative, approach when establishing the stringency of new standards for emissions from aircraft engines. As EPA has recognized in a past aircraft engine emission standard rulemaking, CAA section 231 does not compel the Agency to obtain the "greatest degree of emission reduction achievable as per section 213 and 202 of the CAA" and "EPA does not interpret the Act as requiring the Agency to give subordinate status to factors such as cost, safety and noise in determining what standards are reasonable for aircraft engines" or "achieve a 'technology-forcing' result."[105] [EPA-HQ-OAR-2018-0276-0181-A2, p.25]

C. Other Arguments Urging Stricter Standards Are Seriously Flawed

1. EPA has no duty under CAA section 231 to reduce GHG emissions from aircraft engines to de minimis or trivial levels – e.g., to the levels below which no standards would be required

Some commenters on the 2015 ANPRM have argued that the "post-endangerment finding duty to regulate" GHG emissions from aircraft under CAA section 231 requires EPA to "reduce or eliminate altogether the pollution from sources subject to its regulation."[111] But this claim is misplaced; indeed, it is fatally flawed in light of section 231's command that EPA shall promulgate no standard that adversely affects safety or significantly increases noise, and that EPA shall consider timing and costs when setting a section 231 standard. While EPA's endangerment and contribution findings creates a duty to establish a standard under CAA section 231, "EPA no doubt has significant latitude as to the manner, timing, content, and coordination of its regulations with those of other agencies."[112] The endangerment and contribution findings may compel action by EPA pursuant to section 231, but such action need only "conform to the authorizing statute."[113] [EPA-HQ-OAR-2018-0276-0181-A2, p.27]

EPA's 2016 findings for GHG emissions from aircraft engines relied heavily on the Agency's 2009 endangerment determination made in support of regulating GHG emissions from light duty vehicles, as well as the technical and administrative record of that rule.[114] With regard to the contribution from aircraft engines, while the amount of GHGs from aircraft was generally discussed in the 2016 determination, EPA did not parse the extent to which any particular level of GHG emissions from aircraft engines would contribute to an endangerment of public health or welfare compared with light duty vehicles, trucks, or stationary sources, and EPA did not establish a "bright line" regarding when aircraft engine emissions are considered to "contribute to" the endangerment, noting only that the emissions it was seeking to regulate were more than "de minimis or trivial."[115] [EPA-HQ-OAR-2018-0276-0181-A2, pp.27-28]

In sum, EPA has consistently treated the endangerment/contribution determination and standard-setting processes to be related but independent[116] and EPA need not seek to reduce GHG emissions from aircraft engines to de minimis or trivial levels. Nor do the endangerment and contribution findings for GHG emissions from aircraft engines need to be revisited in the context of this proposed rule.[117] [EPA-HQ-OAR-2018-0276-0181-A2, p.28]

2. The Scope of the Rule is Appropriate

EPA received comments in response to the 2015 ANPRM that criticized ICAO's approach to applying standards to new-type and in-production aircraft.[118] The comments favored applying standards at '"different levels and implementation dates' for 'newly and previously certified engines"' and suggested that EPA could also '"pursue near- and long-term greenhouse gas exhaust emission standards.'"[119] One option advanced in those comments advocated applying the standards to "'partially redesigned aircraft' and when there were 'incremental improvements'" to aircraft (since applying new standards on this basis "would result in a faster, more effective turnover of outdated or inefficient technologies").[120] [EPA-HQ-OAR-2018-0276-0181-A2, p.28]

The final ICAO standard as proposed to be adopted by EPA in fact applies to both new type and in-production aircraft, and the requirements for new aircraft are more stringent and apply sooner than those that apply to in-production aircraft.[121] The ICAO CO_2 standard as proposed to be adopted by EPA applies prospectively to new aircraft type designs beginning in 2020,[122] and to changed aircraft type designs (i.e., derivatives) for already in-production aircraft beginning in 2023.[123] And those in-production aircraft which do not meet the ICAO standard by 2028 will no longer be able to be produced unless their designs are sufficiently modified to meet the standard[124] or they are granted relief under the contemplated FAA exemption process.[125] Furthermore, in addition to (a) the general applicability to in-production aircraft in 2028, and (b) the accelerated applicability of the in-production requirements to changed aircraft type designs for in-production aircraft starting in 2023, the ICAO CO_2 standard also applies the new-type requirements when the design of an in-production aircraft is changed so significantly that a substantially new investigation of compliance with the applicable airworthiness regulations is required.[126] Thus, the commenter's suggestions as to "different levels and implementation dates," and favoring application of the standards to "'partially redesigned aircraft' and when there are 'incremental improvements'" to aircraft, have been satisfied. [EPA-HQ-OAR-2018-0276-0181-A2, p.29]

As to adding "long-term" standards to this rulemaking, as noted above, EPA is constrained by several statutory factors related to safety, noise and the time necessary to permit "the development and application of requisite technology, giving appropriate consideration to the cost of compliance within such period."[127] EPA cannot adequately determine and balance these factors too far into the future. While broader or more stringent standards might be necessary and appropriate in future years, trying to speculate in the current rulemaking as to how the statutory factors could potentially be balanced down the road as applied to as-yet unknown or unproven technology, or to mandate additional "long term" standards beyond the current ICAO standard that are based on TRL-8 "flight-tested" technologies, is simply not prudent, nor is it required. [EPA-HQ-OAR-2018-0276-0181-A2, pp.29-30]

CAA section 231 neither includes any specific timeframe within which the EPA must promulgate new or revised standards for emissions from aircraft engines, nor includes a technology-effectiveness criterion. The section provides only that: "The Administrator shall, from time to time, issue proposed emission standards applicable to the emission of any air pollutant from any class or classes of aircraft engines which in [his] judgment causes, or contributes to, air pollution which may reasonably be anticipated to endanger public health or welfare."[128] Public comments on the proposed rule must be considered, but EPA need only makes changes that it "deems appropriate."[129] And final regulations shall take effect only after such period as the Administrator finds necessary (after consultation with FAA) "for the development and application of the requisite technology," taking costs into consideration.[130] Thus, having proposed an ICAO-equivalent standard, EPA satisfies its duties under CAA section 231 by taking public comments, considering any comments, and, in consultation with FAA, finalizing the standard with changes it deems appropriate. [EPA-HQ-OAR-2018-0276-0181-A2, p.30]

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[1] EPA's contribution finding addressed only emissions from engines used in subsonic jet aircraft with a maximum takeoff mass (MTOM) greater than 5,700 kilograms and subsonic propeller driven (e.g., turboprop) aircraft with a MTOM greater than 8,618 kilograms). 81 Fed. Reg. 54,422, 54,461 (Aug. 15, 2016); see also 85 Fed. Reg. at 51,562-51,563.
[2] Grand Canyon Air Tour Coal. v. FAA, 154 F.3d 455, 477-78 (D.C. Cir. 1998).
[89] CO_2 emissions from commercial aviation, 2018, The International Council on Clean Transportation, Working Paper 2019-16.
[90] "CO_2 represents 99 percent of all GHGs from both total U.S. aircraft (220 Tb CO_2 eq) and U.S. covered aircraft (195 Tg CO_2 eq). [N]itrous oxide represents 1 percent from total aircraft ... . Modern aircraft do not emit methane, and hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride are not products of aircraft engine combustion."
[81] Fed. Reg. at 54,466.
[91] See, e.g., State of Global Aviation Safety, ICAO Safety Report, at 9-12 (2019 Ed.).
[92] Executive Order 12866, § 1(b) (Sept. 30, 1993).

[93] Comments of Center for Biological Diversity, Clean Air Task Force, Earthjustice, Friends of the Earth, Natural Resources Defense Council, Sierra Club and World Wildlife Fund (Aug. 31, 2015) ("Environmental NGO 2015 Comments"); EPA-HQ-OAR-2014-0828-0863 at 1, 17.
[94] Id. at 17.
[95] Id. at 18.
[96] See https://www.icao.int/environmental-protection/Pages/ClimateChange_TechnologyStandards.aspx.
[97] ICAO, 2016 Environmental Report, at 112-114, available at https://www.icao.int/environmental-protection/Documents/EnvironmentalReports/2016/ENVReport2016_pg112-114.pdf#search=co2.
[98] The modeling exercise involved several analytical tools, including fleet evolution modelling, environmental benefits, recurring costs, non-recurring costs, costs per metric tonne of CO_2 avoided, certification costs, applicability scenarios, and various sensitivity studies to inform the decision-making process. This work allowed CAEP to conduct an analysis, with the aim of providing a reasonable assessment of the economic costs and environmental benefits of a potential CO_2 standard in comparison with a "no action" baseline. Id.
[99] CAEP/10 Report, Appendix C, § 3.1.5 (Feb. 2016).
[100] CAA § 202(3)(A)(i), 42 U.S.C. § 7521(3)(A)(i) (emphasis added).
[101] Int'l Harvester Co. v. Ruckelshaus, 478 F.2d 615, 623 (D.C. Cir. 1973) (quoting 116 Cong. Rec. 33,120 (1970)).
[102] CAA §§ 231(a)(1)(B) and (2)(B)(ii), 42 U.S.C. §§ 7521(a)(1)(B) and (2)(B)(ii).
[103] CAA § 231(a)(1)(B), 42 U.S.C. § 7571(a)(1)(B).
[104] CAA § 231(a)(2)(B)(ii), 42 U.S.C. § 7571(a)(2)(B)(ii).
[105] 70 Fed. Reg. 69664, 69676 (Nov. 17, 2005). When that rulemaking approach under section 231 was challenged, the D.C. Circuit deferred to EPA's interpretation. NACAA v. EPA, 489 F.3d 1221, 1230 (D.C. Cir. 2007) (citing 70 Fed. Reg. 69,664, 69,676 (Nov. 17, 2005)).
[111] Environmental NGO 2015 ANPRM Comments at 16-17.
[112] Massachusetts v. EPA, 549 U.S. 497, 533 (2007).
[113] Id. EPA has noted that its 2011 rule for medium and heavy-duty vehicles "implements a specific provision from Title II section 202(a). ... EPA is afforded considerable discretion under section 202(a) when assessing issues of technical feasibility and the availability of lead time to implement new technology. Such determinations are 'subject to the restraints of reasonableness', which 'does not open the door to 'crystal ball' inquiry." 76 Fed. Reg. 57,129-30 (citing NRDC v. EPA, 655 F.2d at 328, quoting International Harvester Co. v. Ruckelshaus, 478 F.2d 615, 629 (D.C. Cir. 1973)).
[114] "The Administrator's view is that the body of scientific evidence amassed in the record for the 2009 Endangerment Finding also compellingly supports an endangerment finding under CAA section 231(a)(2)(A)." 81 Fed. Reg. at 54,424. "The Administrator interprets the two-part test required under section 231(a)(2)(A) [i.e., whether GHG emissions may reasonably be anticipated to endanger public health or welfare and second, whether GHG emissions from aircraft engines cause or contribute to this air pollution] as being the same as that explained in the 2009 Endangerment Finding." Id. at 54,434. While EPA reviewed additional scientific assessments that post-dated the 2009 Endangerment Finding, it did so with the limited objective of determining whether a different interpretation of the 2009 assessment was required. Id. at 54,442. This approach is consistent with the approach the agency took with regard to other mobile source sectors. For example, when EPA moved to regulate GHG emissions from medium- and heavy-duty vehicles for the first time in 2011, EPA cited its 2009 Endangerment Determination and its accompanying Technical Support Document (TSD) regarding light-duty vehicles. EPA took a similar course of action when it acted to revise and extend GHG standards for light duty vehicles in 2015. 77 Fed. Reg. 62,624 (Oct. 15, 2012). In extending light-duty vehicle GHG standards to MY 2025, EPA cited the 2009 Endangerment Determination and its TSD. Id. at 62,634, 62,770. EPA additionally noted that the 2009 finding had survived judicial challenge. Id. at 62,895 (citing Coalition for Responsible Regulation v. EPA). EPA also repeated this approach when it extended GHG emissions from heavy duty vehicles and engines to cover model years through model year (MY) 2025 in 2016. 81 Fed. Reg. 73,478, 73,486 (Oct. 25, 2016).
[115] EPA noted that "[t]he U.S. transportation sector constitutes a meaningful part of total U.S. and global anthropogenic GHG emissions. In 2014, aircraft remained the single largest GHG-emitting transportation source not yet subject to any GHG standards." 81 Fed. Reg. at 54,424. EPA indicated that it need not establish a "bright line" with regard to the contribution of aircraft emissions to endangerment, but noted that while the level of contributions must be "more than de minimis or trivial, [it] does not need to rise to the level of significance to support a contribution finding." Id. at 54,471. EPA also did not seek to expand the scope of the 2009 Endangerment Finding relative to the category of GHG air pollutants. The Agency did not make any determination with respect to other substances emitted from aircraft that could have climatic effect, such as black carbon, nor did the Agency consider whether additional regulation of NOx was required. Id. at 54,450-51.

[116] EPA previously took such an approach with respect to emissions of NOx from aircraft engines. See, 77 Fed. Reg. 36,342 (June 18, 2012) (EPA's final rule adopting NOx standards for aircraft turbofan or turbojet engines). The final rule did not discuss endangerment other than to note that military aircraft were not covered by the Agency's 1997 endangerment finding. Id. at 36,372. In the Response to Comments document for the 2012 final rule, EPA noted that CAA § 231(a)(2)(A) allowed the Agency to propose emission standards "from time to time" and that in 1997 the Agency found that public health and welfare were endangered by NOx emissions from aircraft operations. Without reopening this determination, EPA indicated that "[u]nder the authority of the Act and our subsequent finding, we are thus updating our aircraft NOx regulations." Control of Air Pollution from Aircraft and Aircraft Engines; Final Emission Standards and Test Procedures, Summary and Analysis of Comments, EPA-420-R-12-011, at 17 (May 2012). There is no reason why EPA should take a different approach with regard to this proposed rule.
[117] EPA has appropriately indicated the NPRM that it does not seek nor intend to respond to comments on these findings. 85 Fed. Reg. at 51,556. This is similar to the approach taken in the Administration's repeal of the Clean Power Plan and revisions to emission guidelines for electric utility generating units in its recent Affordable Clean Energy Rule, in which EPA indicated that "[t]he substance of the 2009 Endangerment Finding, which addressed GHG emissions from mobile sources, is not an issue in this action." 84 Fed. Reg. 32,521, 32,522, n.5 (July 8, 2019).
[118] Environmental NGO 2015 ANPRM Comments, at 13.
[119] Id. at 15.
[120] Id.
[121] Proposed 40 C.F.R. §§ 1030.1 and 1030.30. See also 85 Fed. Reg. at 51,559 ("The proposed standards would apply to both new type designs and in-production airplanes. The in-production standards would have later applicability dates and different emission levels than for the standards for new type designs. The different emission levels for new type designs and in-production airplanes depend on the airplane size, weight, and availability of fuel efficiency technologies.").
[122] Proposed 40 C.F.R. §§ 1030.1(a)(1) and (3). See also 85 Fed. Reg. 51,567 ("[F]or subsonic jet airplanes over 5,700 kg MTOM and certificated with more than 19 passenger seats, and for turboprop airplanes over 8,618 kg MTOM, the proposed regulations would apply to all airplanes for which application for an original type certificate is made to the FAA on or after January 1, 2020.").
[123] Proposed 40 C.F.R. §§ 1030.1(a)(4) and (5). See also 85 Fed. Reg. at 51,571 ("After January 1, 2023, and until January 1, 2028, an applicant that submits a modification to the type design of a non-GHG certificated airplane that increases the Metric Value of the airplane would be required to demonstrate compliance with the in-production rule. This proposed earlier applicability date for in-production airplanes, of January 1, 2023, is the same as that adopted by ICAO and is similarly designed to capture modifications to the type design of a non-GHG certificated airplanes newly manufactured prior to the January 1, 2028, production cut-off date."); ICAO Annex 16 , vol. III, ch. 1, 2.1 (noting that the January 2023 deadline applies to "derived versions for which the application for certification of the change in type design is submitted after Jan. 1, 2023," and defining "derived version of a non-CO_2 certified airplane" as "an airplane that conforms to an existing type certificate but which is not certified to Annex 16, Vol. III, and to which changes in type design are made prior to issuance of aeroplane's first certificate of airworthiness." (emphasis added)).
[124] 85 Fed. Reg. at 51,558 ("[E]xisting in-production airplanes that are non-compliant will either be modified and re-certificated as compliant or will likely go out of production before the production compliance date of January 1, 2028."). As discussed below in Section VII of these comments, Boeing is requesting that EPA extend the 2028 deadline for a narrow class of in-production mid-size widebody purpose-built freighters.
[125] See proposed 40 C.F.R. § 1030.10. See also 85 Fed. Reg. at 51,573 ("On occasion, manufacturers may need additional time to comply with a standard. The reasons for needing a temporary exemption from regulatory requirements vary and may include circumstances beyond the control of the manufacturer."); id. at 51,574 ("The primary criterion for any exemption filed with the FAA is whether a grant of exemption would be in the public interest.").
[126] See 85 Fed. Reg. at 51,574 ("If the FAA finds that a new original type certificate is required for any reason, the airplane would need to comply with the regulatory level applicable to a new type design.").
[127] CAA § 231(b), 42 U.S.C. § 7571(b).
[128] Id.
[129] CAA § 231(a)(3), 42 U.S.C § 7571(a)(3).
[130] CAA §§ 231(a)(2)(A) & (b), 42 U.S.C. §§ 7571(a)(2)(A) & (b).

Organization: California Air Resources Board (CARB)

California and the world need real limits on aviation emissions, and there are effective ways to cut this pollution; yet, as this letter and the Multistate Comment explain, EPA's proposal dramatically misses the mark. EPA has previously recognized its authority to regulate factors influencing fuel consumption and greenhouse gas (GHG) emissions from the whole aircraft, including engine emissions, aerodynamics, and aircraft weight.[1] EPA also acknowledged its obligation to control aircraft GHG emissions as a result of its 2016 finding that these emissions contribute to pollution endangering public health and welfare.[2] Nonetheless, EPA has proposed a standard that, on its own admission, does nothing to cut pollution from aircraft, even though the agency acknowledges that this pollution is dangerous. Because real reductions are available, and the Clean Air Act obligates EPA to take action, the wholly ineffective proposed standards are illegal and arbitrary. The proposal must be withdrawn, and EPA must instead propose standards reflecting the controls needed. [EPA-HQ-OAR-2018-0276-0169-A1, pp.1-2]

V. Conclusion.

To meet its legal obligations and adequately protect public health and welfare, EPA must incorporate the technologies and procedures identified in this supplemental comment into its aircraft GHG emissions standard. In its proposed rule, EPA has ostensibly prioritized industry competitiveness by proposing to codify ICAO's do nothing standard.[97] Yet a robust standard would significantly benefit the industry as well. Airbus notes that the success of its hydrogen-fueled commercial aircraft will depend on airlines' incentive to retire older, dirtier aircraft, and calls on governments to create this incentive.[98] ICCT concludes that "fuel consumption of new aircraft designs can be reduced by approximately 25% in 2024 and 40% in 2034 compared with today's aircraft by deploying emerging cost-effective technologies, providing net savings to operators over a seven-year time frame."[99] These fuel savings could make airlines both more profitable and more competitive, as ICCT found that "airlines could reduce their fuel spending over the 2025 to 2050 time frame by 19% compared with the baseline case," which, if passed on to consumers, could "lower ticket prices by up to $20 for short-haul flights and $105 for long-haul flights."[100]

EPA's meager rationale for refusing to substantively regulate aircraft GHG emissions thus falls flat. EPA must withdraw its worse than business-as-usual proposal and propose an aircraft GHG standard that would meaningfully reduce emissions, as the law and the climate crisis demand. [EPA-HQ-OAR-2018-0276-0169-A1, pp.21-22]

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[1] EPA, Proposed Finding That Greenhouse Gas Emissions From Aircraft Cause or Contribute to Air Pollution That May Reasonably Be Anticipated To Endanger Public Health and Welfare and Advance Notice of Proposed Rulemaking, 80 Fed. Reg. 37,758, 37,768-69 (July 1, 2015).
[2] EPA, Finding That Greenhouse Gas Emissions From Aircraft Cause or Contribute to Air Pollution That May Reasonably Be Anticipated To Endanger Public Health and Welfare, 81 Fed. Reg. 54,422 (Aug. 15, 2016).
[97] Proposal TSD at 118.
[98] Charlotte Ryan, "Airbus unveils hydrogen designs for zero-emission flight," Energywire (Sept. 22, 2020), https://www.eenews.net/energywire/stories/1063714307.
[99] Anastasia Kharina and Daniel Rutherford, ICCT, "Cost Assessment of Near and Mid-term Technologies to Improve New Aircraft Fuel Efficiency" (2016), at 35, available at https://theicct.org/sites/default/files/publications/ICCT%20aircraft%20fuel%20efficiency%20cost%20assessment_final_09272016.pdf.
[100] Ibid.

Organization: California Attorney General's Office and the California Air Resources Board (CARB) et al.

As explained in Section II, climate science and the increasingly damaging consequences of climate change on our residents and resources demonstrate the need to promptly reduce greenhouse gas (GHG) emissions from aircraft and other significant sources. We highlight threats the Commenting States are facing from climate change, the contribution of aircraft GHG emissions to these threats, and our efforts to control GHG emissions generally and from our airports, specifically. Because the Clean Air Act generally preempts States from establishing distinct standards for aircraft engine emissions, the States and our residents depend on EPA to perform its duty under the Clean Air Act to set robust limits on aircraft GHG emissions to the maximum extent feasible to mitigate ongoing and anticipated public health and environmental harms from impacts of climate change.

Section III explains how the Proposed Rule completely fails to satisfy this duty. While the Proposed Rule contains some necessary components for regulating aircraft GHG emissions,[1] if adopted, it would do nothing to control GHG emissions. The substantive standards that EPA proposes to adopt—the 2016 GHG standards developed by the International Civil Aviation Organization (ICAO)—lag existing technology by more than 10 years and would result in no GHG reductions at all compared to business-as-usual. In fact, EPA has not even considered any form of emission control that would reduce GHGs, despite the agency's determination that these emissions endanger public health and welfare.2 By not even evaluating feasible options besides the ICAO standards that would reduce dangerous pollutants, EPA violated its duty to protect the public health and welfare under Clean Air Act section 231. Section IV identifies further defects of the Proposed Rule that would render its final adoption arbitrary and capricious, including EPA's failure to accurately evaluate the co-benefits of GHG regulation, environmental justice impacts, and federalism impacts. Accordingly, the Commenting States request that EPA rescind the Proposed Rule and issue a revised Notice of Proposed Rulemaking that evaluates the full range of feasible options for effective emissions control and proposes emission standards that actually reduce dangerous GHGs from aircraft. [EPA-HQ-OAR-2018-0276-0176-A1, pp.1-2]

Limiting climate change to the lower-emissions scenarios is a steep task that demands a strong government commitment at all levels to emissions reduction.[39] To date, 189 nations and other parties have formally committed to GHG reductions through the Paris Agreement; at the subnational level, California, Massachusetts, Oregon, New York, Vermont, and many other States have enacted their own commitments in statute.[40] Even with government commitments, the scientific consensus confirms that the deepest of reductions from all major industries are required to prevent the worst, irreversible climate change impacts.[41] To that end, it is imperative the United States exercise its technology-forcing powers to advance proven and viable emissions-reducing science—such as alternative jet fuels, weight-reduction technologies, and other improvements—into more effective, widespread uses. [EPA-HQ-OAR-2018-0276-0176-A1, p.8]

III. EPA'S FAILURE TO EVEN CONSIDER FEASIBLE REDUCTIONS IN GREENHOUSE GAS EMISSIONS IS UNLAWFUL AND ARBITRARY

A. In exercising its discretion to promulgate "appropriate" emission standards under section 231, EPA must take into account, at the very least, the danger of the pollutant and the technological feasibility of control.

1. The plain language of Section 231 requires EPA to take into account air quality needs and technological feasibility and issue appropriate emission standards.

Section 231 authorizes and directs EPA to issue appropriate emission standards for dangerous pollution from aircraft engines. 42 U.S.C. §§ 7571(a)(1)-(3). Subsection (a)(1) directs EPA to study and investigate "emissions of air pollutants from aircraft in order to determine … (A) the extent to which such emissions affect air quality in air quality control regions throughout the United States, and (B) the technological feasibility of controlling such emissions." Subsection (a)(2)(A) then states:

The Administrator shall, from time to time, issue proposed emission standards applicable to the emission of any air pollutant from any class or classes of aircraft engines which in his judgment causes, or contributes to, air pollution which may reasonably be anticipated to endanger public health or welfare.

Finally, subsection (a)(3) requires the Administrator to hold hearings on the proposed standards, which must, "to the extent practicable, be held in air quality control regions which are most seriously affected by aircraft emissions," and to "issue such regulations with such modifications as he deems appropriate."

Section 231, subsection (b) directs the Administrator to select an effective date that allows lead time as necessary for the "development and application of the requisite technology, giving appropriate consideration to the cost of compliance within such period." Id., § 7571(b). Finally, subsection (c) authorizes the President to disapprove such regulation if the Secretary of Transportation finds the regulation would create a hazard to aircraft safety. Id., § 7571(c).

"These provisions, all of which use compulsory language, together create a comprehensive scheme for the regulation of harmful aircraft emissions, of which paragraph 231(a)(2)(A) is the centerpiece." Center for Biological Diversity v. EPA, 794 F. Supp. 2d 151, 160 (D.D.C. 2011). EPA's duty to regulate harmful aircraft emissions under section 231 is separate and independent of the U.S.'s treaty obligations regarding ICAO standards under the Chicago Convention.[125]

EPA contends section 231 "confers an unusually broad degree of discretion … to adopt aircraft engine emission standards as the Agency determines are reasonable," citing National Association of Clean Air Agencies v. EPA, 489 F.3d 1221, 1229-30 (D.C. Cir. 2007) ("NACAA"). 85 Fed. Reg. at 51,559. However broad, EPA's discretion under section 231 is not unfettered: it must be exercised according to the considerations set forth in section 231. Certainly, EPA overreads NACAA to the extent it claims discretion to adopt ineffective standards in response to an endangerment finding, especially where the pollutant is of so extreme a threat as climate changing GHGs. As the full quotation from NACAA states, section 231 "confer[s] broad discretion to the Administrator to weigh various factors in arriving at appropriate standards." 489 F.3d at 1230 (emphasis added).[126]

These factors particularly include (1) aircraft's contribution to dangerous air pollution, and (2) the technological feasibility of emission control. 42 U.S.C. §§ 7571(a)(1)(A)-(B), (2)(A); see Center for Biological Diversity, 794 F. Supp. 2d at 160 (finding section 231(a)(2)(A) "cannot be understood without reference to the provisions around it"); see also Del. Dept. of Natural Res. & Envtl. Control v. EPA, 905 F.3d 90, 97 (D.C. Cir. 2018) (courts construe provisions of Clean Air Act according to "the language and design of the statute as a whole"). These factors inform what emission standards can be "appropriate" and "reasonable" under section 231. Moreover, EPA must exercise its discretion at all times subject to the broad anti-pollution goals of the Clean Air Act.

2. The legislative history of Section 231 confirms EPA's selection of emission standards must be tied to the statutory factors of pollution reduction needs and technological feasibility.

Section 231 as it now reads is primarily a product of the 1970 Clean Air Act amendments, Pub. L. 91-604, 84 Stat. 1676 (Dec. 31, 1970), and their history confirms that EPA must base its aircraft standards, at minimum, on reasoned considerations of pollution reduction needs and technological feasibility. Most of Section 231's operative language represents a compromise between the 1970 House amendments bill, which preserved existing language requiring "appropriate consideration to technological feasibility and economic costs,"[127] and the Senate bill, which deleted this language in order to prioritize pollution reduction needs: as the accompanying Senate report stated, "standards should be a function of the degree of control required, not the degree of technology available today."[128] The conference substitute, which became law, omitted the House language but added three requirements that neither bill had featured: (1) an EPA study of the effect of aircraft emissions on air quality and the availability of emission control technology, (2) public hearings in regions where air quality is most affected by aircraft emissions, and (3) effective dates that provide necessary lead time to develop and apply requisite technology.[129]

Because the conference substitute represents a compromise between the House and Senate bills, the only logical way to read these three requirements is as a mandate to EPA to base its emission standards on pollution reduction needs and the technological feasibility of emission control. The final law thus directs EPA to study both air quality impacts and technological feasibility, with the understanding such study would inform the standards themselves. As the Secretary of Health, Education, and Welfare told both houses: "[W]e are conducting and supporting research [on] aircraft emissions and to explore various means of controlling gaseous emissions … . We will seek prompt application of new knowledge that is obtained."[130] The second and third requirements likewise convey a particular solicitude for evidence on the air quality impacts of pollution and the state of emission control technology.

3. The rulemaking history under Section 231 supports basing emission standards on pollution reduction needs and technological feasibility.

In the decades after section 231 invested EPA with regulatory authority over aircraft emissions, EPA consistently exercised that authority to subject aircraft to "a program of control compatible with their significance as pollution sources," such that "emissions from aircraft and aircraft engines should be reduced to the extent practicable with present and prospective technology."[131] Thus, the very first section 231 aircraft emission standards that EPA proposed represented its "best estimates of achievable technology by 1979," which EPA expected industry to "translate … into practice with reasonably aggressive and imaginative research and development programs." 37 Fed. Reg. at 26,488 (1972 NPRM) (emphasis added). Subsequently, EPA has used similar formulations of controlling emissions to the maximum extent feasible with current and projected technology:

• "Exhaust emission standards … will be based on the best available combuster design technology expected in 1979 and later." 38 Fed. Reg. at 19,088 (1973 final rule).

• Rulemaking for large engines will "ensure that the best technology available is reflected in these standards." Id.; accord 43 Fed. Reg. at 12,617 (1978 NPRM).

• Supersonic aircraft engine standards "are believed to be the most stringent that can be imposed by [the Jan. 1, 1980 compliance date]. They reflect the emission control technology currently under development and expected to be available to the SST engine manufacturers. The standards established here for newly certified SST engines reflect the best technology expected for subsonic engines." 41 Fed. Reg. at 34,722 (1976 final rule).

• Emission levels for new engines were "based on the best technology available, short of sector burning," where the sector burning technique was deemed a risk to airworthiness. Control of Air Pollution from Aircraft and Aircraft Engines; Emission Standards and Test Procedures, 47 Fed. Reg. 58,462, 58,467 (Dec. 30, 1982) (final rule).

EPA consistently exercised its Section 231 authority to set emission standards according to the statutory factors, e.g.: "In determining appropriate levels for standards, consideration was given to air quality needs, technical feasibility, and comparative cost effectiveness." 43 Fed. Reg. at 12,618 (1978 NPRM); see also Proposed Finding that Greenhouse Gas Emissions From Aircraft Cause or Contribute to Air Pollution that May Reasonably Be Anticipated To Endanger Public Health and Welfare and Advance Notice of Proposed Rulemaking, 80 Fed. Reg. 37,758, 37,804 (July 1, 2015) (ANPR) ("EPA interprets its authority under section 231 to be similar to those provisions that grant us significant discretion to identify a reasonable balance of specified emissions reduction, and cost without adversely affecting safety or increasing noise."). This consistent practice affirms EPA's statutory duty to base aircraft standards on a forward-looking evaluation of air quality needs and technological feasibility, so that emissions are "reduced to the extent practicable with present and prospective technology." 37 Fed. Reg. at 26,488. Nor has EPA given a reasoned explanation for tis departure from this practice. Cf. FCC v. Fox Television Studios, 556 U.S. 502, 515-16 (2009) (agencies must explain reversals in established policy). [EPA-HQ-OAR-2018-0276-0176-A1, pp.21-25]

4. Constitutional considerations demand EPA regulate commensurate with the harm of greenhouse gas emissions from aircraft.

Two constitutional considerations confirm that EPA must base its emission standards on its independent assessment pollution reduction needs and technological feasibility, and regulate GHGs to the maximum extent of present and expected technology. First, the States are preempted under section 233 of the Clean Air Act from establishing distinct standards for aircraft engine emissions, so they must rely on EPA to adopt effective controls to protect their citizens. Having given up their "sovereign prerogative" to defend their public health, natural resources, and local industries against threats from certain dangerous emissions, States face imminent harm from EPA's failure to act more aggressively. Massachusetts v. EPA, 549 U.S. 497, 519, 521 (2007).

Second, EPA must review ICAO standards independently under the criteria Congress has set out in section 231; it must not adopt its standards solely or primarily in the interest of "harmonization." 85 Fed. Reg. at 51,564. Federal agencies "may not subdelegate to outside entities—private or sovereign—absent affirmative evidence of authority to do so." U.S. Telecom Ass'n v. FCC, 359 F.3d 554, 566 (D.C. Cir. 2004); see also Defs. of Wildlife v. Gutierrez, 532 F.3d 913, 926-27 (D.C. Cir. 2008) (noting Coast Guard's delegation of authority to promulgate traffic separation schemes to International Maritime Organization "would be unlawful absent affirmative evidence that Congress intended the delegation"). There is no evidence here that Congress intended EPA to delegate authority to ICAO. Rather, EPA has long recognized its obligation to review ICAO standards under its Clean Air Act mandate and to adopt more stringent standards if ICAO standards are "insufficient to protect U.S. air quality":

[I]n the future we intend to assess … whether or not [the new ICAO NOx standards under development] would be stringent enough to protect the U.S. public health and welfare. If so, we would plan to propose to adopt [those] NOx standards. EPA … retains the discretion to adopt more stringent NOx standards in the future if the international consensus standards ultimately prove insufficient to protect U.S. air quality.

70 Fed. Reg. at 69,678 (2005 final rule). And EPA has rejected ICAO standards when its independent review of section 231 factors characterized those standards as inappropriate. From 1982 to 1997, EPA declined to adopt ICAO's NOx standards precisely because it believed (albeit incorrectly) the air quality impacts were minor and the feasibility obstacles were great. 47 Fed. Reg. at 58,466 (1982 final rule).

An independent EPA review is all the more critical because ICAO's policy window is explicitly narrower than the Clean Air Act's. ICAO is not an environmental protection body— not even CAEP is—and the FAA, not EPA, is the U.S.'s primary agency in ICAO negotiations. 85 Fed. Reg. at 51,560.[132] ICAO limits its consideration to "technology-following" options, i.e., control technologies that are already proven,[133] while EPA considers both technology-forcing and technology-following regulations. 70 Fed. Reg. at 69,676 ("[T]he Agency is not limited in identifying what is 'technologically feasible' as what is already technologically achieved"). As the D.C. Circuit warned, delegation of standards-setting to outside entities like ICAO "increases the risk that these parties will not share the agency's 'national vision and perspective' … and thus may pursue goals inconsistent with those of the agency and the underlying statutory scheme." U.S. Telecom, 359 F.3d at 565-66 (citation omitted). If EPA were to adopt only what ICAO adopts, or even consider only what ICAO considers, it would fail to exercise the discretion Congress invested in it and fail its mandate to reduce pollution to the full extent practicable and necessary. [EPA-HQ-OAR-2018-0276-0176-A1, pp.25-26]

C. The United States' obligations under the Chicago Convention do not excuse EPA's failure to protect the United States from dangerous pollution.

As EPA acknowledges, the Chicago Convention does not restrict EPA's authority under the Clean Air Act to regulate GHG emissions from U.S. aircraft. 85 Fed. Reg. at 51,559-61. Nor does it replace EPA's responsibility to protect the public from dangerous pollution. The Chicago Convention explicitly recognizes that member states may adopt standards that are more stringent than those agreed upon by ICAO; Article 38 of the Convention requires only that they notify the ICAO of their decision to do so. Id. at 51,559-60. In fact, when the EPA issued the 2015 ANPR, it specifically sought input on adopting and implementing a more stringent aircraft emissions standard than ICAO. 80 Fed. Reg. at 37,805 (2015 ANPR).

Nonetheless, EPA in this Notice proposes to adopt ICAO emission standards with zero environmental benefits, against the science behind its own endangerment finding, based solely on a vaguely stated interest in "harmonization." 85 Fed. Reg. at 51,564. EPA alternately explains its harmonization interest as uniformity in regulation, building international consensus, and protecting U.S. manufacturers' competitiveness abroad. But none of these interests hold up on examination, and none counter the extraordinary need for aggressive action by EPA to curb aircraft emissions.

First, EPA invokes Article 37 of the Chicago Convention, which obligates member states to secure "the highest practicable degree of uniformity." 85 Fed. Reg. at 51,557. But EPA cuts its selective quotation short: Article 37 seeks "the highest practicable degree of uniformity in regulations, standards, procedures, and organization in relation to aircraft, personnel, airways and auxiliary services in all matters in which such uniformity will facilitate and improve air navigation." Chicago Convention, art. 37 (emphasis added). EPA offers no reason why increased emissions reduction beyond ICAO's standards would impede air navigation. Certainly, adopting any lesser emissions standard would have such an effect, since it would allow other countries to withhold permission to fly in their airspace. But the Chicago Convention demands only that the standards EPA establishes be at least as stringent as the ICAO standards in order to ensure global acceptance of the FAA's airworthiness certification.

Second, EPA claims that adopting the ICAO standards, and not more stringent standards, would have substantial benefits for future international cooperation on airplane emission standards and that such cooperation is the key for achieving worldwide emission reductions. 85 Fed. Reg. at 51,564. Again, this rationale is a sound basis for adopting at least the ICAO standard; but EPA offers no reason why exceeding such standards would detract from an international consensus for more stringent standards. On the contrary, more stringent domestic standards enhance the United States' credibility in negotiations for tighter ICAO standards, since they demonstrate such standards' feasibility, their effectiveness on a major part of the global aviation industry, and U.S. leadership on aviation emissions. More stringent standards would also support key international policies, including ICAO's goal of carbon neutral growth for international aviation from 2020 and the U.S. government's goal to cap emissions from its carriers at 2005 levels starting in 2020.[148]

Third, EPA claims that a more stringent standard "could have disruptive effects on manufacturers' ability to market planes for international operation." 85 Fed. Reg. at 51,564. EPA provides no evidence or reasoning behind this bare assertion; its only apparent basis is that tighter standards may make aircraft more expensive to manufacture, and thus may make U.S. aircraft less price-competitive internationally. See Draft TSD at 130 (rejecting Scenario 3 so that "no U.S. manufacturer finds itself at a competitive disadvantage"). Such a view is profoundly short-sighted, however. To the extent that emissions-reducing technologies result in reduced fuel burn, those fuel savings may offset a higher purchase price over the life of the aircraft.[149] Moreover, as the effects of climate change worsen—according to EPA's own findings—and as other nations implement their mid-century emission reduction targets, the global regulatory environment will necessarily trend toward tighter standards;

thus, domestic standards that force emission reduction technology now will likely make U.S. aircraft more competitive in the long run.[150] This concern for technological competitiveness is all the more acute given the long lead time for new aircraft designs.[151] Lastly, EPA is simply not in the business of protecting the competitiveness of U.S. aircraft manufacturing: its mission is to protect the public against dangerous pollution from this very sector. While EPA should certainly take into account the impact of its regulations on price-competitiveness abroad, that cannot be the sole and exclusive basis of EPA's action.

IV. THE PROPOSED RULE IS ARBITRARY AND CAPRICIOUS.

For all the reasons stated above, the Proposed Rule is arbitrary and capricious. Given the 2016 endangerment finding showing an existential threat from GHG-driven climate change, and the manifest availability of more stringent controls beyond Scenarios 1-3, EPA's failure to propose or even consider options that would reduce emissions is irrational and arbitrary. See Sw. Elec. Power Co. v. EPA, 920 F.3d 999, 1022 (5th Cir. 2019) (finding EPA's "choice of an outdated and ineffective technology" in setting Clean Water Act standards was arbitrary and capricious). At a minimum, EPA must explain why it would be unreasonable to pursue feasible and more stringent controls, which it has not. EPA provides no evidence that more stringent standards would impair safety, increase noise, or otherwise implicate other section 231 considerations. EPA identifies no evidence that domestic industry would be harmed by more stringent standards, and no analysis of other countries' standards or mechanisms. Simply incorporating the ICAO GHG standard into domestic law without analysis of other meaningful alternatives is not an exercise of discretion, but a failure to exercise that discretion. It turns section 231 into an international certification provision, not a pollution control provision. [EPA-HQ-OAR-2018-0276-0176-A1, pp.32-34]

V. CONCLUSION

For the foregoing reasons, EPA must rescind the Notice and initiate a proper section 231 rulemaking. That rulemaking must be based on the full range of technologically feasible control technologies and other measures for aircraft GHGs, and must result in reductions commensurate with the catastrophic harms of unchecked climate change. [EPA-HQ-OAR-2018-0276-0176-A1, p.36]

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[1] The Commenting States support EPA's adoption of a carbon dioxide metric, reporting requirements, testing procedures, and a standard based on the characteristics of the whole airplane as important components of an effective emission standard for GHGs from aircraft. See 85 Fed. Reg. at 51,562, 51,575-78. However, as set forth below, emission reductions that far exceed the Proposed Rule in both stringency and kind are technologically feasible and necessary to meaningfully control GHG emissions.

[2] Finding That Greenhouse Gas Emissions From Aircraft Cause or Contribute to Air Pollution That May Reasonably Be Anticipated To Endanger Public Health and Welfare, 81 Fed. Reg. 54,422, 54,440 (Aug. 15, 2016) (Endangerment Finding).

[39] IPCC 2018 Summary at 17-18.

[40] See e.g., Paris Agreement to the United Nations Framework Convention on Climate Change, Dec. 12, 2015, T.I.A.S. No. 16-1104; California Assembly Bill 32 (Nunez, Ch. 488, Stats. Of 2006), California Senate Bill 32 (Pavley, Ch. 249, Stats. of 2016); Mass. Gen. Law ch. 21N, §§ 3(b) & 4(a); Or. Rev. Stat. § 468A.205(1)(c); N.Y. Envtl. Conserv. Law § 75-0107; Vermont Global Warming Solutions Act of 2020, 2020 Vt. Acts & Resolves No. 153.

[41] World Meteorological Organization, United in Science 2020, at 3, 19 (Sept. 9, 2020), https://library.wmo.int/doc_num.php?explnum_id=10361.

[125] The Chicago Convention on International Civil Aviation, 15 U.N.T.S. 295 (Dec. 7, 1944), established the International Civil Aviation Organization (ICAO) to coordinate the regulation and development of international air navigation. Its Committee on Aviation Environmental Protection (CAEP) develops and recommends international standards for noise and emissions from aircraft engines; once ICAO adopts these standards, member states must adopt domestic standards that are at least as strict to maintain their fleets' permission to fly in other states' airspace. See infra Part III.C.

[126] In NACAA, the court considered EPA's codification of 1999 ICAO standards for NOx as part of an ongoing effort to catch domestic NOx standards up to international ones. 489 F.3d at 1225-26. EPA acknowledged ICAO had issued more stringent NOx standards in 2005, during the pendency of the rulemaking, but stated it needed time to assess the 2005 standards, even as the compliance date for the 1999 ICAO standards had passed. Id. At the time of the final rule in 2005, EPA was already studying the 2005 standards and stated they would be a "central consideration" in future rulemaking; and in fact, EPA adopted the 2005 ICAO NOx standards in 2012 along with the even stricter 2008 ICAO NOx standards. Control of Air Pollution from Aircraft and Aircraft Engines; Emission Standards and Test Procedures, 70 Fed. Reg. 69,664, 69,677 (Nov. 17, 2005) (final rule); Control of Air Pollution from Aircraft and Aircraft Engines; Emission Standards and Test Procedures, 77 Fed. Reg. 36,342, 36,343 (Jun. 18, 2012) (final rule). In contrast, here, EPA claims the proposed standards "fully discharg[e] its obligations under the CAA that were triggered by the [endangerment finding]" and indicates no intention to explore standards that actually reduce GHG emissions in the future. 85 Fed. Reg. at 51,565. Furthermore, the 1999 ICAO NOx standards, although not "technology-forcing," still represented a 16 percent reduction from existing standards and carried associated environmental benefits. 70 Fed. Reg. at 69,672, 69,6974. The fact that the court approved EPA's interim action in those specific circumstances cannot be extended into a license to adopt standards with zero environmental benefits in any circumstances.

[127] Motor Vehicle Air Pollution Control Act of 1965, Pub. L. 89-272, § 202(a), 79 Stat. 992 (Oct. 20, 1965); see H.R. 17255, 91st Cong., § 231(a) (Jun. 3, 1970), reprinted in 2 LEG. HIST. OF THE CLEAN AIR ACT AMENDMENTS OF 1970 ("LEG. HIST."), at 935 (1970).

[128] S. Rep. No. 91-1196, at 24, 1 LEG. HIST. at 424; see S. 4358, 91st Cong. § 202(a) (Sept. 17, 1970), 1 LEG. HIST. at 575.

[129] H.R. Rep. No. 91-1783, at 55 (Conf. Rep.), 1 Leg. Hist. at 205; see Pub. L. 91-604, 84 Stat. 1703-1704 (Dec. 31, 1970).

[130] Air Pollution–1970, Hearings on S. 3229, S. 3466, S. 3546 Before the Subcomm. on Air and Water Pollution of the S. Comm. of Public Works, 91st Cong. 140 (1970) (statement of Hon. Robert H. Finch, Secretary of Health, Educ. & Welfare), 2 LEG. HIST. at 980 (emphasis added); accord Air Pollution Control and Solid Wastes Recycling: Hearings Before the Subcomm. on Public Health and Welfare of the H. Comm. on Interstate and Foreign Commerce, 91st Cong. 290 (1969) (statement of Secretary Finch), 2 LEG. HIST. at 1371.

[131] Control of Air Pollution from Aircraft and Aircraft Engines: Proposed Standards, 37 Fed. Reg. 26,488 (Dec. 12, 1972); Control of Air Pollution from Aircraft and Aircraft Engines: Emission Standards and Test Procedures for Aircraft, 38 Fed. Reg. 19,088, 19,089 (July 17, 1973) (final rule); Control of Air Pollution from Aircraft and Aircraft Engines: Supersonic Aircraft, 41 Fed. Reg. 34,722 (Aug. 16, 1976) (final rule); Control of Air Pollution from Aircraft and Aircraft Engines: Proposed Amendments to Standards, 43 Fed. Reg. 12,615, 12,617 (Mar. 24, 1978); see also Control of Air Pollution from Aircraft and Aircraft Engines: Emission Standards and Test Procedures, 62 Fed. Reg. 25,356, 25,357 (May 8, 1997) (direct final rule). For ease of reference, this comment will use "ANPR" and "NPRM" to refer to, respectively, advanced notices of proposed rulemaking and notices of proposed rulemaking.

[132] As Senator Muskie, who sponsored the 1970 Clean Air Act amendments, stated, "Air quality determinations should be made by agencies charged with air quality responsibilities. Clearly, the agency with the responsibility for promoting air commerce [i.e., the FAA] should not be the agency which determines the extent to which aircraft emission controls will be necessary to protect the public health and welfare." Introduction of S. 3229, Air Qual. Improvement Act, 115 CONG. REC. 38,211 (1969) (statement of Sen. Muskie), 2 LEG. HIST. at 1536.

[133] See 85 Fed. Reg. at 51585 ("Technical feasibility" under CAEP means "'any technology expected to be demonstrated to be safe and airworthy … by 2016 or … approximately 2017 … and expected to be available for application in the short term (approximately 2020) over a sufficient range of newly certificated airplanes.' This means that the analysis that informed the international standard considered the emissions performance of in-production and on-order or in-development airplanes, including types that would first enter into service by about 2020.").

[148] See ICAO, Resolution A40-18: Consolidated statement of continuing ICAO policies and practices related to environmental protection - Climate change, ¶6 (Oct. 4, 2019), https://www.icao.int/environmental-protection/Documents/Assembly/Resolution_A40- 18_Climate_Change.pdf; United States Aviation Greenhouse Gas Emissions Reduction Plan, at 4, 9 (June 2015), https://www.icao.int/environmentalprotection/Lists/ActionPlan/Attachments/30/UnitedStates_Action_Plan-2015.pdf.

[149] See Zheng & Rutherford, supra note 137, at 35 (observing that, by deploying cost-effective technologies, "[a]irlines could reduce their fuel spending over the 2025 to 2050 time frame by 19% compared with the baseline case; if passed along to the consumer, these savings could lower ticket prices by up to $20 for short-haul flights and

$105 for long-haul flights"); Kharina et al., supra note 143, at 28 (finding the technologically feasible 40 percent fuel reduction by 2034 would become cost-effective over a seven-year time horizon).
[150] For example, the European Union's Emission Trading System (EU ETS) exempts airlines that emit less than 10,000 tons CO_2 per year and incentivizes emission reduction for covered airlines; a U.S.-made airplane that outperforms others in emission reduction may end up being more competitive for airlines operating in the EU ETS's scope. See Directive 2008/101/EC, Annex I, subsection (c) (Nov. 19, 2008). Similarly, China's inclusion of aviation in its national ETS may make U.S. aircraft with tighter emission controls more attractive internationally. See Swartz, J., "China's National Emissions Trading System: Implications for Carbon Markets and Trade," at 17 (March 2016), https://www.ieta.org/resources/China/Chinas_National_ETS_Implications_for_Carbon_Markets_and_Trade_ICTSD_March2016_Jeff_Swartz.pdf.
[151] See Zheng & Rutherford, supra note 137, at 15 ("A timely adoption of a more stringent standard will be particularly relevant for new narrow body aircraft development, as major manufacturers introduced reengined narrow body models in the late 2010s and are likely looking to create clean-sheet designs in the next round of development.").

Organization: Campbell, Trevor

While I support the proposed rule in question, more is required of the Environmental Protection Agency to fulfill their goals and duties pertaining to climate change. [EPA-HQ-OAR-2018-0276-0173-A1 p. 1]

If the EPA is dedicated to adequately promoting public health and welfare, then the agency must break with tradition and take aggressive action to limit GHG emissions from the U.S. air transportation industry. Adopting the International Civil Aviation Organization's standards clearly do not meet the bar of promoting public health and welfare when U.S. emissions remain high,[3] global emissions continue to rise exponentially,[4] and the EPA admits that its proposed rules do not contribute to meaningful change. I urge the EPA to revisit this rule and develop more stringent ones on GHG emissions from aircrafts. Specifically, I would like for the administration to consider the findings of another United Nations committee, the Intergovernmental Panel on Climate Change and their Fifth Assessment Report, which shows that climate change and its consequences pose severe threats to the public health and welfare of U.S. citizens and peoples all around the world.[5] Developing a rule that further limits GHG emissions in the transportation sector would go a long way in the fight against climate change and establish the United States as a world leader in that arena. [EPA-HQ-OAR-2018-0276-0173-A1 p. 2]

[3] EPA. "Inventory of U.S. Greenhouse Gas Emissions and Sinks." 2020.
[4] EPA. "Global Greenhouse Gas Emissions Data". 2020.
[5] IPCC. "Fifth Assessment Report." 2014.

Organization: Center for Biological Diversity, et al.

[The following comments were submitted as testimony at the virtual public hearing on September 17, 2020.]

Third, the standard should be technology-forcing, not -following.

Organization: Center for Biological Diversity, Earthjustice, on behalf of the Sierra Club and Friends of the Earth, and the Natural Resources Defense Council (NRDC)

Section 231 of the Clean Air Act (CAA) requires EPA to set standards to reduce emissions from aircraft that cause and contribute to air pollution that endangers public health and welfare.[1] Congress's purpose in enacting the CAA was to promote "pollution prevention," which it defined as the "reduction or elimination, through any measure, of the amount of pollutants produced or created at the source."[2] Thus, in promulgating emissions standards, EPA must act to reduce pollution and mitigate the harms these emissions cause. EPA's proposed standards fail to accomplish this obligation. Indeed, the Proposal and supporting documentation are virtually silent on the need to reduce greenhouse gases, any consideration of standards that would accomplish this goal, and the significant costs that failure to reduce greenhouse gas emissions from aircraft are imposing on current and future generations. For these reasons, the Proposal is arbitrary and capricious and violates the Clean Air Act. EPA must quickly replace the Proposal with strong, technology-forcing standards that decarbonize the aviation industry in line with what climate science and equity demand. [EPA-HQ-OAR-2018-0276-0150-A1, pp.1-2]

The proposed regulations would only apply to new aircraft designs[63] and new inproduction[64] aircraft—they would not apply to airplanes that are already in-service[65]—and would set emissions thresholds based on an aircraft's MTOM. The standards applicable to new aircraft designs go into effect in 2020 but no new designs are currently in development, and none are expected for certification for at least ten years.[66] The standards applicable to new in-production aircraft do not go into effect until 2028.[67] CAEP also established "exemption" procedures which allow in-production planes to be modified between 2023 and 2028 without triggering any emission reduction obligations as long as those modifications do not exceed the proposed fuel efficiency metric by more than 1.5 percent.[68]

For both in-production and new type design airplanes, CAEP analyzed ten stringency options[69] and selected a stringency level that all affected in-production and new-type airplanes would meet by the time the standards went into effect.[70] In adopting ICAO's CO_2 emission standards, EPA was clear that its proposed greenhouse gas standards "are meant to be technology following standards" and "reflect[] the performance and technology achieved by existing airplanes (in-production and in-development airplanes)."[71] [EPA-HQ-OAR-2018-0276-0150-A1, p.9]

D. The Chicago Convention is not a barrier to adoption of standards that protect public health and welfare.

EPA's emphasis on "promot[ing] international harmonization"[120] seems to suggest that the U.S.'s treaty obligations are a barrier to setting the standards necessary to curb climate pollution. They are not. The United States has the sovereign power under international law to regulate activities within its jurisdiction that have an adverse effect on its citizens.[121]

Under the Chicago Convention, EPA has jurisdiction over both U.S. registered aircraft and foreign aircraft operating in U.S. airspace.[122] As EPA admits,[123] Article 38 of the Chicago Convention explicitly authorizes the U.S. to depart from international standards and procedures and adopt stricter ones for these aircraft if the U.S. "deems it necessary to adopt regulations or practices differing in any particular respect from those established by an international standard," requiring only notice to ICAO regarding the differences between the state and international standards.

Indeed, the U.S. has opted in the past to adopt standards that are stricter than ICAO's.[124] For example, the U.S. phased out noisy in-service aircraft on a quicker timeframe than ICAO did.[125] In making the decision to embrace a more stringent standard, the United States noted that "aviation noise management is crucial to the continued increase in airport capacity" and "use of quieter aircraft" could alleviate "community noise concerns."[126] Notably, the U.S. chose to expedite the phase-out of noisier aircraft even though the Government Accountability Office estimated at the time that airlines' compliance costs ranged from $2.1 to $4.6 billion in 1990 dollars,[127] and airline industry groups estimated the cost to be much higher.[128]

EPA has also previously agreed that it can set more protective emissions standards under the Chicago Convention. In an aviation nitrogen oxides rulemaking in 2005, the Agency stated:

The Chicago Convention does not require all Contracting States to adopt identical airworthiness standards. Although the Convention urges a high degree of uniformity, it is expected that States will adopt their own airworthiness standards, and it is anticipated that some states may adopt standards that are more stringent than those agreed upon by ICAO.[129]

EPA acknowledged in that rulemaking that "more stringent standards" than ICAO's would "likely be necessary and appropriate in the future,"[130] but argued that incorporation of ICAO standards into U.S. law was an appropriate first step because the agency was already several years behind in the regulatory process and failure to implement the 1999 NOx standards immediately would result in the decertification of U.S. aircraft.[131] In the 2016 Endangerment Findings, EPA announced that it expected to proceed with emission standards "of at least equivalent stringency to the international CO_2 standard," clearly indicating its view that the ICAO standards did not prevent it from adopting a more stringent standards.[132] EPA has not acknowledged, let alone explained, its shift of position between 2016 and 2020.[133]

Given that the proposed ICAO standards will not reduce domestic emissions, EPA has the ability and responsibility to issue standards that will. Substantial emissions reductions are necessary to avoid the worst effects of climate change. Moreover, the U.S. is by far the greatest emitter of aircraft greenhouse gases and therefore has a unique obligation to reduce those emissions through technology-forcing regulations. EPA may not use ICAO's inaction to avoid its duty to reduce greenhouse gas pollution to protect public health and welfare. [EPA-HQ-OAR-2018-0276-0150-A1, pp.17-19]

V. Proper Consideration of the Endangerment Findings, Purpose of the Clean Air Act, and Other Factors Demands the Promulgation of Ambitious, Technology-Forcing Standards.

EPA has both the authority and the obligation to immediately implement strong, technology forcing standards to reduce U.S. aviation emissions to address the climate crisis. To effectively reduce greenhouse gas emissions from the aviation sector, emission standards should: (1) apply to in-service aircraft, which have a lifespan of 25-30 years, not just to new aircraft and new aircraft designs; (2) include the emissions reductions achievable through both airframe design and operational improvements;166 and (3) include a ratchet mechanism to decrease emissions over time and work to decarbonize the industry. Studies suggest that the most effective way of incorporating these three features would be to set a declining fleetwide average standard, which would allow airlines to reduce their emissions through operational changes and design improvements, decreasing demand growth, electrifying aircraft, or some combination of these options.[167] [EPA-HQ-OAR-2018-0276-0150-A1, pp.23-24]

C. Standards should be technology forcing.

Congress intended the Clean Air Act to be a technology-forcing statute, and section 231 in particular gives EPA the ability to establish standards based on "the degree of control required" to address the "contribution of moving sources to deterioration of air quality."[185] In describing EPA's responsibilities with respect to aircraft emissions in 1970, the Senate noted that EPA is "expected to press for the development and application of improved technology rather than be limited by that which exists."[186]

The statute itself provides that standards should take effect "after such period as [EPA] finds necessary . . . to permit the development . . . of the requisite technology."[187] Thus, as EPA explained in its first rulemaking under section 231, "the standards set by EPA may reflect technology which may reasonably be obtained within a given time frame but which is not yet available."[188] EPA in 2005 again confirmed its authority to implement a "technology-forcing standard," and the agency need not "demonstrate that a [necessary] technology is currently available universally or over a broad range of aircraft" to require implementation of its standards, so long as "sufficient lead time" is provided.[189] [EPA-HQ-OAR-2018-0276-0150-A1, pp.26-27]

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[1] 42 U.S.C. § 7571(a).
[2] 42 U.S.C. § 7401.
[63] "New type designs" include "[a]irplane types for which original certification is applied for (to the FAA) on or after the compliance date of a rule, and which have never been manufactured prior to the compliance date of a rule." 85 Fed. Reg. at 51,566.
[64] "In-production" refers to "newly-manufactured or built after the effective date of the regulations—and already certificated to pre-existing rules." 85 Fed. Reg. at 51,566 n.79.
[65] Id. at 51,566.

[66] 85 Fed. Reg. 51,566; see also Technical Support Document at 39 ("The EPA is currently not aware of a specific model of a new type design airplane that is expected to enter service after 2020 (no announcements have been made by airplane manufacturers).")
[67] Id. at 51,567-71.
[68] Id. at 51,571 (noting that certification applications for modified aircraft on or after January 1, 2023 trigger compliance with the proposed rule if "the airplane's GHG emissions metric value for the modified version increases by more than 1.5 percent from the prior version of the airplane") (emphasis added).
[69] Technical Support Document at 121.
[70] Id. at 106 (explaining that "all the airplanes in the [growth and replacement] fleet either meet the stringency or are out of production when the standards take effect according to [EPA's] expected technology responses").
[71] 85 Fed. Reg. at 51,570.
[120] 85 Fed. Reg. at 51,564.
[121] Restatement (Third) of The Foreign Relations Law of the United States § 402 (1987) (stating that "[A] state has jurisdiction to prescribe law with respect to . . . conduct that, wholly or in substantial part, takes place within its territory." International law recognizes links of territoriality and nationality as justifying the exercise of State jurisdiction.); see also Am. Soc'y Int'l L., "Jurisdictional, Preliminary, and Procedural Concerns," in Benchbook on International Law § II.A (Diane Marie Amann ed., 2014), available at https://www.asil.org/sites/default/files/benchbook/ASIL_Benchbook_Complete.pdf; see generally The Case of the S.S. Lotus (Fr. v. Turk.), 1927 P.C.I.J. (ser. A) No. 10, at 18 (1927) (discussion of territorial jurisdiction in international law including a statement that "jurisdiction is certainly territorial").
[122] Chicago Convention chs. 2-3 (establishing the rights and privileges afforded to contracting states in relation to aircraft operating within their borders). Article 17 of the Chicago Convention establishes that "[a]ircraft have the nationality of the State in which they are registered." Therefore, all U.S. registered aircraft have U.S. nationality. The Endangerment Findings explicitly considered the impact of emissions aircraft flying domestically in the United States and aircraft flying internationally that have a departure point in the U.S., on the basis that these are the emissions "assigned" to the United States under the IPCC Guidelines for National Greenhouse Gas Inventories. 81 Fed. Reg. at 54,465, 54,470 n.265. In 2008, EPA also indicated that a declining fleet average GHG emission standard "could cover all domestic operations and international departures of domestic airlines." Regulating Greenhouse Gas Emissions Under the Clean Air Act, 73 Fed. Reg. 44,354, 44,472-73 (July 30, 2008) (emphasis added). Article 11 of the Chicago Convention also establishes that "the laws and regulations of a contracting State relating to . . . the operation and navigation of such aircraft while within its territory, shall be applied to the aircraft of all contracting States without distinction as to nationality, and shall be complied with by such aircraft upon entering or departing from or while within the territory of that State." Foreign-flagged aircraft can be made subject to operational and economic controls to reduce greenhouse gas emissions so long as the controls are imposed in a non-discriminatory manner.
[123] 85 Fed. Reg. at 51,559-60.
[124] See Federal Aviation Administration, Interagency Comments on Proposed NPRM at 1 (May 15, 2020), available at https://downloads.regulations.gov/EPA-HQ-OAR-2018-0276-0038/attachment_1.pdf ("While we strive to make sure our aviation regulations are in line with ICAO standards per Article 37, we sometimes decide not to follow the ICAO standard and instead opt to file a difference per Article 38"); id. at 14 ("Our treaty obligations do allow for us to file a difference if we opt not to follow an ICAO standard, so there is no obligation to follow ICAO standards."); Paul Stephen Dempsey, Compliance & Enforcement in International Law: Achieving Global Uniformity in Aviation Safety, 30 N.C. J. Int'l L. & Com. Reg. 1, 17 n.65 (2004) ("[A]s of 2000, 55 states had notified ICAO of the differences between their domestic laws and Annex 1."); Mark Edward Peterson, The UAV and the Current and Future Regulatory Construct for Integration Into the National Airspace System, 71 J. Air L. & Com. 521, 559 n.197 (2006) ("A review of the filed differences [pursuant to Article 38] reveals that most deal with differences in terminology or involve more stringent practices.").
[125] U.S. General Accounting Office, GAO-01-1053, Aviation and the Environment: Transition to Quieter Aircraft Occurred as Planned, but Concerns about Noise Persist (2001) ("USGAO 2001"), https://www.gao.gov/assets/240/232737.pdf; 49 U.S.C. § 47528(a); International Civil Aviation Organization, GIACC/3-IP/1, Agenda Item 2: Review of aviation emissions related activities within ICAO and internationally Parallels between Noise and CO_2 Environmental Goals (July 1, 2009), at ¶ 2.2 https://www.icao.int/environmentalprotection/ GIACC/Giacc-3/Giacc3_ip01_en.pdf (deadline that is 15 months after deadline set out in the United States' Aircraft Noise and Capacity Act of 1990).
[126] 49 U.S.C. § 47521; see also USGAO 2001 at 9.
[127] USGAO 2001 at 11.

[128] Id. (Air Transport Association of America, Inc. estimated airlines' transition costs at $175 billion).
[129] Emission Standards and Test Procedures, 70 Fed. Reg. at 69,667.
[130] Nat'l Ass'n of Clean Air Agencies v. EPA, 489 F.3d 1221, 1225 (D.C. Cir. 2007) (quoting 70 Fed. Reg. at 69,676- 78).
[131] 489 F.3d at 1224-26 (EPA explained in its Final Rule that it adopted the ICAO standards because it needed more time to "fully analyze[] the emissions benefits . . . and the implementation costs of [wider applicability]").
[132] 81 Fed. Reg. at 54,471; see also Proposed Finding That Greenhouse Gas Emissions From Aircraft Cause or Contribute to Air Pollution That May Reasonably Be Anticipated To Endanger Public Health and Welfare and Advance Notice of Proposed Rulemaking, 80 Fed. Reg. at 37,766 (noting EPA would only adopt the "international aircraft CO_2 standard [if it was] consistent with CAA section 231 and . . . appropriate for domestic needs in the United States").
[133] FCC v. Fox Television Stations, Inc., 556 U.S. 502, 515 (2009) (an agency must provide a reasoned explanation for changing a position and disregarding prior findings).
[166] EPA has explicitly and extensively considered setting aviation emission standards that take into account reductions achievable through both aircraft design modifications and operational improvements. Regulating Greenhouse Gas Emissions Under the Clean Air Act, 73 Fed. Reg. at 44,470-473.
[167] Rutherford, Dan, Standards to promote airline fuel efficiency, International Council on Clean Transportation (2020), https://theicct.org/sites/default/files/publications/Airline-fuel-efficiency-standard-2020.pdf. According to the International Council on Clean Transportation, a declining fleet average standard, requiring airlines to reduce their emissions, could yield 2.5 percent annual fuel efficiency improvements. In this scenario, fuel efficiency improvements occur via three main pathways: (1) replacing older aircraft with newer, more fuel-efficient aircraft; (2) improving operations to carry more passengers and freight per flight and to fly more directly to destinations; and (3) finding optimal flight paths and avoiding congestion near airports using advanced air traffic management. Historically, replacing older aircraft has led to fuel burn reductions of 1.3 percent per year (since the late 1960s), operational improvements have led to reductions of 0.5 percent, and advanced air-traffic management has led to reductions of 0.2 percent, producing total reductions of two percent. These historic trends can be improved upon.
[185] National Air Quality Standards Act of 1970, Report of the Committee on Public Works United States Senate together with Individual Views to Accompany S. 4358 at 24, 91st Cong., 2nd Session, Report No. 91-1196.
[186] Id.
[187] 42 U.S.C. 7571(b) (1990).
[188] Control of Pollution from Aircraft and Aircraft Engines, 38 Fed. Reg. at 19,089.
[189] Control of Air Pollution From Aircraft and Aircraft Engines; Emission Standards and Test Procedures, 70 Fed. Reg. at 69,676 ("forward-looking language" of section 231 does not preclude EPA from setting a technology-forcing standard, and "the Agency is not limited in identifying what is 'technologically feasible' as what is already technologically achieved").

Organization: Center for Biological Diversity, et al.

On behalf of our millions of members and supporters, we write to urge you to withdraw the Environmental Protection Agency's ("EPA") do-nothing proposed rule for greenhouse emissions from commercial aircraft, 85 Fed. Reg. 51,556 ("Proposed Rule"). While a rule to regulate the aviation industry's growing share of greenhouse gas emissions is long overdue, the Proposed Rule will not protect public health and fails to address the unfolding climate emergency. The proposed standards mirror standards adopted by the International Civil Aviation Organization ("ICAO") in 2017 following an industry-controlled process designed to maintain business as usual. In fact, EPA acknowledges that the Proposed Rule does nothing to reduce emissions.

For the following reasons, we call on you to withdraw the proposed rule and quickly replace it with strong, technology-forcing standards that rapidly decarbonize the aviation industry in line with what climate science and equity demand. [EPA-HQ-OAR-2018-0276-0147-A1, p.1]

The undersigned organizations agree that we must immediately and significantly reduce carbon emissions from the aviation sector to prevent devastating warming of our planet and protect the public from harmful air pollution. We therefore urge you to withdraw this Proposed Rule and commit to a rule that will avoid climate catastrophe. [EPA-HQ-OAR-2018-0276-0147-A1, p.3]

[The following comments were submitted as testimony at the virtual public hearing on September 17, 2020.]

Aviation executives have too long evaded every attempt to make the industry reduce its fair share of pollution. Aviation emissions have tried escaping in the wrong direction. Over the last 10 years, emissions grew by 44 percent due to increased travel and only slight improvements in fuel efficiency.

The fact is that aviation pollution can be dramatically reduced. Already there are huge fuel efficiency performance gaps between airlines. Hybrid and all-electric aircraft are gaining momentum. Reports also demonstrate that fuel burn rates can be rapidly reduced. Only by embracing efficiency in an electric future can the U.S. align aviation with a 1.5-degree Celsius pathway, which the science and climate justice demand, but, rather than cut emissions, EPA has opted to adopt a woefully insufficient standard proposed by ICAO.

The ICAO standard does nothing to affect business-as-usual emissions. The standard already lags behind industry advances for new aircraft by about a decade. According to a recent International Council on Clean Transportation report, Irish new commercial jets met the 2028 ICAO standard several years ago, and many new aircraft designs now beat the standard by a substantial margin. It is not an accident that the ICAO standard does nothing. At the ICAO negotiations, nearly every nation was represented by its aircraft industry.

In an internal 2016 email we received through a FOIA request, the top EPA director put it bluntly, “Environmental protection is not a priority” for most at ICAO. Instead, “growing the airline industry and domestic manufacturing industry is the priority.”

Adopting ICAO’s standard goes against the U.S. moral imperative to reduce our outside share of emissions. And it goes against EPA’s mandate to protect public health and the environment.

Rather than finalize the proposed rule, EPA must quickly issue a revised standard that follows several principles. First, the standard should apply to the entire aircraft and should include reductions achievable through changes in operations and management.

Organization: CERES

[The following comments were submitted as testimony at the virtual public hearing on September 27, 2020.]

Instead, emission standards should be consistent with a 1.5 degree pathway. [EPA-HQ-OAR-2018-0276-0075-A1, p.1]

Aviation emissions are projected to triple by 2050, and, while we acknowledge the difficulties airlines face at this time, we need to adopt standards that, in concert with supplemental policies, will ensure the downward trajectory of aviation emissions in a manner consistent with Paris goals. [EPA-HQ-OAR-2018-0276-0075-A1, p.1]

Strong regulations are necessary to drive investment in fuel efficiency technologies that will both enhance the global competitiveness of the U.S. aviation sector and ensure emissions reductions. The proposed rule would not spur those necessary investments: ICCT’s analysis shows that a 2016 airplane would actually meet the proposed 2028 standard. [EPA-HQ-OAR-2018-0276-0075-A1, p.1]

Organization: Ceres BICEP (Business for Innovative Climate and Energy Policy) Network

I am writing on behalf of the Ceres BICEP (Business for Innovative Climate and Energy Policy) Network – a coalition of more than 58 major employers across the United States, to express our opposition to the Environmental Protection Agency’s (EPA) proposed aircraft greenhouse gas (GHG) rule. Our companies, along with a growing number of leading businesses and institutions, have prioritized reducing our carbon footprints.[1] Given that aviation emissions, both from freight and employee travel, need to be significantly reduced to meet climate goals, the proposed rule, which will actually result in increased emissions, will undermine the efforts of businesses to meet their climate goals. [EPA-HQ-OAR-2018-0276-0165-A1, p.1]

Unfortunately, the proposed rule will undermine the ability of the U.S. aviation industry, and our companies, to meet climate goals. Accordingly, we oppose the proposed rule. [EPA-HQ-OAR-2018-0276-0165-A1, p.2]

Of course, the industry is facing significant challenges during the current pandemic. Nevertheless, as a significant and growing source of emissions, the aviation sector needs to take concrete steps to reduce emissions, and strong regulation is necessary to drive necessary innovation and advanced technologies. Aviation emissions are growing quickly; they are about 70% higher than in 2005,[2] and, according to the International Civil Aviation Organization (ICAO), could grow by over 300% more.

Further, aviation emissions per capita in the U.S. are about eight times the global average (and three times the European average),[3] and the majority of major U.S. airlines recently failed to meet their common goal for fuel efficiency improvements in the last decade.[4] Thus, it is necessary that EPA adopt GHG emission standards that, in concert with supplemental policies, will ensure domestic emission reductions consistent with net zero emissions by 2050. [EPA-HQ-OAR-2018-0276-0165-A1, pp.1-2]

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[1] 1,354 companies, representing $24.8 trillion market cap, have committed to climate action; In addition, nearly half of all Fortune 500 companies have set goals to reduce GHG emissions, procure renewable energy, and invest in energy efficiency, see: Ceres. "Power Forward 3.0: How the largest U.S. companies are capturing business value while addressing climate change" April 15, 2017. https://www.ceres.org/resources/reports/power-forward-3. Further, over 300 companies have signed the Business Ambition for 1.5 degree target.

[2] https://ec.europa.eu/clima/policies/transport/aviation_en

[3] https://theicct.org/blog/staff/whats-the-plan-sam-aviation-emissions

[4] https://theicct.org/blog/staff/us-air-carriers-miss-first-climate-goal-sept2020

Organization: Chesapeake Bay Foundation, Inc. (CBF)

The aircraft sector is the largest source of greenhouse gas (GHG) emissions in the United States transportation sector yet to be regulated, and it is growing faster than predicted.[1] EPA has the opportunity in these aircraft GHG standards to set emissions limits that are backed by science and evidenced to mitigate the aviation sector's impact on climate change. However, the Proposed Rule misses the mark and instead permits aircraft manufacturers to cruise forward on autopilot without imposing any meaningful limitations. The Proposed Rule threatens to thwart CBF's mission to save the Chesapeake Bay and to harm CBF members and others who depend on a healthy Bay ecosystem. In addition to proposing meaningless standards, the Proposed Rule also fails to address possible nitrous oxides (NOx) impacts and provide a thorough environmental justice inquiry. [EPA-HQ-OAR-2018-0276-0093-A1, pp.1-2]

II. The Proposed Rule Represents a Missed Opportunity to Strengthen ICAO's Insufficient Standards.

In 2016, ICAO, the United Nations body dedicated to international civil aviation, proposed its first-ever CO_2 standards for international aircraft.[38] These standards were finalized in early 2017.[39] Several environmental groups have pointed out that ICAO's standards follow a business-as-usual trajectory and, therefore, do not have any meaningful impact on future aviation CO_2 emissions or force any further fuel-efficiency technology.[40] As a member of ICAO, the United States must issue domestic regulations to implement standards at least as stringent as ICAO's CO_2 standards. Member states are permitted to impose stricter standards with notice to ICAO, and several environmental groups and states have encouraged EPA to do so.[41] [EPA-HQ-OAR-2018-0276-0093-A1, pp.5-6]

EPA took the first step towards domestic regulation of not only CO_2 emissions, but a mixture of six GHGs (of which only CO_2 and nitrous oxide (N_2O) are emitted from aircraft engines), when it made a finding in August 2016 that these GHGs from aircraft cause and contribute to air pollution that is anticipated to endanger public health and welfare (Endangerment Finding).[42] However, when the Agency had yet to issue corresponding GHG standards in January 2020, three environmental groups filed a notice of intent to sue EPA over its delay.[43] On August 20, 2020, EPA issued the Proposed Rule that promotes adopting standards essentially identical to those ICAO adopted. As explained in more detail below, CBF takes issue with several aspects of the Proposed Rule. [EPA-HQ-OAR-2018-0276-0093-A1, p.6]

III. CBF Opposes the Proposed Airplane GHG Emissions Standards and Test Procedures Rule Because This Rule Is Legally Inadequate and Does Nothing but Formalize a Business-as-usual Scenario.

A. The Proposed GHG Emission Standards Do Nothing to Curb Rising Aircraft GHG Emissions.

First, the GHG standards, as proposed, do nothing but formalize expected business-as-usual fuel-efficiency technology developments. Aircraft manufacturers may even be on track to produce more fuel-efficient aircraft than the standards require by 2028.[44] [EPA-HQ-OAR-2018-0276-0093-A1, p.6]

EPA's GHG standards can and must go further than ICAO's CO_2 standards. While technology improvements are increasing fuel efficiency, the growing demand for air travel is outpacing these fuel efficiency improvements.[47] Therefore, to effectively mitigate climate change impacts from aircraft GHGs, EPA must create stringent, technology-forcing standards. These standards should be revisited and strengthened at frequent, clearly defined intervals to promote continuous technological improvements. EPA should also add a deadline for in-service aircraft to comply with the GHG standards or be phased out. Although aircraft manufacturers are expected to meet the proposed standards when producing aircraft, some airlines have older fleets that would not meet the GHG standards if required to by 2028.[48] The average age of aircraft operating in the United States is between 11 and 13 years old, so applying the GHG standards to in-service aircraft will be essential to realizing aircraft GHG reductions.[49] [EPA-HQ-OAR-2018-0276-0093-A1, p.7]

IV. Conclusion

CBF urges EPA to withdraw this proposed rule and propose technology-forcing airplane GHG emission standards that are grounded in science and the law, and that impose increasingly stringent emissions limits on airplanes to mitigate climate change impacts. In proposing new standards, EPA must also be transparent about NOx impacts and meaningfully analyze the possibility of disproportionate impacts to low-income and minority communities. [EPA-HQ-OAR-2018-0276-0093-A1 p.9]

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[1] Finding that Greenhouse Gas Emissions from Aircraft Cause or Contribute to Air Pollution that May Reasonably Be Anticipated to Endanger Public Health and Welfare, 81 FR 54,422, 54,464 (Aug. 15, 2016) [hereinafter Endangerment Finding]; Hiroko Tabuchi, 'Worse Than Anyone Expected: Air Travel Emissions Vastly Outpace Predictions, N.Y. Times (Sept. 19, 2019).

[38] New ICAO Aircraft CO_2 Standard One Step Closer to Final Adoption, ICAO (Feb. 8, 2016), https://www.icao.int/Newsroom/Pages/New-ICAO-Aircraft-CO2-Standard-One-Step-Closer-To-Final-Adoption.aspx.

[39] ICAO Council Adopts New CO_2 Emissions Standard for Aircraft, ICAO (Mar. 6, 2017), https://www.icao.int/newsroom/pages/icao-council-adopts-new-co2-emissions-standard-for-aircraft.aspx.

[40] See, e.g., Anna Guth, Airplanes to Fly Fancy-Free Under Weak Global Carbon Rule, Earthjustice (Mar. 4, 2016), https://earthjustice.org/blog/2016-march/airplanes-to-fly-fancy-free-under-weak-global-carbon-rule.

[41] Control of Air Pollution from Airplanes and Airplane Engines: GHG Emission Standards and Test Procedures, 85 FR 51,556, 51,563 (Aug. 20, 2020) [hereinafter Proposed Rule]; Jeff Tollefson, U.N. Agency Proposes Greenhouse Gas Standard for Aircraft, Scientific American: Nature (Feb. 9, 2016), https://www.scientificamerican.com/article/u-n-agency-proposes-greenhouse-gas-standard-for-aircraft/.

[42] Endangerment Finding, 81 FR at 54,422. This finding also came after environmental groups petitioned EPA to make such a finding and a subsequent court case challenging the delay in responding to the petition. Id. at 54,427. See also Center for Biological Diversity v. EPA, 794 F. Supp.2d 151 (D.D.C. 2011).
[43] Earthjustice, Center for Biological Diversity, and Friends of the Earth to EPA, Notice of Intent to File Suit Under Section 304 of the Clean Air Act with Respect to Proposed Rulemaking to Reduce Greenhouse Gas Emissions from Aircraft (Jan 30, 2020), https://www.biologicaldiversity.org/campaigns/fuel_economy_standards/pdfs/20-01-23-Unreasonable-Delay-Notice-Letter.pdf
[44] Brandon Graver & Dan Rutherford, U.S. Passenger Jets Under ICAO's CO_2 Standard, 2018-2038, International Council on Clean Transportation 3-4 (Oct. 2, 2018), https://theicct.org/sites/default/files/publications/Aircraft_CO2_Standard_US_20181002.pdf.
[47] Graver & Rutherford, supra note 44, at 4.

Organization: Environmental Defense Fund

Our nation is in a climate crisis. To avoid catastrophic climate impacts, it is imperative that heat-trapping emissions go down. But as EPA's own analysis in the Notice of Proposed Rulemaking indicates, the proposed standard will not drive emissions down. It simply embodies what the industry has already baked in.[2] It is thus patently capricious and not in accordance with law - the Clean Air Act - for EPA, having found that greenhouse gas (GHG) emissions from aviation cause or contribute to air pollution that may be reasonably expected to endanger public health and welfare,[3] to propose a standard that achieves, in EPA's own words, "no benefit (no emission reduction)."[4] [EPA-HQ-OAR-2018-0276-0158-A1, p.1]

In making its decision on level of stringency, EPA must weigh the health and environmental benefits, including the benefits of avoided climate damages as well as the co-benefits of improved local air quality; in fact, it would be arbitrary for EPA to fail to do so.[5] [EPA-HQ-OAR-2018-0276-0158-A1, p.2]

It has been twenty-three years since nations of the world first directed the aviation industry to address its climate pollution. To date, ICAO has adopted only two global measures: The Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA), which the industry succeeded in getting postponed for three years due to the COVID-19 crisis, and ICAO's CO_2 standard, which won't cut emissions below business-as-usual. EPA has the statutory authority and the statutory duty to adopt a much more stringent emissions standard. It is time for the industry's effective quarter-century of evading effective climate action requirements to end. Status quo operation of the aviation industry is incompatible with global efforts to avoid the worst impacts of climate change. [EPA-HQ-OAR-2018-0276-0158-A1, p.2]

The Environmental Defense Fund submits these comments based on decades of expertise in the science, economics and law of aviation and climate change. EDF staff served as lead and contributing authors of the 1999 Intergovernmental Panel on Climate Change (IPCC) Special Report on Aviation and the Global Atmosphere.[6] EDF experts serve as nominated observers on Expert Working Groups in the Committee on Aviation Environmental Protection (CAEP) of the International Civil Aviation Organization (ICAO).[7] EDF staff have published extensively on aviation emissions, analyzing their contributions to global warming as well as advocating market-based solutions to stabilize such emissions,[8] and have participated as observers in meetings of the U.S.-EU Joint Committee under the U.S.-EU bilateral open skies agreement. EDF is an active participant in efforts in the United Nations Framework Convention on Climate Change (UNFCCC) and ICAO to reduce aviation pollution, and EDF staff have testified before the Committee on Commerce, Science, and Transportation of the United State Senate on matters related to aviation emissions. [EPA-HQ-OAR-2018-0276-0158-A1, p.2-3]

EPA must act swiftly to control GHG pollution from airplane engines by setting emission standards and test procedures as required by section 231 of the Clean Air Act (CAA). We urge EPA to adopt a much more stringent standard to achieve real benefits and actually address the danger posed to public health and welfare by air pollution from aircraft engine emissions, including both CO_2 and non- CO_2 emissions that contribute to anthropogenic climate forcing.[9] We also request that the sources cited herein form part of EPA's Record of Decision. [EPA-HQ-OAR-2018-0276-0158-A1, p.3]

I. EPA is authorized to promulgate standards more stringent than ICAO standards.

EPA is specifically authorized, and in fact required, to promulgate standards for aircraft engine emissions. Section 231 of the Clean Air Act (CAA) grants EPA the authority to "issue proposed emission standards applicable to the emission of any air pollutant from any class or classes of aircraft engines," which are determined by EPA to cause or contribute to "air pollution which may reasonably be anticipated to endanger public health or welfare."[10] [EPA-HQ-OAR-2018-0276-0158-A1, p.3] Pursuant to EPA's 2016 "Finding That Greenhouse Gas Emissions From Aircraft Cause or Contribute to Air Pollution That May Reasonably Be Anticipated To Endanger Public Health and Welfare" (2016 Findings), EPA is bound to issue standards under section 231. In the 2016 Findings, EPA found that aircraft engine emissions of six well-mixed GHGs contribute to air pollution as defined under CAA section 231 and "endanger the public health and welfare."[11] Consequently, EPA is now required by law to propose standards applicable to the emissions referenced in the 2016 Findings. [EPA-HQ-OAR-2018-0276-0158-A1, p.3]

Additionally, as an ICAO Member State, the United States has committed to "adopt and put into operation the appropriate standard systems . . . which may be recommended or established [by ICAO] from time to time."[12] The United States is only able to fulfill its commitment if the administrator of EPA works with the Secretary of Transportation to issue emission standards and "prescribe regulations to insure compliance with all standards."[13] [EPA-HQ-OAR-2018-0276-0158-A1, p.3]

Moreover, the Chicago Convention on International Civil Aviation, to which the United States is a Party, specifically recognizes that Member States may adopt standards more stringent than those negotiated in ICAO. Article 33 of the Chicago Convention provides that ICAO Member States shall recognize certificates of airworthiness,[14] which, pursuant to several federal regulations, specifically include certification that the aircraft has met applicable exhaust emissions standards.[15] The Chicago Convention states, in Article 33, that Member States shall recognize airworthiness certificates of other Member States "provided that the requirements under which such certificates or licenses were issued or rendered valid are equal to or above the minimum standards which may be established from time to time."[16] Thus, the Convention expressly affirms that its Member States may adopt requirements more stringent than the minimum standards of ICAO. EPA is empowered and required by CAA to promulgate emission standards applicable to any air pollutant, emitted from aircraft engines, which contribute to "air pollution which may reasonably be anticipated to endanger public health or welfare."[17] While ICAO standards thus serve as a floor below which EPA cannot go, and the Chicago Convention authorizes its Member States to apply more stringent standards, EPA remains empowered to promulgate standards stricter than those adopted by ICAO. [EPA-HQ-OAR-2018-0276-0158-A1, p.4]

II. EPA is required to promulgate standards effective to reduce pollutant emissions.

As mentioned above, section 231 of CAA expressly states,

The Administrator [of EPA] shall, from time to time, issue proposed emission standards applicable to the emission of any air pollutant from any class or classes of aircraft engines which in his judgment causes, or contributes to, air pollution which may reasonably be anticipated to endanger public health or welfare.[18] [EPA-HQ-OAR-2018-0276-0158-A1, p.4]

a. EPA is required to promulgate standards more stringent than the current proposed standards.

In its 2016 findings, EPA determined that six well-mixed GHGs—carbon dioxide (CO_2), methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride—all emitted from aircraft engines, contribute to air pollution causing climate change, and thus endanger public health and welfare.[19] As such, EPA is required to promulgate standards that address and encourage the reduction of emissions of these six well-mixed GHGs, in order to effectuate the reduction or elimination of these pollutants. However, EPA's proposed standards simply are not stringent enough to make any meaningful impact. The standards EPA are proposing "lag[] existing aircraft technologies by more than 10 years," and are therefore "too weak" to encourage reduction of total pollutant emissions.[20] Though EPA would set a deadline of 2028 for compliance with the proposed standards, many new aircraft already satisfied or exceeded the standards initially adopted by ICAO in 2016, standards which EPA seeks to emulate.21 [EPA-HQ-OAR-2018-0276-0158-A1, p.4-5]

This is not to mention that EPA developed the current proposed standards based upon outdated and incomplete information. EPA's bases for promulgating the proposed standards were the conclusions drawn from the 2016 Findings.[24] However, by the time EPA began the process of developing the standards, new studies were well underway suggesting that the ICAO standards targeting carbon dioxide emissions were insufficient to address the environmental problems posed by aircraft engine emissions. In particular, the definitive study published last month by the "A Team" of aviation-atmosphere researchers, including experts from the U.S. National Oceanic and Atmospheric Administration (NOAA) Chemical Sciences Laboratory, the U.S. National Center for Atmospheric Research (NCAR), and the Universities of Michigan and Colorado, found that noncarbon dioxide (non-CO_2) emissions, including water vapor, NO_X, and aerosol particles together contribute to roughly two-thirds of the environmental impact of aviation, while carbon dioxide emissions contribute to the remaining third.[25] These non-CO_2 emissions were omitted from the 2016 Findings26 due in part to the fact that the "effective radiative forcing" (ERF) metric utilized by the new study not fully available when the 2016 Findings were being assembled.[EPA-HQ-OAR-2018-0276-0158-A1, p.5-6]

Moreover, while the Covid-19 pandemic has caused significant disruptions to the air traffic industry, current projections suggest that air traffic could return to pre-pandemic levels within the next four years.[22] In fact, even under the least optimistic projections, total air traffic is expected to increase beyond pre-pandemic levels by the end of the decade.[23] As air traffic returns to, and eventually exceeds pre-pandemic levels, stringent standards will be necessary to effectively address aircraft engine emissions. This is because total emissions will rise as air traffic increases. Thus, total emissions may easily rise in aggregate in the absence of standards sufficiently stringent to offset the increase in total number of flights. Consequently, to effectively address emissions of air pollutants from aircraft engines so as to achieve "the reduction or elimination . . . of pollutants produced or created at the source," EPA must promulgate stricter standards than the already outdated current proposed standards. [EPA-HQ-OAR-2018-0276-0158-A1, p.5]

With more complete and accurate information now available, EPA should work to tailor its standards to address newly recognized areas of environmental concern. [EPA-HQ-OAR-2018-0276-0158-A1, p.6]

Moreover, it is essential to set stringent standards to drive new technologies to reduce total emissions and warming pollution, which the current proposed standards are too weak to do. [EPA-HQ-OAR-2018-0276-0158-A1, p.6]

VII. Conclusion

EPA is not only empowered, but also required under the law to promulgate standards to address the polluting effects of aircraft engine emissions. EPA must ensure that its standards are based on accurate information; are sufficiently stringent to avert aviation's contribution to dangerous climate change, taking into account the high costs of inaction; incentivize necessary technological innovation; and catalyze emissions reductions demanded by science and the interests of equity. EPA must act swiftly to control GHG pollution from airplane engines by setting emission standards and test procedures as required by section 231 of the Clean Air Act (CAA). However, we urge EPA to consider the risks to the aviation sector and to the American people posed by climate change, and to work with FAA to strengthen the proposed rule so as to effectively address the danger posed to public health and welfare by air pollution from aircraft engine emissions. Particularly in this time of crisis, the United States aviation industry and the country as a whole need stringent standards that will actually address the climate crisis. Meeting this challenge, and utilizing the flexibility designed into the Clean Air Act, will enable EPA to meet its statutory requirements and spur the creation of many good jobs in the process. [EPA-HQ-OAR-2018-0276-0158-A1, p.14]

[The following comments were submitted as testimony at the virtual public hearing on September 17, 2020.]

EDF urges EPA to strengthen proposed rule to more effectively address the danger posed to public health and welfare by air pollution from aircraft engine emissions, including both CO_2 and non-CO_2 emissions proposed rule to more effectively address the danger posed to public health and welfare by air pollution from aircraft engine emissions, including both CO_2 and non-CO_2 emissions.

Moreover, member states are required to recognize certificates of airworthiness issued by other member states provided that the requirements under which such certificates or licenses were issued or rendered valid are equal to or above the minimum ICAO standards. This language allows member states to adopt standards more stringent than ICAO's emissions standards. EPA is empowered and required by the Clean Air Act to promulgate emissions standards, which ICAO's standards may be able to serve as a guide. But EPA remains in power to promulgate standards stricter than those adopted by ICAO.

As EPA proceeds with its rulemaking, it is essential to consider new scientific developments and discoveries and to set stringent standards to effectively address air pollution, which may reasonably be anticipated to endanger public health or welfare. EPA developed the current proposed standards based, in part, on outdated and incomplete information. EPA's bases for promulgating the proposed standards were the conclusions drawn from the 2016 findings and the current ICAO minimum standards. However, by the time EPA began the process of developing the standards, new studies were well underway, suggesting that the ICAO standards, mainly targeting CO_2 emissions, were insufficient to address the environmental problems posed by aircraft engine emissions. In particular, a recent study, led by researchers at Manchester Metropolitan University, found that non-CO_2 emissions, including water vapor, NOx, and aerosol particles, together contribute to roughly two-thirds of the environmental impact of aviation while CO_2 emissions contribute to the remaining third. These non-CO_2 emissions were omitted from the 2016 findings, due, in part, to the fact that the metric utilized by the Manchester study was not fully available when the 2016 findings were being assembled. With more complete and accurate information now available, EPA should work to tailor its standards to address newly recognized areas of environmental concern.

Moreover, much more is known now about the urgency of cutting greenhouse gas emissions in order to avert dangerous interference with the climate system, an objective that the United States as a party to the 1992 U.N. framework convention on climate change following the unanimous consent of the U.S. Senate has bound itself to observe. New engine and aircraft designs demonstrate significant emission reduction potential, underscoring that a much more stringent standard than the one EPA is proposing apply to existing as well as new-type and in-production aircraft, is not only necessary but also feasible. Establishing a more stringent standard would incentivize technological innovation, support existing jobs, and create new jobs in the aviation sector. Reducing greenhouse gas emissions from aviation can also help reduce conventional air pollution, providing health benefits for communities close to airports.

In conclusion, EPA is not only empowered but required under the law to promulgate standards to address the polluting effects of aircraft engine emissions. However, EPA should ensure that any standards it does promulgate are based on accurate information and are sufficiently stringent to address the reality on environmental concerns. We agree that EPA must act swiftly to control greenhouse gas air pollution from airplane engines by setting emissions standards and test procedures. However, we urge EPA to consider the risks to the aviation sector and to the American people posed by climate change and to strengthen the proposed rule to more effectively address the danger posed to public health and welfare by air pollution from all aircraft engine emissions.

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[2] Should the proposed standards be finalized, "all U.S. airplane models (in-production and in-development airplane models) should be in compliance with the proposed standards, by the time the standards would become applicable. Therefore, there would only be limited costs from the proposed annual reporting requirement and no additional benefits from complying with these proposed standards ..." Id. at 51588 (emphasis added).

[3]"Finding That Greenhouse Gas Emissions From Aircraft Cause or Contribute to Air Pollution That May Reasonably Be Anticipated To Endanger Public Health and Welfare" (EPA 2016), text available at https://www.federalregister.gov/documents/2016/08/15/2016-18399/finding-that-greenhouse-gas-emissions-from-aircraft-cause-or-contribute-to-air-pollution-that-may (accessed October 16, 2020).

[4] Draft Airplane Greenhouse Gas Standards Technical Support Document (TSD) (EPA-420-D-20-004, July 2020), at pages 105-106 (emphasis added). Text available at https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100ZN37.pdf (accessed October 16, 2020).

[5] EDF joins separately-submitted comments of the Institute for Policy Integrity detailing how EPA in preparing the instant proposal, has arbitrarily relied on problematic estimates of the social costs of carbon and nitrous oxide that fail to take account of the benefits that more stringent standards would provide.

[6] Aviation and the Global Atmosphere, J.E.Penner, D.H.Lister, D.J.Griggs, D.J.Dokken, M.McFarland (Eds.), Cambridge University Press 1999).

[7] EDF is a founding member of the International Coalition for Sustainable Aviation, which has observer status. EDF is also a founding member of the Clean Shipping Coalition, an organization established to reduce the global environmental effects of maritime transportation.

[8] See, e.g., Allen Pei-Jan Tsai & Annie Petsonk, Tracking the Skies: An Airline-based System for Limiting Greenhouse Gas Emissions from International Civil Aviation, 6 ENVTL. LAW 763 (2000); Anu Vedantham & Michael Oppenheimer, Long-term Scenarios for Aviation: Demand and Emissions of CO_2 and NOx, 26 ENERGY POL'Y 625 (1998); Catherine C. Ivanovich, Ilissa B. Ocko, Pedro Piris-Cabezas & Annie Petsonk, Climate Benefits of Proposed Carbon Dioxide Mitigation Strategies for International Shipping and Aviation, 19 Atmos. Chem. & Phys. 14949 (2019).

[9] D.S. Lee et al., The Contribution of Global Aviation to Anthropogenic Climate Forcing for 2000 to 2018, Atmospheric Environment (2020), https://www.sciencedirect.com/science/article/pii/S1352231020305689?via%3Dihub. This paper is attached in the Appendix to these comments.

[10] 42 U.S.C. § 7571(a)(2)(A).

[11] 81 Fed. Reg. 54422.

[12] ICAO, 2006: Convention on International Civil Aviation, 9th ed., Doc. 7300/9, Art. 28. Available at: https://www.icao.int/publications/Documents/7300_cons.pdf (last accessed Sept. 9, 2020).

[13] 42 U.S.C. §§ 7571(a)(2)(B)(i), 7572(a).

[14] Certificates of airworthiness are required for all aircraft flying between the United States and other countries. See Chicago Convention at Article 31: "Certificates of airworthiness. Every aircraft engaged in international navigation shall be provided with a certificate of airworthiness issued or rendered valid by the State in which it is registered." ICAO, 2006: Convention on International Civil Aviation, 9th ed., Doc. 7300/9, Art. 33. Available at: https://www.icao.int/publications/Documents/7300_cons.pdf (last accessed Sept. 9, 2020).

[15] See 14 CFR §§ 21.183(g), 34.21(d), 34.23(a), 34.3(o).

[16] ICAO, 2006: Convention on International Civil Aviation, 9th ed., Doc. 7300/9, Art. 33 (emphasis added). Available at: https://www.icao.int/publications/Documents/7300_cons.pdf (last accessed Sept. 9, 2020).

[17] 42 U.S.C. § 7571(a)(2)(A).

[18] Id.

[19] 81 Fed. Reg. 54422.

[20] Marisa Garcia, New EPA Aircraft Emission Standard 'Too Weak' To Encourage New Aircraft And Engine Technologies, ICCT Finds, Forbes, July 22, 2020, available at:

https://www.forbes.com/sites/marisagarcia/2020/07/22/new-epa-aircraft-emission-standard-too-weak-to-encourage-new-aircraft-and-engine-technologies-icct-finds/#10b357646867, (last visited Sept. 11, 2020).
[21] Id.
[22] Int'l Air Transp. Ass'n, Traffic recovery slower than expected, Airlines, July 29, 2020, available at: https://airlines.iata.org/analysis/traffic-recovery-slower-than-expected (last visited Sept. 23, 2020); Manfred Hader, Robert Thomson, & Holger Lipowsky, How The Covid-19 Crisis Is Expected to Impact The Aerospace Industry, Roland Berger, June 10, 2020, available at: https://www.rolandberger.com/en/Point-of-View/How-the-COVID-19-crisis-is-expected-to-impact-the-aerospace-industry.html (last visited Sept. 23, 2020).
[23] Hader, Thomson, & Lipowsky, supra.

Organization: Environmental Protection Network (EPN)

This rulemaking presents a significant opportunity to reduce GHG emissions and for EPA to set standards that reflect reasonable expectations about future increases in efficiency from the industry, commensurate with the seriousness of the agency's findings in 2016. EPA's proposed rule does not meet its statutory responsibility, however. It sets a lowest common denominator standard that matches the international standard set by the ICAO in 2016. EPA itself acknowledges that the airline industry is already meeting this standard. Indeed, the proposal explicitly states "the EPA is not projecting emissions reductions associated with the proposed GHG regulations." [4]

The proposal is unequivocal that all it is doing is enshrining the ICAO standards in its regulations. Members of the Environmental Protection Network who worked on aviation issues at EPA know that the ICAO's historic approach to setting environmental standards is generally to grandfather in what industry is already doing, and to look to the lowest performing aircraft in setting standards. These are international standards, so every country that produces aircraft that fly internationally is bound by them and participates in the negotiations that lead to the final standards. This essentially writes out of the equation EPA's statutory responsibility under the Clean Air Act to promulgate rules that respond to its endangerment finding with reasonable standards that reflect the efficiency opportunities that are expected in the future, let alone setting standards that encourage ambition commensurate with the health, economic, and environmental threats that climate change poses to the US public.

EPN urges EPA to repropose this rule, with standards that reflect meaningful reductions from aircraft in line with its statutory responsibility to protect public health and its own factual findings about the severity of the impacts and the opportunities for greater efficiency. American manufacturers would not be at a competitive disadvantage. Indeed, the American aircraft industry is well-positioned to benefit from more ambitious standards: its manufacturers continue to innovate on fuel efficiency and could expand deliveries of new aircraft under policies that promote fleet turnover. [EPA-HQ-OAR-2018-0276-0155-A1, pp.1-2]

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[4] https://www.icao.int/environmental-protection/Documents/EnvironmentalReports/2019/ENVReport2019_pg17-23.pdf , at 51558.

Organization: Federal Express Corporation

As evident by the above, FedEx Express, as well as the U.S. aviation industry as a whole, have demonstrated global leadership in setting and achieving environmental sustainability objectives and will continue to do so. This rulemaking effort is just one element of a comprehensive suite of initiatives that are well underway to achieving our shared global objective of reducing the industry's carbon footprint. In developing the final rule, we encourage the EPA to bear this in mind when evaluating the effectiveness of the proposed standard and adopt the ICAO standard (with the modifications noted below), to ensure continued international recognition of U.S. manufactured and certificated aircraft. [EPA-HQ-OAR-2018-0276-0178-A1, p.2]

Organization: General Electric Company (GE)

D. More stringent GHG standards are not appropriate and would potentially violate the CAA

The CAA does not require EPA to "technology force" at the risk of flight safety. Section 231(a)(2)(B) of the CAA requires EPA to refrain from changing aircraft emission standards if such a change would adversely affect safety. To maintain the trust and confidence of the flying public, it is imperative that EPA not adopt standards that could in any way be perceived as sacrificing aviation safety. The perception of the flying public matters, and EPA should endeavor to avoid any erosion of public confidence in the safety of aviation. This objective is best achieved by EPA remaining aligned with the ICAO analytical criteria of technical feasibility, environmental benefit, cost effectiveness, and impacts of interdependencies, which have helped ensure the continuation of aviation's impressive safety record. [EPA-HQ-OAR-2018-0276-0157-A1, p.8]

Organization: Hahnel, Tanya

[The following comments were submitted as testimony at the virtual public hearing on September 17, 2020.]

And it is very clear to me that the EPA is lagging behind what we as citizens expect from a regulatory body that is supposed to be looking out for our interests.

As the EPA, you are really accountable to us as the citizens. And so I just want to echo that as a parent, a resident, a taxpayer, I expect that the EPA is going to change its standards and take into account, you know, testimony by Mr. Rutherford about the 10 ways that you could be strengthening this new rule.

Organization: International Council on Clean Transportation (ICCT)

We commend EPA for proposing the first U.S. domestic aircraft greenhouse gas (GHG) standard. As U.S. aviation emissions continue to grow rapidly and make up almost a quarter of global commercial passenger emissions, policy incentives for more fuel-efficient aircraft are urgently needed.[1] [EPA-HQ-OAR-2018-0276-0168-A1][EPA-HQ-OAR-2018-0276-0168-A1, p.1]

EPA should not propose ineffective standards.

In its endangerment finding, EPA concluded that GHG emissions from the classes of aircraft engines covered under this rule endanger human health and welfare. Nonetheless, the agency here proposes a domestic standard that, according to its own analysis, will not reduce GHG emissions beyond business as usual. EPA thus cannot meet its Clean Air Act obligations via this rule. According to EPA analysis, under this proposed standard, CO_2 emissions would increase by 40% to 53% above 2015 levels in 2040. This is inconsistent with the US goal of capping aviation emissions at 2005 levels starting in 2020, among others.[3] The marginal benefit of international harmonization through adopting the ICAO standard does not justify the agency's inaction to protect human health and welfare from aviation pollution. [EPA-HQ-OAR-2018-0276-0168-A1, p.2-3]

The new type standard should be strengthened and provide manufacturers with more lead time.

Because of the long-time frame associated with fuel efficiency technology development and deployment, a meaningful new type standard is critical for long-term technology development in the U.S. aviation. When analyzing standard options, CAEP defined the upper limit of technological feasibility as widely available technologies (Technology Readiness Level, or TRL, 8+) in 2016. Technologies scheduled to integrated into concrete aircraft projects shortly thereafter were not used to establish standard stringency. [EPA-HQ-OAR-2018-0276-0168-A1, p.3]

As a result, the new aircraft that dominate deliveries today easily pass ICAO's requirements. According to ICCT's analysis, new deliveries of commercial jet aircraft in 2019 were on average 6% more fuel efficient than required by the standard in 2028.[4] Advanced new type aircraft that entered into service in recent years pass the standard by 10 to 20% on average. [EPA-HQ-OAR-2018-0276-0168-A1, p.3]

Moreover, when completing its own analysis, EPA did not develop alternative scenarios that could have delivered substantial climate benefits. Although EPA's Scenario 3 increased stringency compared to the proposed rule, the only passenger aircraft type affected is the Airbus A380, which will cease production in 2023 before the assumed early implementation date in this scenario. The agency opted for the less stringent scenario (Scenario 1) based upon the logic that the modest GHG reductions in Scenario 3 do not justify deviating from the international standard. The agency could have evaluated scenarios more ambitious than Scenario 3 that could have provided significant reductions, but chose not to do so. [EPA-HQ-OAR-2018-0276-0168-A1, p.3]

The proposed rule for new types already took effect internationally in January of this year and with insufficient lead time. We encourage EPA to begin work on a new standard, for implementation around 2030, with increased stringency. The agency should also invite an independent expert entity like the National Academy of Sciences to evaluate near-mature aircraft technologies that would not otherwise be promoted under a technology-following standard. As one example, a comprehensive technology assessment has concluded that fuel efficiency improvements for new aircraft could be accelerated up to 2.2% per year through 2034 by the adoption of cost-effective technologies.[5] [EPA-HQ-OAR-2018-0276-0168-A1, p.3]

In summary, instead of proposing an ineffective standard, the EPA should consider ways to build upon and supplement ICAO's minimum requirements in order to protect human health and welfare. These include investigating a more ambitious phase of the new-type standard around 2030 and applying the 2028 in-production standard to in-service aircraft to promote the retrofit and retirement of older, less efficient designs. EPA should likewise expand the GHG reporting requirement to in-service aircraft and other GHGs, and, as a precautionary principle, apply ICAO recommended subsonic standard to supersonic designs. We also encourage the agenda to incorporate flexibility mechanisms such as averaging and banking to support more ambitious, cost-effective standards in the future. [EPA-HQ-OAR-2018-0276-0168-A1, p.6]

[The following comments were submitted as testimony at the virtual public hearing on September 17, 2020.]

We commend EPA for proposing the first U.S. domestic greenhouse gas standard for aircraft. The proposed rule follows the international aircraft CO_2 standard finalized by the International Civil Aviation Organization, or ICAO, in 2017.

Based upon that experience, ICCT agrees with the EPA on the following aspects of the proposed rule: one, that ICAO's standard is designed to be technology-following and, therefore, that, as proposed, will not lead to additional greenhouse gas emission reduction from aircraft and aircraft engines. That is because, although the rule doesn't take full effect until 2028, ICAO defined technological feasibility in such a way that it excluded aircraft fuel efficiency technologies that were set to be delivered starting in 2016.

We have thus far identified five areas of refinement in the proposed rule, namely that, one, the agency should not propose standards it recognizes as ineffective two, that the new type standards should be strengthened and implemented with a longer lead time; three, that the in-production standard should be tightened by applying it to in-service, rather than just new engines; four, that EPA's reporting requirement should be broadened to cover a wider range of greenhouse gases and engines; and, five, that for future standards, flexibility mechanisms, like averaging and banking, should be considered to enable more ambitious cost-effective standards.

One, EPA should not propose ineffective standards. EPA's 2015 endangerment finding concluded that greenhouse gas emissions from aircraft contribute to air pollution that may reasonably be anticipated to endanger public health and welfare under Section 231A of the Clean Air Act. Nonetheless, EPA here proposes a domestic standard that according to its own analysis will not reduce greenhouse gas emissions beyond business as usual.

According to EPA's analysis, under this proposed standard, greenhouse gas emissions will increase by 40 percent to 53 percent above 2015 levels in 2040. This is inconsistent with the U.S. goal of capping aviation emissions at 2005 levels starting in 2020, among others. The marginal benefit of international harmonization through adopting the ICAO standard does not justify the agency's inaction to protect human health from aviation pollution; two, that the new type standard should be strengthened and provided more lead time.

The proposed rule for new types already took effect internationally in January of this year and with insufficient lead time. We encourage EPA to begin work on a new standard for implementation around 2030 with increased stringency. The agency should also invite an independent expert group, like the National Academy of Sciences, to evaluate near-mature aircraft technologies that would not otherwise be promoted under a technology-following standard.

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[1] Graver B., Zhang K., & Rutherford, D. (2019). CO_2 emissions from commercial aviation, 2018. Retrieved from the International Council on Clean Transportation, https://theicct.org/sites/default/files/publications/ICCT_CO2-commerclaviation-2018_20190918.pdf

[3] United States Aviation Greenhouse Gas Emissions Reduction Plan. https://www.icao.int/environmentalprotection/Lists/ActionPlan/Attachments/30/UnitedStates_Action_Plan-2015.pdf

[4] Zheng, X.; Rutherford, D. (2020). "Fuel burn of new commercial jet aircraft: 1960 to 2019." International Council on Clean Transportation. https://theicct.org/publications/fuel-burn-new-comm-aircraft-1960-2019-sept2020

[5] Kharina, A.; Rutherford, D.; Zeinali, M. (2016). "Cost Assessment of Near- and Mid-term Technologies to Improve New Aircraft Fuel Efficiency." International Council on Clean Transportation.

Organization: Kroeker, Anne

However, as so many environmental and social justice organizations have already asked, we do need a rule which would "rapidly decarbonize the aviation industry in line with what climate science and equity demand." [EPA-HQ-OAR-2018-0276-0162 p. 1]

It is well-documented that the airline industry and operations are growing and that their emissions are not being correctly calculated or mitigated. Flights are increasing worldwide, outpacing any fuel-efficiency improvements. Here in Seattle, the Seattle Tacoma airport is experiencing a slow return to pre-pandemic levels, which most assuredly will be reached, and surpassed, once the virus restrictions are eased. This trajectory of growth is inline with what is happening elsewhere and is expected and planned for by airports around the world. [EPA-HQ-OAR-2018-0276-0162 p. 1]

Because the United States is the world's top emitter of aircraft GHGs"airplanes released 24% of global passenger transport-related CO_2 in 2018" - the EPA is not only the agency to set the GHG regulations for this international industry, it is a long overdue ruling they already need to have made. With unregulated air operations, and its ensuing pollution, unrestricted growth of air travel is both possible and is taking place. Accounting for the pollution generated, will bring a practical and common-sense curb to that growth. [EPA-HQ-OAR-2018-0276-0162 p. 1]

The EPA's mission is to protect public health and welfare by reducing and preventing pollution, not pandering to business as usual or industry competitive advantages. In light of the limited time left to reduce greenhouse gas emissions to future livable levels, the climate emergency and Clean Air Act mandates require that the EPA set a strong, technology-forcing standard. [EPA-HQ-OAR-2018-0276-0162 p. 1]

Organization: Maryland Department of the Environment

In the proposed rule, EPA emphasizes the need to be consistent with the emissions standards set by the International Civil Aviation Organization's (ICAO) Committee on Aviation Environmental Protection (CAEP) (85 FR 51557). At the same time, EPA points out that the agency has "an unusually broad degree of discretion… to adopt aircraft engine emission standards as the Agency determines are reasonable (Nat'l Ass'n of Clean Air Agencies v. EPA, 489 F.3d 1221, 1229–30 (D.C. Cir. 2007) (85 FR 51559). EPA is not bound by the ICAO's standards, and adoption of more stringent standards will still allow U.S. manufacturers to remain competitive in a global marketplace. The Department supports the comments of the National Association of Clean Air Agencies and urges the EPA to use its authority under Clean Air Act Section 231 to adopt GHG emission standards that are more stringent than ICAO's. [EPA-HQ-OAR-2018-0276-0153-A1, p.2]

Organization: Mercy Investment Services

[The following comments were submitted as testimony at the virtual public hearing on September 17, 2020.]

Although we know the impact that COVID-19 has had on the airline industry in the short term, as long-term investors, we believe that climate change poses an ever greater business risk to U.S. airlines in weather-related safety and operational costs and due to their status as a source of emissions.

U.S. airlines must meet a Paris-aligned net-zero-emissions goal by 2050 to minimize the long-term risks of climate change. To meet this goal, we need strong regulations that will both drive innovation and ensure meaningful emissions reductions in the interim. This proposed rule fails on both counts. Strong emissions rules and complementary policies, including promoting advanced fuels, are necessary to ensure reductions in U.S. aviation emissions. A strong rule would drive investment in fuel efficiency technologies and practices and support efforts to scale up production and adoption of aviation biofuels.

Both government and industry must work to align emissions with Paris climate goals. That effort needs to begin well before 2028 and to drive emissions reductions consistent with net-zero emissions by 2050.

Organization: Mira's Garden

[The following comments were submitted as testimony at the virtual public hearing on September 17, 2020.]

I am here for the protection of children around airports and around the world. We need to have much more stringent regulations on the airplanes. I agree that it needs to go beyond what the EPA is currently recommended. It needs to be, at a minimum, the Paris standards. We need to incentivize the airline industry to do more than they are currently doing.

Organization: National Association of Clean Air Agencies

EPA should adopt meaningful and effective standards to address airplane emissions of GHGs; however, simply adopting the ICAO standards would fall short of what is necessary and feasible. EPA is not bound by the ICAO standards and should adopt GHG emission standards for new type airplane designs and in-use production models that are more stringent than ICAO's – that are technology forcing rather than technology following – to ensure adequate and appropriate regulation of airplane GHG emissions rather than just business as usual (BAU). [EPA-HQ-OAR-2018-0276-0177-A1, p.1]

I. The Proposed Standards Fall Short of What Is Necessary and Feasible

According to EPA, proposing and implementing airplane GHG standards equivalent to ICAO's is "consistent with U.S. efforts to secure the highest practicable degree of uniformity in aviation regulations and standards." The agency states that the proposed standards would allow U.S. manufacturers of covered airplanes[2] (new type designs and in-production models) to remain competitive in the global marketplace and that because other ICAO member States that certify airplanes have adopted the standards, U.S. adoption would ensure international consistency and acceptance of U.S.-manufactured aircraft around the world. EPA claims that, if finalized, the standards would also fulfill the agency's obligation under Section 231 of the Clean Air Act (CAA) to adopt GHG standards for certain classes of airplanes as a result of the August 15, 2016 "Finding That Greenhouse Gas Emissions from Aircraft Cause or Contribute to Air Pollution That May Reasonably Be Anticipated To Endanger Public Health and Welfare,"[3] in which the EPA Administrator found "that elevated concentrations of greenhouse gases in the atmosphere endanger the public health and welfare of current and future generations within the meaning of section 231(a)(2)(A) pf the Clean Air Act." [EPA-HQ-OAR-2018-0276-0177-A1, p.2]

Adoption of the proposed ICAO technology-following standards fails to meet EPA's obligation under Clean Air Act (CAA) Section 231 to adopt aircraft GHG standards as a result of the 2016 endangerment finding. Given the contribution of the aircraft sector to U.S. emissions, far more is reasonable and required. U.S. emissions data demonstrate the need to regulate the aircraft sector well beyond ICAO's BAU standards and commensurate with other transportation sectors relative to GHGs.[EPA-HQ-OAR-2018-0276-0177-A1, p.2]

The EPA Administrator reached her decision on the 2016 endangerment finding after reviewing emissions data on the contribution of covered aircraft under CAA section 231(a) to GHG emission inventories both in the U.S. and globally. In her judgment, the collective GHG emissions from the classes of engines used in covered U.S. aircraft clearly contribute to endangering GHG pollution, whether the comparison is to domestic GHG inventories (10 percent of all U.S. transportation GHG emissions, representing 2.8 percent of total U.S. emissions), to global GHG inventories (26 percent of total global aircraft GHG emissions, representing 2.7 percent of total global transportation emissions and 0.4 percent of all global GHG emissions) or if using a combination of domestic and global inventory comparisons.[4] This is especially important because states and localities do not have authority to directly regulate aircraft emissions beyond standards adopted by EPA. [EPA-HQ-OAR-2018-0276-0177-A1, p.2]

This proposal represents a missed opportunity. Notwithstanding critical environmental need, this action amounts to little more than an administrative exercise. EPA acknowledges that this proposed regulation has no environmental benefits and that adopting the ICAO GHG airplane standards will do nothing to move the needle on aircraft emissions: "U.S. manufacturers have already developed or are developing technologies that will allow affected airplanes to comply with the ICAO standards, in advance of EPA's adoption of standards. Furthermore, based on the manufacturers' expectation that the ICAO standards will be implemented globally, the EPA anticipates nearly all affected airplanes to be compliant by the respective effective dates for new type designs and for in-production airplanes. This includes the expectation that existing in-production airplanes that are non-compliant will either be modified and re-certificated as compliant or will likely go out of production before the production compliance date of January 1, 2028. For these reasons, the EPA is not projecting emission reductions associated with these proposed GHG regulations [emphasis added]. We do, however, project a small cost associated with the proposed annual reporting requirement."[EPA-HQ-OAR-2018-0276-0177-A1, p.2-3]

II. EPA Has Clear Authority to Adopt Standards More Stringent than ICAO's

EPA is in no way bound by ICAO's BAU, technology-following standards. The agency has authority under CAA Section 231 to adopt standards more stringent than ICAO's. The only limits placed on the establishment or amendment of U.S. aircraft standards are that they not significantly increase noise or create hazards to aircraft safety. [EPA-HQ-OAR-2018-0276-0177-A1, p.3]

In 2007, the U.S. Court of Appeals for the D.C. Circuit put a fine point on this when it held that CAA Section 231(a)(2)(A) confers broad discretion on EPA to weigh relevant factors and adopt aircraft engine emission standards as the agency determines are reasonable.[6] EPA proposes to codify ICAO standards that incorporated only existing technology at the time of their adoption by ICAO four years ago. This proposal is not reasonable, considering the scale of the pollution and its impacts and the availability of current and nearterm technologies and measures to effectively reduce it. [EPA-HQ-OAR-2018-0276-0177-A1, p.3]

EPA has contemplated setting more stringent aircraft GHG emission standards than ICAO's. In the Advance Notice of Proposed Rulemaking (ANPR) portion of its July 1, 2015 "Proposed Finding That Greenhouse Gas Emissions From Aircraft Cause or Contribute to Air Pollution That May Reasonably Be Anticipated To Endanger Public Health and Welfare and Advance Notice of Proposed Rulemaking,"[7] EPA provided an overview of and sought input on a number of issues related to setting an international CO_2 standard for aircraft at ICAO and (provided that EPA ultimately promulgated a final endangerment and cause and contribute findings for aircraft engine GHG emissions, which is did the following year) the potential use of Section 231 to adopt and implement domestic aircraft engine GHG emission standards. In particular, EPA specifically sought comment on adopting standards more stringent than ICAO's: "Although the EPA has traditionally established domestic standards that track the ICAO standards, for purposes of having a robust ANPR process, we ask for comment on the possibility of the EPA adopting a more stringent aircraft engine emissions standard than ICAO, provided ICAO/CAEP promulgates a standard in 2016 and the EPA makes a positive endangerment finding [emphasis added]."[8] [EPA-HQ-OAR-2018-0276-0177-A1, p.3]

Nor does ICAO preempt member States from going beyond the Organization's standards. As EPA has noted, "ICAO is a United Nations (UN) specialized agency, established in 1944 by the Convention on International Civil Aviation (Chicago Convention), 'in order that international civil aviation may be developed in a safe and orderly manner and that international air transport services may be established on the basis of equality of opportunity and operated soundly and economically' … In the interest of global harmonization and international air commerce, the Chicago Convention urges its member States to collaborate in securing the highest practicable degree of uniformity in regulations, standards, procedures and organization. The Chicago Convention also recognizes that member States may adopt standards that are more stringent than those agreed upon by ICAO [emphasis added]."[9] Such more stringent U.S. standards do not in any way interfere with the stated goals of the U.S. to secure the highest degree of uniformity with ICAO standards, allow U.S. manufacturers to remain competitive and ensure international consistency and acceptance of U.S.- manufactured aircraft worldwide. [EPA-HQ-OAR-2018-0276-0177-A1, p.3-4]

III. NACAA's Recommendations

First and foremost, EPA should adopt GHG emission standards for new type airplane designs and in-use production models that are more stringent than ICAO's BAU standards – that are technology forcing rather than technology following – to ensure adequate and appropriate regulation of airplane GHG emissions that will yield critically needed reductions in GHGs. [EPA-HQ-OAR-2018-0276-0177-A1, p.4]

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[2] As described by EPA, "[t]he proposed standards would apply to civil subsonic jet airplanes (those powered by turbojet or turbofan engines and with a MTOM [Maximum Takeoff Mass] greater than 5,700 kilograms), as well as larger civil subsonic propeller-driven airplanes (those powered by turboprop engines and with a MTOM greater than 8,618 kilograms). The timing and stringencies of the standards would differ depending on whether the covered airplane is a new type design (i.e., a design that has not previously been type certificated under title 14 CFR) or an inproduction model (i.e., an existing design that had been type certificated under title 14 CFR prior to the effective date of the GHG standards). The standards for new type designs would apply to covered airplanes for which an application for certification is submitted to the [Federal Aviation Administration] on or after January 1, 2020 (January 1, 2023, for new type designs that have a maximum takeoff mass (MTOM) of 60,000 kilograms MTOM or

less and have 19 passenger seats or fewer). The in-production standards would apply to covered airplanes beginning January 1, 2028."

[3] 81 Fed. Reg. 54,422 (August 15, 206) – https://www.govinfo.gov/content/pkg/FR-2016-08-15/pdf/2016-18399.pdf

[4] Id. at 54,461

[5] Supra note 1, at 51,558

[6] Nat'l Ass'n of Clean Air Agencies v. EPA, 489 F.3d 1221, 1229–30 (D.C. Cir. 2007)

[7] 80 Fed. Reg. 37,758 (July 1, 2020) – https://www.govinfo.gov/content/pkg/FR-2015-07-01/pdf/2015-15192.pdf

[8] Id. at 37,805

[9] Id. at 37,766

Organization: National Tribal Air Association

Although the NTAA supports the regulation of greenhouse gas (GHG) emissions in airplanes, as per the 2016 endangerment finding for aircraft that requires the EPA to set standards for the two GHGs of CO_2 and N_2O, the proposed standards demonstrate that the EPA is lagging behind the achievable technology for GHG reductions and is not taking meaningful action to protect human health and the environment. While the EPA is required to at least meet the standards set by the International Civil Aviation Organization (ICAO), there is nothing prohibiting the EPA from setting standards that are more stringent to push the industry to achieve lower GHG emissions in order to have a more significant impact on addressing global warming. [EPA-HQ-OAR-2018-0276-0179-A1, p.1]

It is well known that the transportation sector as a whole contributes a disproportionate amount of planet warming GHGs (28.2% as of 2018, the "largest share of greenhouse gas emissions" in the U.S.[1]). Of that 28.2%, nearly half (~13%) comes from the aircraft sector. This represents substantial opportunity for reductions in GHGs, and therefore this Proposed Rule represents a significant missed opportunity for the EPA to take mitigative action on global warming. [EPA-HQ-OAR-2018-0276-0179-A1, p.1-2]

Aircraft manufacturers have long been designing aircraft to be increasingly fuel-efficient because an airplane that burns less fuel costs them less money to operate. In fact, in 2016, the average new aircraft already met the 2028 ICAO requirements, and as of 2019 the average new aircraft surpassed the standard by 6%.[2] Unfortunately, these reductions in emissions are substantially offset by increased air travel, so the overall impact on emissions from aviation has continued to increase at the alarming rate of 44% over the past 10 years, and is expected to triple again by 2050.[3] [EPA-HQ-OAR-2018-0276-0179-A1, p.2]

The Proposed Rule itself acknowledges that "the manufacturers of affected airplanes and engines have already developed or are developing technologies that meet the 2017 ICAO Airplane CO_2 Emission Standards," 85 Fed. Reg. at 51578, and states that "the proposed GHG standards are not expected to result in reductions in fuel burn and GHG emissions beyond the baseline," 85 Fed. Reg. at 51583. In other words, this Proposed Rule is meant solely to comply with the minimum standards set by the ICAO, which are approximately 10 years behind the aviation industry's own technological ability, with no foreseeable reduction in emissions that can be attributed to the Proposed Rule. [EPA-HQ-OAR-2018-0276-0179-A1, p.2]

There are several possibilities for effectively lowering emissions from the aviation industry that are within the EPA's control:

1. Set more stringent standards [EPA-HQ-OAR-2018-0276-0179-A1, p.3]

In conclusion, while the NTAA supports setting emissions standards for the aircraft industry, the proposed standards will not achieve emissions reductions, and therefore are unacceptably lax and are lagging behind the industry's own technological ability. Pursuant to the Clean Air Act, EPA is charged with protecting human health and the environment, and this Proposed Rule will not further that mission. [EPA-HQ-OAR-2018-0276-0179-A1, p.3]

[1] U.S. Envtl. Prot. Agency, Sources of Greenhouse Gas Emissions, https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions#:~:text=Transportation%20(28.2%20percent%20of%202018,ships%2C%20trains%2C%20and%20planes
[2] Zheng, X. S., & Rutherford, D. (2020, September). Fuel burn of new commercial jet aircraft: 1960 to 2019. https://theicct.org/sites/default/files/publications/Aircraft-fuel-burn-trends-sept2020.pdf.
[3] Id.
[4] Jantarasami, L.C., R. Novak, R. Delgado, E. Marino, S. McNeeley, C. Narducci, J. Raymond-Yakoubian, L. Singletary, and K. Powys Whyte, 2018: Tribes and Indigenous Peoples. In Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II [Reidmiller, D.R., C.W. Avery, D.R. Easterling, K.E. Kunkel, K.L.M. Lewis, T.K. Maycock, and B.C. Stewart (eds.)]. U.S. Global Change Research Program, Washington, DC, USA, pp. 572–603. doi: 10.7930/NCA4.2018.CH15.

Organization: Northeast States for Coordinated Air Use Management (NESCAUM)

We note, however, the proposed standards for new type design and in-production airplanes are equivalent to those adopted by the International Civil Aviation Organization (ICAO) in 2017 and represent a business as usual (BAU) technology-following trajectory. Moreover, the proposed regulation is not expected to achieve any environmental benefits. As EPA observes:

U.S. manufacturers have already developed or are developing technologies that will allow affected airplanes to comply with the ICAO standards, in advance of EPA's adoption of standards. Furthermore, based on the manufacturers' expectation that the ICAO standards will be implemented globally, the EPA anticipates nearly all affected airplanes to be compliant by the respective effective dates for new type designs and for in-production airplanes. This includes the expectation that existing in-production airplanes that are non-compliant will either be modified and re-certificated as compliant or will likely go out of production before the production compliance date of January 1, 2028. For these reasons, the EPA is not projecting emission reductions associated with these proposed GHG regulations [emphasis added].4

Several new aircraft from Airbus, Boeing, and smaller aviation manufacturers currently meet the proposed standards and as airline carriers introduce new technology into their fleets, they will outperform the standards. Under the BAU trajectory, all regional and 70 percent of mainline U.S. carriers are projected to be in compliance with the standards by January 1, 2028.5

EPA has clear authority under CAA Section 231 to adopt GHG emission standards more stringent than those set forth by ICAO, and ICAO does not preempt member states from doing so.6 Furthermore, the Agency is obliged to reduce aircraft GHG emissions that endanger the public health and welfare of current and future citizens as determined by a 2016 endangerment finding.7

EPA should consider adopting technology forcing GHG emission standards that will realize GHG emission reductions from the aircraft sector. More stringent standards will not only enable U.S. aviation manufacturers to remain competitive in the global marketplace, but also regulate GHGs from the aircraft sector commensurate with other transportation sectors. EPA should also accelerate its January 1, 2028 compliance date for in-production models and establish standards to reduce emissions from in-use aircraft, for example, by retrofitting these aircraft to reduce aerodynamic drag and increase fuel efficiency. Finally, EPA should expand annual reporting requirements for airplane production, airplane characteristics, and test parameters to include aircraft CO_2 emission rates. These data would provide valuable insights into regulatory compliance and can be used to inform future policy development.

Given the unmistakable evidence that impacts from a changing climate are worsening – from record-breaking heat waves, to enormous and widespread forest fires in the West, to more rapidly intensifying hurricanes – it is imperative that EPA take meaningful action to reduce GHG emissions from all sectors. Therefore, we urge EPA to go back to the drawing board and propose technology forcing emission standards that would achieve reductions in aircraft GHG emissions beyond a BAU scenario. [EPA-HQ-OAR-2018-0276-0152-A1, pp.1-3]

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[5] Environmental and Energy Study Institute, Fact Sheet: The Growth in Greenhouse Gas Emissions from Commercial Aviation (October 17, 2019). Available at https://www.eesi.org/papers/view/fact-sheet-the-growth-ingreenhouse- gas-emissions-from-commercial-aviation.

Organization: Office of the Comptroller of New York City, et al.

As long-term investors, collectively managing more than $278 billion in assets under management, we are writing to express our opposition to the Environmental Protection Agency's (EPA) proposed aircraft greenhouse gas (GHG) rule. The rule, which is essentially equivalent to the International Civil Aviation Organization (ICAO) standard, will result in increased emissions and is thus clearly inconsistent with Paris climate goals. [EPA-HQ-OAR-2018-0276-0166-A1, p.1]

It will be extremely challenging for the aviation sector to meet a Paris aligned net zero goal by 2050, and it is critical that we accelerate our efforts now. Unfortunately, the proposed rule will only exacerbate that challenge, and also undermine the global competitiveness of the U.S. aviation industry. Accordingly, we oppose the proposed rule. [EPA-HQ-OAR-2018-0276-0166-A1, p.2]

Organization: Salim, Nadia

[The following comments were submitted as testimony at the virtual public hearing on September 17, 2020.]

I strongly believe that EPA needs to strengthen the proposed rules to reduce greenhouse gas emissions under consideration. Air pollution endangers public health and welfare on a number of levels. And, of course, the most recent science on climate change tells us that we must be more aggressive if we are to avert disastrous health and climate implications.

Current science tells us that the standards under consideration currently are not sufficient to address the public health and climate change issues that endanger our collective health and wellbeing. It is not only within the power of the EPA but also part of your responsibility to take maximum care to limit the negative impact of emissions, not to accept the minimum standards.

Organization: South Coast Air Quality Management District (South Coast AQMD)

The Chicago Convention on International Civil Aviation does not require all nations to adopt identical standards, and anticipates that some nations will adopt standards more stringent than those of ICAO for air carriers based in that nation.[2] Foreign flagged aircraft may travel through airspace of any country if they meet or exceed ICAO standards.[3] But regulations affecting US-flagged aircraft can be vital in demonstrating technologies and practices that are later adopted world-wide. [EPA-HQ-OAR-2018-0276-0144-A1, p.2]

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2 70 Fed. Reg. 69664, 69667 (Nov. 17, 2005).
3 NACAA v. EPA, 498 F. 3d 1221, 1225 (D.C. Cir. 2007).

Organization: Uribe, Daniela and Molnar, Timothy

• More Stringent Standards Are Needed to Meet Climate Goals of the Intergovernmental Panel on Climate Change [EPA-HQ-OAR-2018-0276-0156-A1, p.2]

Along with 192 other nations, the U.S. is a party to the ICAO. And, as such, the United States harbors the obligation to comply with ICAO's greenhouse gas emission standards. As noted by The Agency, the Proposed Rule would do just that. And maintaining uniformity in international standards, an idea highlighted by various industry commenters, is not without its merits.[3,4] Yet seeking only to compel manufacturers to comply with these de minimis standards does little to achieve further progress on combating climate change. Especially when considering that "[t]he EPA does not project that the proposed GHG rule would cause manufacturers to make technical improvements to their airplanes that would not have occurred in the absence of the rule."[5] But even absent the value-laden arguments opining on appropriate levels of greenhouse gas emission reductions, statutory obligations compel the adoption of more stringent standards by The U.S. Environmental Protection Agency ("The Agency," "EPA," or "E.P.A."). [EPA-HQ-OAR-2018-0276-0156-A1, p.3]

CONCLUSION

Preventing the most severe impacts of climate change requires swift action from across industries. Regulations in the U.S. aviation sector present one such important opportunity for decarbonizing. And, specifically, the proposed rule at issue holds potential to move the ball in a positive direction. Unfortunately, the current version is inadequate to meet the proportional reductions required to stay below dangerous levels of interference in the global climate system. Furthermore, the proposed rule, in its current form, exacerbates issues of environmental justice and fails to protect the health of this country's most vulnerable citizens. This is in strict contradiction of the E.O. 12898.

Beyond the implicated moral issues, the Agency harbors a directive to protect this country's citizens against pollutants that "endanger public health and welfare." Scientific research confirms that aviation-related emissions such as CO_2, N_20, and various form of PM constitute such pollutants. In closing, we reiterate:

• More Stringent Standards Are Needed to Meet Climate Goals of the Intergovernmental Panel on Climate Change

• Stricter Stringent Standards Ameliorate Environmental Injustices

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[3] Comment submitted by Catherine M. Downen, Director, CAO Enterprise Management - TC, Gulfstream Aerospace Corporation
[4] Comment submitted by Stephane Flore, Head of Regulations and Standards, Airbus S.A.S.
[5] EPA. "Control of Air Pollution From Airplanes and Airplane Engines: Greenhouse Gas Emission Standards and test Procedures". Proposed Rule. 2020.

Organization: Washington State Department of Ecology (Ecology)

Ecology strongly disagrees with the U.S. Environmental Protection Agency's (EPA) direction in its proposal. While we wholeheartedly agree that greenhouse gas (GHG) emissions from aircraft must be regulated, the proposed rule provides no net reduction in aircraft GHG pollution, fails to meet EPA's legal mandate to set meaningful emission standards for aircraft, forgoes an opportunity to establish readily achievable technology-driven reductions, and willfully ignores the disproportionate and adverse effects climate change poses to sensitive and vulnerable populations. [EPA-HQ-OAR-2018-0276-0140-A1,p.1]

Promulgating a standard that merely maintains the status quo does not square with the urgent necessity to reduce GHGs in the face of our rapidly changing climate, or with EPA's statutory obligation to set a meaningful emission standard for aircraft. The time to drag feet on climate change is long past — EPA must adopt standards for aircraft GHGs that provide real and lasting emissions reductions. [EPA-HQ-OAR-2018-0276-0140-A1,p.1]

Response

See the Preamble Section IV.I.1 for the EPA's general response to comments on adopting more stringent standards. Also, for further discussion on this subject see the introductory paragraphs of Section IV of the Preamble. In cases where commenters raise additional issues and specific points above, we include and respond to those issues and points in the appropriate sections below.

Boeing stated other programs that target CO_2 emission reductions from aircraft-- including improved traffic control and air carrier operations, more use of sustainable aviation fuels, and carbon offsetting of international aviation emissions – are a valid consideration for the stringency of standards for emissions from aircraft engines under CAA section 231. To begin the EPA response to this Boeing comment, the Agency points to the 2019 ICAO Environmental Report which indicated that to limit the adverse effects of international civil aviation on the global climate, ICAO decided to pursue a basket of measures that includes aircraft technology improvements, operational improvements, sustainable aviation fuels, and market-based measures (Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA).[2] Aircraft technology improvements are the portion of these basket of measures that refers to the ICAO airplane CO_2 standards. The EPA notes that nearly all of the other programs (the non-standards programs) in ICAO's basket of measures did not exist or were not fully developed when ICAO assessed the stringency of the airplane CO_2 standards. ICAO did not consider these programs when setting the stringency of the airplane GHG standards, and thus, neither did the EPA consider them or develop a record that considers the other programs. Therefore, the public has not been provided an opportunity to evaluate and comment upon how these programs could affect selection of stringency levels for GHG standards, if at all.

In addition, the EPA is now late in issuing its GHG standards applicable to new type designs, as the January 1, 2020, applicability date under the international CO2 standards has already passed, and the ICAO applicability date of January 1, 2023 for modified airplane types (changes for non-GHG Certificated Airplane Types) is fast approaching. Also, the U.S. airplane manufacturers are urging the EPA to promptly promulgate this final rulemaking to adopt ICAO's standards, which were adopted back in 2017, because decisions are now being made by air carriers on airplane deliveries through the end of this decade.[3] Furthermore, the EPA understands that U.S. airplane manufacturers need time to certify their airplanes, after the subsequent FAA rulemaking to enforce the standards, to ensure the airplanes comply with the in-production standards by the applicability date of January 1, 2028. Since we have not yet provided that opportunity for public comment on these other programs and their relationship (if any) to stringency levels of GHG standards, and attempting to do so now would in the EPA's view unacceptably slow down this rulemaking, in the interests of expediency and of bringing U.S. domestic law into conformity with our obligations under the Chicago Convention, we have decided that the most appropriate course for now, under CAA section 231, is to simply adopt airplane GHG standards that are harmonized with the standards adopted by ICAO in 2017 (in terms of stringency level, timing, scope, etc.).

3. Consideration of Whole Airplane Characteristics

Comments:

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[2]ICAO, 2019: *Environmental Report 2019 – Aviation and Climate Change – Destination Green The Next Chapter*, 2019, which is located at https://www.icao.int/environmental-protection/Pages/envrep2019.aspx (last accessed November 10, 2020).

[3] AIA, 2020: *Aerospace Industries Association comments on Control of Air Pollution from Airplanes and Airplane Engines: Greenhouse Gas Emission Standards and Test Procedures, Docket: EPA–HQ–OAR–2018–0276*, October 19, 2020.

Organization: Aerospace Industries Association (AIA)

AIA does note that the ICAO CO_2 standard applies at the aircraft level, and the Clean Air Act only provides the EPA with explicit authority to address aircraft engine emissions. However, there is a direct, linear connection between fuel burn and CO_2 emissions – which does not exist for other currently regulated aircraft engine emissions. CO_2 emissions are directly affected by the characteristics of both the airframe and aircraft engines. This direct relationship between engine fuel burn and aircraft CO_2 emissions in reality makes the aircraft CO2 standard an aircraft engine standard for the purposes of the Clean Air Act. [EPA-HQ-OAR-2018-0276-0087-A1, p.6]

Organization: Airlines for America (A4A) and Air Line Pilots Association, International (ALPA)

We do emphasize that the approach taken to the ICAO CO_2 Aircraft Standards, which is based on a fuel-efficiency metric applied to the aircraft as a whole (the “ICAO CO_2 Metric”), must be reconciled with EPA’s authority under Section 231 of the Clean Air Act, which is limited to promulgating “emissions standards applicable to the emission of any air pollutant from any class or classes of aircraft engines.”18 The ICAO CO_2 Metric allows the CO_2 standard to be met through the development and deployment of the wide range of technologies incorporated into aircraft that affect its fuel efficiency, including, for example, combustion systems, winglets, and aerodynamic innovations. While Section 231 clearly does not confer authority upon EPA to regulate aircraft generally,19 we do agree with the Agency that its adoption of the ICAO CO_2 Aircraft Standards is consistent with U.S. law given the unique, direct and linear relationship between aircraft fuel efficiency and the aircraft engine emissions EPA proposes to regulate here (CO_2 and nitrous oxide (“N_2O”)). [EPA-HQ-OAR-2018-0276-0161-A1, pp.4-7]

B. The Proposed GHG Aircraft Engine Emissions Standards Should Be Clarified to Ensure, Consistent with the Authority Conferred by Section 231 of the Clean Air Act, they Apply to Aircraft Engine Emissions

As noted above, A4A and ALPA believe the aircraft-wide fuel-efficiency metric approach under the ICAO CO_2 Aircraft Standard can be reconciled with EPA’s authority for regulating aircraft engine emissions in the unique case presented by the particular emissions at issue. However, we believe EPA needs to better reflect this in the structure of the Proposed Rule. We are concerned that as presently worded proposed section 1030.1(a) could be read to assert regulatory authority more broadly over aircraft than authorized under Section 231. To make clear that EPA is regulating emissions from aircraft engines consistent with its authority, we respectfully request the provision be amended to read:

(a) ~~Except as provided in paragraph (c) of this section, when an~~ Greenhouse Gas (GHG) emissions from an aircraft engine subject to 40 CFR part 87 shall not exceed levels such that the aircraft ~~is installed on an airplane that is described in this section and subject to title 14 of the Code of Federal Regulations, the airplane may not~~ exceeds ~~the Greenhouse Gas (~~GHG~~)~~ standards of this part when ~~certification under title 14 is sought~~ when the engine is installed on: [EPA-HQ-OAR-2018-0276-0161-A1, pp.11-12]

Organization: Center for Biological Diversity, Earthjustice, on behalf of the Sierra Club and Friends of the Earth, and the Natural Resources Defense Council (NRDC)

ICAO’s CO_2 emissions metric “measures the fuel efficiency from the perspective of whole airplane design—an airframe and engine combination.”[59] Accordingly, the emissions test procedures measure “the performance of the whole airplane rather than the airplane engines alone,” taking into account “aerodynamics, airplane weight, and engine propulsion technologies” in determining overall CO_2 emissions.[60] These test procedures do not quantify emissions of any single chemical compound. Instead, they “measure fuel efficiency based on how far an airplane can fly on a single unit of fuel at the optimum cruise altitude and speed.”[61] Following ICAO’s approach, EPA proposes to use “airplane fuel efficiency as a surrogate for GHG emissions from covered airplanes" and "adopt [Maximum Takeoff Mass, or MTOM, thresholds] as a correlating parameter to be used when setting emissions limits."[62] [EPA-HQ-OAR-2018-0276-0150-A1, pp.8-9]

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[59] Id.
[60] Id. at 51,561-62.
[61] Id. at 51,562.
[62] Id. at 51,565.

Organization: International Council on Clean Transportation (ICCT)

ICCT agrees with EPA on the following aspects of the proposed rule:

2. That EPA has the authority to regulate the entire aircraft, rather than just aircraft engines. Since GHGs are emitted from the aircraft engine, while aerodynamic and lightweighting technologies can materially impact the fuel efficiency of an airplane, this approach is important. It also aligns the U.S. with international certification procedures and CAEP's 2009 finding that an engine-only standard would be ineffective.[2] [EPA-HQ-OAR-2018-0276-0168-A1, p.2]

[The following comments were submitted as testimony at the virtual public hearing on September 17, 2020.]

Two, we agree that EPA has the authority to regulate the entire aircraft, rather than just the aircraft engines. Since greenhouse gases are emitted from the aircraft engine while aerodynamic and light-weighting technologies can materially impact the fuel efficiency of a plane, this approach is important. It also aligns the U.S. with international certification procedures and ICAO's 2009 finding that an engine-only standard would be ineffective.

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[2] CAEP8-WG3-WP7-03. Draft Report of the 6th Meeting, Emission and Technology Working Group, ICAO Committee on Aviation Environmental Protection. London, UK.

Response

The EPA agrees with the statements of support from commenters that the EPA in this first set of airplane engine GHG standards control GHG emissions in a manner identical to how ICAO's standards control CO_2 emissions -- with a fuel efficiency standard based on the characteristics of the whole airplane. However, the EPA clarifies that by adopting a fuel efficiency standard the agency is not directly regulating "the entire aircraft." Instead, EPA is adopting a standard that controls aircraft engine GHG emissions after considering factors in addition to engine technology that affect the amount of GHGs that such engines emit, including aspects of the airplane. In addressing CO_2 emissions, ICAO adopted an approach that measures the fuel efficiency from the perspective of whole airplane design - an airframe and engine combination. ICAO's test procedures measure the performance of the whole airplane rather than the airplane engines alone, and these procedures account for three factors: aerodynamics, airplane weight, and engine propulsion technologies. Also, see Preamble Section II.E for a description of the EPA's authority under section 231 of the CAA to control emissions from aircraft engines. The EPA agrees with ICAO's approach for these first airplane GHG standards and the comments to measure the fuel efficiency based on the performance of the whole airplane.

In regard to the A4A-ALPA comments to clarify the applicability section of the regulations, introductory paragraph of section 1030.1(a), to ensure consistency with section 231 of the Clean Air Act, see the response to these same comments later in Section 5 of the Responses to Comments document.

3.1. Auxiliary Power Units

Comments:

Organization: National Association of Clean Air Agencies

III. NACAA's Recommendations

Third, EPA should apply an aircraft CO_2 standard to engines associated with but not part of an aircraft, such as auxiliary power units. [EPA-HQ-OAR-2018-0276-0177-A1, p.4]

Organization: Washington State Department of Ecology (Ecology)

Specifically, the rule should:

- Incorporate aircraft GHG standards for engines associated with, but not part of an aircraft, such as auxiliary power units. [EPA-HQ-OAR-2018-0276-0140-A1,p.5]

Response:

The EPA's proposed test procedures, which match ICAO's test procedures, measure fuel efficiency during cruise operation. Auxiliary power units (APUs) are typically only used or operational during airplane ground operation, i.e., parked at the airport gate. While APUs on airplanes also emit GHG emissions, establishing emission standards related to ground operations were not considered while the ICAO international CO_2 standards were under development, and EPA does not have information that could inform what standards specifically for APUs might be appropriate. As such, it would require substantial new technical and economic information gathering and analysis to develop and propose APU standards. The EPA continues to believe that the appropriate approach at this time is to promptly adopt airplane GHG standards that match the ICAO standards, an action which we believe is well justified by the technical record analysis developed during the process for adopting the ICAO standards and in our subsequent rulemaking.

4. Airplane Fuel Efficiency Metric

Comments:

Organization: Boeing Company (Boeing)

D. The Proposed Standards are Properly Focused on Fuel-Efficiency.

Compliance with the ICAO CO_2 standard is measured by a "CO_2 metric" that is, in effect, a measure of aircraft fuel-efficiency. The metric is based on fuel used during cruise operations as a function of the size of a fuselage and a scaling factor, based on the maximum takeoff mass ("MTOM") of the aircraft at three different test points.[66] Thus, for a given size of aircraft the standard regulates and limits the rate of CO_2 emissions (per kilometer flown) from the combustion of aviation fuels in the aircraft's engines. Therefore, the standard regulates "emission[s] from … aircraft engines" consistent with CAA section 231(a)(2)(A), while recognizing the combined effects of engine technology, aerodynamics, and weight on the fuel consumption of, and hence CO_2 emissions from, the engines propelling a particular size of aircraft. As described by ICAO,[67] the intent of the standard is:

to equitably reward advances in aircraft technologies (i.e. structural, propulsion and aerodynamic) which contribute to reductions in aircraft CO_2 emissions, and differentiate between aircraft with different generations of these technologies. As well as accommodating the full range of technologies and designs which manufacturers can employ to reduce CO_2 emissions, the CO_2 metric system has been designed to be common across different aircraft categories, irrespective of aircraft purpose or capability. As a result, the CO_2 metric system is based on three elements associated with aircraft technology and design:

Cruise point fuel burn performance;

Aircraft size; and

Aircraft weight. [EPA-HQ-OAR-2018-0276-0181-A2, pp.16-17]

ICAO has further explained that the standard is designed to be "especially stringent where it will have the greatest impact: for larger aeroplane types with a Maximum Take-off Mass (MTOM) of greater than 60 tonnes."[68] The CAEP considered "technical feasibility very carefully during the development of environmental standards, and as such, the decision at CAEP 10 recognized the fact that the larger aeroplane designs have access to the broadest range of CO_2 emissions reduction technologies."[69] [EPA-HQ-OAR-2018-0276-0181-A2, p.17]

Finalizing a rule implementing an ICAO-equivalent standard under CAA section 231 will result in increased fuel-efficiency for aircraft and thereby result in corresponding decreases in emissions of CO_2 because of the direct correlation between the amount of fuel burned and the volume of CO_2 emitted. Such a rule will also ensure that older product lines exit the market in an appropriate timeframe and ensure that new type designs exceed the highest fuel-efficiency of today's airplanes.[70] The rule would thereby build upon the progress that has already been made, as each new generation of aircraft has been roughly 15 to 20% more fuel-efficient than the models they replace.[71] [EPA-HQ-OAR-2018-0276-0181-A2, p.17]

Boeing-Suggested Changes to the CAA Section 231 Aircraft CO_2 Standard Proposed Rule Text

§1030.30 GHG emission standards.

(a)The greenhouse gas emission standards in this section are expressed as maximum permitted values fuel efficiency metric values, as calculated under §1030.20.

(b) The fuel efficiency metric value may not exceed the following, rounded to three decimal places:

For airplanes defined in...	with MTOM...	the standard is...
(1) §1030.1(a)(1) and (2)	5,700 < MTOM < 60,000 kg	10 (-2.73780 + (0.681310 * log(MTOM)) + (-0.0277861 * 10(log(MTOM))^2)) 10
(2) §1030.1(a)(3)	8,618 < MTOM < 60,000 kg	10 (-2.73780 + (0.681310 * log(MTOM)) + (-0.0277861 * 10(log(MTOM))^2)) 10
(3) §1030.1(a)(1) and (3)	60,000 < MTOM < 70,395 kg	0.764
(4) §1030.1(a)(1) and (3)	MTOM > 70,395 kg	10 (-1.412742 + (-0.020517 * log(MTOM)) + (0.0593831 * 10(log(MTOM))^2)) 10
(5) §1030.1(a)(4) and (6)	5,700 < MTOM < 60,000 kg	10 (-2.57535 + (0.609766 * log(MTOM)) + (-0.0191302 * 10(log(MTOM))^2)) 10

[EPA-HQ-OAR-2018-0276-0181-A2,pp.51-52]

[66] The standard includes a high weight test point (0.92 x MTOM) and low weight test point (0.45 x MTOM) and a midweight test point (average of the high and low test points). Testing will also be done at different pressure altitudes depending on the type of aircraft.
[67] Aircraft CO_2 Emissions Standard Metric System, ICAO Fact Sheet AN 1/17.
[68] ICAO, 2016 Environmental Report, Aviation and Environment, at 114, available at https://www.icao.int/environmental-protection/Pages/env2016.aspx.
[69] Id. See also CAEP/10 Report, Appendix C.
[70] As detailed in Section I.D. of these comments, this transition to newer generation aircraft has been significantly accelerated by the COVID-19 pandemic.
[71] What Will the Standard Mean In Terms of CO_2 Reduction?, ATAG Q&A: The ICAO Standard for Aircraft (Feb. 2016), available at https://www.atag.org/component/attachments/?task=download&id=307:FACT-SHEET_CO2Standard.

Organization: International Council on Clean Transportation (ICCT)

Complementary measures will be needed to promote structural efficiency improvements.

Following the international standard, the proposed rule measures aircraft fuel burn using ICAO's CO_2 metric value (MV) system. The MV is designed to be transport capability neutral and helps set emissions targets specific to aircraft mass. While reasonable for standard setting purposes, the MV comes with certain limitations. First, while it tracks aircraft's cruise fuel burn performance generally, it does deviate from block fuel burn for some aircraft types, as shown in

Figure 2 in the Appendix. Notably, regional jets are given a lenient reference line because they fall into a similar mass range as business jets, which are usually less fuel-efficient than commercial jets (Figure 3 and 4). However, regional jets burn 80% more fuel than narrowbody and widebody jets per passenger-kilometer transported.[9] [EPA-HQ-OAR-2018-0276-0168-A1, p.4-5] [Refer to page 9 of docket number EPA-HQ-OAR-2018-0276-0168-A1 for Figure 2.]

Second, because the regulatory limits under the MV are assigned as a function of aircraft mass, the metric under-rewards changes in aircraft design that reduce fuel burn per unit payload, such as the use of lightweight materials and stretch variants. This effect is not inconsequential – by one assessment, structural efficiency improvements such as lightweighting account for about 20% of the total technology potential to improve new aircraft fuel efficiency through 2034.[10] Similarly, the MV does not reward operational efficiency improvements due to load factor, seating density, belly freight carriage, and so on. This implies the need for complementary measures to promote such means of reducing CO2 emissions in use. [EPA-HQ-OAR-2018-0276-0168-A1, p.5] [Refer to page 9 of docket number EPA-HQ-OAR-2018-0276-0168-A1 for Figure 2.]

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[9] Graver B., Rutherford, D., & Zheng, S. (2019). "CO_2 emissions from commercial aviation: 2013, 2018, and 2019." https://theicct.org/publications/co2-emissions-commercial-aviation-2020
[10] Kharina, A.; Rutherford, D.; Zeinali, M. (2016). "Cost Assessment of Near- and Mid-term Technologies to Improve New Aircraft Fuel Efficiency." International Council on Clean Transportation. https://theicct.org/publications/costassessment-near-and-mid-term-technologies-improve-new-aircraft-fuel-efficiency

Organization: National Association of Manufacturers

Accordingly, EPA is proposing to use the fuel efficiency-based metric established by ICAO, which reasonably serves as a surrogate for controlling both the GHGs emitted by airplane engines, CO_2 and N2O".[3] The NAM agrees. [EPA-HQ-OAR-2018-0276-0149-A1, p.3]

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[3] Control of Air Pollution from Airplanes and Airplane Engines: GHG Emission Standards and Test Procedures, 85 Fed. Reg. 51556 (August 20, 2020), available at https://www.govinfo.gov/content/pkg/FR-2020-08-20/pdf/2020-16271.pdf.

Response:

The EPA acknowledges the comments in support of its proposed fuel efficiency metric which is consistent with the metric adopted by ICAO in its CO_2 emissions standards contained in Annex 16 Volume III. EPA is finalizing the proposed fuel efficiency metric.

The ICAO CO_2 standard was developed with the intent to improve the fuel efficiency of newly built products and ensure future airplane types would be at least as efficient as today's airplanes. The fuel efficiency metric chosen by ICAO, and the EPA, reflects this intended scope. The fuel efficiency metric was designed to be a measure of the technology and efficiency of an airplane. The EPA acknowledges that the ICAO fuel efficiency-based metric does not directly reward all potential means of fuel efficiency improvements, as described by the ICCT. In Section IV.A of the preamble, the EPA noted that the inability to define a standardized empty weight across manufacturers and types of airplanes led to ICAO CO_2 emissions standards based on MTOM rather than empty weight and prevented the metric from characterizing the payload of an airplane. However, for newly built airplanes weight savings are frequently traded to increase payload capacity or the range of the airplane.

The metric cannot characterize measures such as load factor or belly freight because of the lack of a definition of payload or airplane empty weight. However, even if these parameters were defined, they would need to be normalized because these parameters will vary by operator and route. The EPA notes, however, that the ICCT did not request that the EPA revise the fuel efficiency metric, but rather stated that the current metric implied the need for complimentary measures to reduce CO_2 emissions in use. Further, additional measures for in-service airplanes are outside of the scope of this action. However, further discussion on these types of measures can be found in section 17 of this document.

5. Applicability of the Proposed GHG Standards

Comments:

Organization: Airlines for America (A4A) and Air Line Pilots Association, International (ALPA)

B. The Proposed GHG Aircraft Engine Emissions Standards Should Be Clarified to Ensure, Consistent with the Authority Conferred by Section 231 of the Clean Air Act, they Apply to Aircraft Engine Emissions

As noted above, A4A and ALPA believe the aircraft-wide fuel-efficiency metric approach under the ICAO CO_2 Aircraft Standard can be reconciled with EPA's authority for regulating aircraft engine emissions in the unique case presented by the particular emissions at issue. However, we believe EPA needs to better reflect this in the structure of the Proposed Rule. We are concerned that as presently worded proposed section 1030.1(a) could be read to assert regulatory authority more broadly over aircraft than authorized under Section 231. To make clear that EPA is regulating emissions from aircraft engines consistent with its authority, we respectfully request the provision be amended to read:

(a) ~~Except as provided in paragraph (c) of this section, when an~~ Greenhouse Gas (GHG) emissions from an aircraft engine subject to 40 CFR part 87 shall not exceed levels such that the aircraft ~~is installed on an airplane that is described in this section and subject to title 14 of the Code of Federal Regulations, the airplane may not~~ exceeds ~~the Greenhouse Gas (~~GHG~~)~~ standards of this part when

~~certification under title 14 is sought~~ when the engine is installed on: [EPA-HQ-OAR-2018-0276-0161-A1, pp.11-12]

Response:

The commenter does not express what language in 1030.1(a) they believe exceeds EPA's authority under Section 231. The EPA worked closely with the FAA to ensure that the scope of applicability section 1030.1(a) is within our authority under CAA Section 231 to control aircraft engine GHG emissions and doesn't impinge on FAA's authority to regulate airplane certification. Also, together the EPA and FAA concluded that while the standards account for characteristics of airplane design as adopted by ICAO, the EPA is not asserting independent regulatory authority over airplane design in this rulemaking. Rather, the form of the standards necessarily takes account of non-engine airplane factors that affect fuel efficiency and therefore aircraft engine GHG emissions.

The EPA sees a couple of issues with the commenters' proposed language compared to the text proposed by the EPA.

1. The commenters' proposed language expands the scope of 1030.1(a) by replacing "airplane" with "aircraft." This rule and the ICAO standards both apply to airplanes, rather than all aircraft. Airplanes are a subset of aircraft, and this applicability statement was written to reflect this subset.

2. The commenters' proposed language does not include the reference to exceptions in paragraph (c), again expanding the scope of the applicability provision.

3. The commenters' proposed language removes the references to title 14 for certification. This title 14 text was purposely included to limit the scope of the rule to specific applicability, which does not include all aircraft or all engines. It is limited to engines on airplanes seeking certification under title 14.

For these reasons The EPA is not incorporating these commenters' proposed changes into part 1030.1(a)

5.1. Covered Airplane Types

Organization: International Council on Clean Transportation (ICCT)

EPA should apply its CO_2 standard to supersonic aircraft.

EPA's proposed standard is tied to its endangerment finding, which is specific to subsonic aircraft powered by turbofan and turboprop engines and weighing more than 5700 and 8618 kg MTOM, respectively. It is expected that turbofan engines will also power the supersonic transport (SST) aircraft under development by manufacturers including Boom Supersonic, Aerion Aerospace, Virgin Galactic, and others. Those aircraft could add an additional 96 million tonnes of CO_2 to the global aviation inventory should manufacturers meet their 2035 sales goals, and expose parts of the United States to sonic boom as frequently as every 5 minutes.[11] [EPA-HQ-OAR-2018-0276-0168-A1, p.5-6]

From a climate and human health perspective, there is little difference between CO_2 emitted from a subsonic versus supersonic aircraft; moreover, most near-term SST designs are meant to use existing subsonic engine cores. For this reason, EPA should apply ICAO's recommended new-type and in-production CO_2 limit values to supersonic designs until such time that data is available to set alternative standards. [EPA-HQ-OAR-2018-0276-0168-A1, p.6]

[11] See Rutherford, D.; Graver, B.; Chen, C. (2019). "Noise and climate impacts of an unconstrained commercial supersonic network." International Council on Clean Transportation. https://theicct.org/publications/noise-climateimpacts-unconstrained-supersonics

Response:

The EPA is aware of increased interest in bringing back civil supersonic airplanes. Further, the EPA is participating in work at ICAO to review emission standards for supersonic aircraft engines and develop CO_2/GHG standards for supersonic airplanes. With that said, the EPA's 2016 Findings were limited to GHG emissions from jet and propeller engines installed on subsonic airplanes, thus limiting the scope of EPA's authority and duty to promulgate aircraft engine GHG emission standards. The EPA plans to continue to monitor the development of these new supersonic aircraft engines and airplanes as they progress closer to market and to continue working at ICAO on international standards. Before the EPA could propose GHG standards for supersonic airplanes it would need to determine that GHG emissions from such supersonic aircraft engines cause or contribute to air pollution which may reasonably be anticipated to endanger public health or welfare.

Organization: California Air Resources Board (CARB)

EPA excluded a variety of aircraft from the proposed standard, because ICAO excludes them.[73] These include small turboprop planes, small business jets, small piston engines, and helicopters, along with military equipment. As EPA acknowledges, these categories of aircraft comprise 11 percent of total U.S. aircraft GHG emissions.[74] Using TSD data regarding 2015 U.S.-operated flights, CARB calculated that roughly 22.4 percent of flights originating in the U.S. were excluded from EPA's consideration.[75] While the proposal preamble notes, accurately, that EPA's 2016 endangerment finding for aircraft GHG emissions did not make a contribution finding for these aircraft,[76] the endangerment finding also states, "[T]his final action does not restrict the EPA's future discretion to address GHG emissions from aircraft that are not included in the scope of this finding, or prejudge how the Agency would respond to a petition to address those GHG emissions should one be submitted in the future."[77] While exceptions to the GHG standards for military aircraft and firefighting may be appropriate, EPA should consider appropriate standards for the remaining categories of smaller aircraft. Moreover, rather than categorically excluding aircraft based on potential use, EPA should consider exemptions based on actual use. For instance, helicopters may be used for aerial firefighting as well as other purposes, such as tourism or general transportation. These vehicles should be subject to emissions standards. [EPA-HQ-OAR-2018-0276-0169-A1, pp.17]

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[73] 85 Fed. Reg. at 51,565.
[74] Id. at 51,563.
[75] Proposal TSD at 83.
[76] 85 Fed. Reg. at 51,562.
[77] 81 Fed. Reg. at 54,469.

Response

As CARB noted, the 2016 Findings did not prejudge our ability to issue Findings in the future for additional types of aircraft besides those covered in 2016 and addressed in our rule here. However, the EPA did not propose such a determination, and therefore cannot in this rulemaking make such a final decision on that issue.

Additionally, applying the current standards to some of these other categories of aircraft would introduce new issues that the EPA has not considered. For example, the GHG metric and test procedures in this rule would not work for aircraft such as helicopters. There are also differences in technology available and different users (fewer commercial owners/operators) for these other categories of aircraft that would need to be evaluated. Therefore, more time and stakeholder involvement would be required before GHG standards for any other categories of aircraft could be proposed.

5.2. New Type Design Airplanes

Comments:

Organization: Airbus S.A.S. (Airbus)

Comment 4 – §V.C.2 Regulatory limits for New Type Designs

Extract: "Airplanes of less than 60 tons with 19 passenger seats or fewer have additional economic challenges…"

Comment: It should be clarified that it is applicable to "Jet airplanes" only, as the corresponding three years delay in the applicability requirement (i.e. January 1st, 2023 instead of January 1st, 2020) does not concern turboprop aircraft of less than 60 tons. [EPA-HQ-OAR-2018-0276-0148-A1, p.3]

Response:

This comment is consistent with the proposed and final regulations, and we added clarification text to the discussion of covered new type airplanes in the Preamble.

5.3. In-Production Airplanes

Comments:

Organization: Air Line Pilots Association's Air Safety Organization

[The following comments were submitted as testimony at the virtual public hearing on September 17, 2020.]

It is very important, therefore, that any future emissions-compliant measures be reasonable and practical, not far-reaching and potentially onerous. In this regard, therefore, we are pleased that the agency expects that nearly all airplanes affected by this rule will be compliant with the emissions standards by the respective effective dates for the new type designs and for end-production airplanes. This includes the expectation that existing-in-production airplanes that are noncompliant will either be modified and recertified as compliant or will likely go out of production before the production compliance date of January 1st, 2028. Aircraft fleet compliance with the proposed emissions standards established by ICAO in 2017, to which the rule would set an equivalent level, reflect the incredible work which the aircraft manufacturers and airlines have done to reduce greenhouse gas emissions over the past several decades.

Response:

The EPA thanks the commenter for their input on the rule. We are finalizing the in-production standards as proposed.

Organization: Airbus S.A.S. (Airbus)

Comment 5 – §V.D.1 Applicability Dates for In-Production Airplane Types

Extract: "All airplanes type certificated prior to January 1, 2020, and newly built after January 1, 2028, would be required to comply with the proposed in-production rule."

Comment: The term “newly built” is misleading, as an aircraft could be manufactured before January 1st, 2028, and then stored in the manufacturer’s facilities before receiving a certificate of airworthiness after January 1st, 2028. We propose amending the text as follows: “All airplanes type certificated prior to January 1, 2020, and receiving a certificate of airworthiness after January 1, 2028, would be required to comply with the proposed in-production rule.”

Comment 6 – §V.D.1 Applicability Dates for In-Production Airplane Types

Extract: “After January 1, 2023, and until January 1, 2028, an applicant that submits a modification to the type design of a non-GHG certificated airplane that increases the Metric Value of the airplane would be required to demonstrate compliance with the in-production rule.”

Comment: It should be clarified that it would only concern modifications to the type design that increase the Metric Value above a certain threshold, but not all modifications that increase the Metric Value. [EPA-HQ-OAR-2018-0276-0148-A1, p.3]

Response:

This comment is consistent with the proposed and final regulations, and we added clarification text to the discussion of covered in-production airplanes in §IV.D.1 of the Preamble.

5.4. In-Service Airplanes

Comments:

Organization: Anonymous Public Comment 1

In addition, since these standards will only apply to future or in current production air-craft, there will not be too much of a financial burden for companies to retrofit older airplanes. [EPA-HQ-OAR-2018-0276-0079, p.1]

Organization: Anonymous Public Comment 17

The significance of GHG emissions have been increasingly detrimental to the environmental air quality, both nationally, and globally. This is especially applicable to the aviation industry, as it contributes impactfully to environmental climate changes, due to these emissions of greenhouse gasses. Thus, being transparent in adjustment to effectively reducing these emissions is important, and vital to pushing towards positive change. To integrate this rule would mean to allow for a slight reduction of these emissions, while pushing towards a more manageable means of flight. However, there should be an adjustment regarding specifications towards what these rules should be set for, especially in relation to existing older models of aircraft and procedures that are still being used to this day, as those also aid in a large amount to contributions of GHGs. If we are going to find a way to truly ensure a sustainable future for the world, we need to adjust our systems regarding the aviation industry as a whole, not just seeking adjustment towards any newer models that are being integrated. [EPA-HQ-OAR-2018-0276-0134, p.1]

Organization: Anonymous Public Comment 19

The EPA also needs to set standards for old as well as new aircraft that include other air quality emissions such as fine particulate matter, and set lower standards for lead allowed in fuel for single engine planes. [EPA-HQ-OAR-2018-0276-0146, pp.1-2]

Organization: Boeing Company (Boeing)

Some commenters on the 2015 ANPRM have also argued that EPA should develop standards applicable to all aircraft.[131] Specifically, they assert that EPA "must assess what reductions could be achieved by regulating existing aircraft that are not undergoing modifications, and should consider the implementation of regulations that apply to the most polluting aircraft."[132] ICAO, EPA, and the FAA have thoroughly considered to what aircraft types the GHG standards should apply and when. The ICAO CO_2 standard applies to new aircraft type designs from 2020, and to changes to aircraft type designs for in-production aircraft starting in 2023. Those in-production aircraft that do not meet the standard by 2028 will no longer be able to be produced unless their designs are sufficiently modified to meet the standard[133] or they are granted relief under a Member State's implementation of the standard. Thus, only "in-service" aircraft are beyond the scope of regulation under the ICAO standard,[134] and those aircraft are excluded for good reason: the costs of retrofitting in-service aircraft with any fuel-saving technologies beyond those that would be installed anyway by the owner/operator to reduce operating costs would likely be "prohibitively expensive,"[135] and the ICAO standard already assures that that in-service aircraft will be replaced over time with newer, more fuel-efficient aircraft.[136] In the meantime, however, U.S. airlines are in a very challenging financial position due to the COVID-19 pandemic, strongly militating against the imposition of any unnecessary costs or competitive disadvantage though this rulemaking. As described in the ANPRM and in this proposed rule, the scope of the new standards is both reasonable and well-reasoned. [EPA-HQ-OAR-2018-0276-0181-A2, pp.30-31]

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[131] Environmental NGO 2015 ANPRM Comments at 19.
[132] Id.
[133] 85 Fed. Reg. at 51,558 ("[E]xisting in-production airplanes that are non-compliant will either be modified and re-certificated as compliant or will likely go out of production before the production compliance date of January 1, 2028.").
[134] 85 Fed. Reg. at 51,566 ("The proposed in-production standards would only be applicable to previously type certificated airplanes, newly-built on or after the applicability date ... and would not apply retroactively to airplanes that are already in-service." (emphasis added)).
[135] ATAG Fact Sheet, Q&A: THE ICAO CO_2 STANDARD FOR AIRCRAFT, at 3 (Nov. 2016) ("A certain amount of retro-fitting already takes place under the 'operations' pillar of the industry's four-pillar strategy for reducing emissions…. However, retrofitting new engines or making substantial changes to the airframe of existing in-service aircraft is prohibitively expensive. Whilst it will take place over time, in-service aircraft are anyway being replaced with newer aircraft. The CO_2 Standard will ensure that these newer aircraft are more efficient."), available at https://www.atag.org/component/attachments/?task=download&id=307:FACT-SHEET_CO2Standard.
[136] The aircraft replacement process, as discussed in Section I.D., above, is being hastened by the COVID-19 pandemic as airlines accelerate retirement of older, less fuel-efficient airplanes.

Organization: California Air Resources Board (CARB)

II. EPA should regulate stages and categories of aircraft omitted from the ICAO standard.

The proposed rule would apply the proposed in-production standards only to airplanes built on or after January 1, 2028, along with in-production airplanes that have any modification that triggers the change criteria after January 1, 2023.[67] Incorporating the technologies and measures described above would make more stringent standards eminently achievable for both new type designs and in-production aircraft.[68] Because aircraft have average service lives of 25 to 27 years,[69] EPA's failure to consider or propose requirements for in-service aircraft is a significant omission.

EPA should add requirements for in-service aircraft types. Without any need for retrofit, these could include drop-in SAFs and measures to reduce emissions from landing, takeoff, taxi, and idling, which could be bolstered by limited offsets to the extent allowed by law. Incorporating retrofits adds significant additional reduction opportunities. Retrofits generally achieve CO_2 metric value reductions of 3 to 5 percent via a combination of wingtip devices and engine performance improvement packages.[70] However, some retrofit wingtip devices alone can provide the emissions reductions associated with fuel savings of 4 to 6 percent, and an alternative design dubbed “spiroid winglets” reduces fuel consumption by over 10 percent.[71] Airframe retrofits, including wingtip devices, riblets (coatings or etchings that reduce drag), and lightweight cabin furnishings, reduce jet fuel burn by 6 to 12 percent.[72] [EPA-HQ-OAR-2018-0276-0169-A1, pp.16-17]

EPA should also consider additional regulatory designs and policy levers. For example, more stringent pass/fail phase-out for individual in-service aircraft would accelerate the retirement of non-compliant aircraft. The agency should consider a declining fleet average standard to increase potential reductions in aircraft GHG emissions each year. Such a standard could incorporate additional tiers to the pass/fail standards, which require an increased portion of a fleet's aircraft to meet more stringent emission reduction requirements over time.[78] If EPA incorporates an averaging, banking, and trading program into its standard, even using a portion of these aircraft will reduce fleetwide emissions, with far more significant reductions than the proposed do-nothing standard. [EPA-HQ-OAR-2018-0276-0169-A1, p.17]

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[67] 85 Fed. Reg. at 51,558.
[68] Similarly, EPA should strengthen the new type design rule by creating a more stringent emissions standard. However, “New type designs are infrequent, and it is not unusual for new type designs to take 8-10 years to develop, from preliminary design to entry into service.” 85 Fed. Reg. at 51,566. With a more stringent standard, CARB also recommends EPA reassess the implementation timeline to give manufacturers adequate time to comply.
[69] U.S. Dept. of Transportation, Bureau of Transportation Statistics, Average Age of Aircraft 2019, available at https://www.bts.gov/average-age-aircraft-2019; D. Forsberg, “Aircraft Retirement And Storage Trends,” Aviation Report (2015), available at https://aviation.report/Resources/Whitepapers/c7ca1e8f-fd11-4a96-9500-85609082abf7_whitepaper%201.pdf.
[70] Brandon Graver and Dan Rutherford, ICCT, “U.S. Passenger Jets Under ICAO’s CO_2 Standard, 2018-2038” (Oct. 2, 2018), available at https://theicct.org/sites/default/files/publications/Aircraft_CO2_Standard_US_20181002.pdf.
[71] NASA, “Winglets Save Billions of Dollars in Fuel Costs” (2010), https://spinoff.nasa.gov/Spinoff2010/t_5.html.
[72] IATA, Technology Roadmap for Environmental Improvement, Fact Sheet (Dec. 2019), available at https://www.iata.org/contentassets/8d19e716636a47c184e7221c77563c93/factsheet- technology-roadmap-environment.pdf.
[78] Dan Rutherford, ICCT, “Standards to Promote Airline Fuel Efficiency” (May 2020), available at https://theicct.org/sites/default/files/publications/Airline-fuel-efficiency-standard-2020.pdf.

Organization: Center for Biological Diversity, et al.

[The following comments were submitted as testimony at the virtual public hearing on September 17, 2020.]

Second, the standard should apply not just to new aircraft but to all aircraft.

Organization: Center for Biological Diversity, Earthjustice, on behalf of the Sierra Club and Friends of the Earth, and the Natural Resources Defense Council (NRDC)

A. Standards should apply to new and existing aircraft.

EPA has the authority to regulate in-use aircraft and must use it to work toward decarbonization of the sector in line with what climate science and equity demand. Even if the Proposal were to set more stringent engine emission standards, they would be insufficient to curb aviation-related emissions without applying to in-service aircraft because planes have decades long lifespans.[168]

In contrast to other mobile source provisions that limit standard-setting authority to “new” engines and vehicles, section 231 does not distinguish between new and existing sources. Section 231 instead authorizes EPA to establish emission standards for “any class or classes of aircraft engines.”[169] Thus, EPA is empowered to regulate emissions from both new and existing aircraft. In fact, EPA has always interpreted section 231 in this way. The emissions controls EPA first adopted in 1973 included retrofit standards for in-use aircraft engines.[170] In 2008, EPA referred to its ability to regulate "previously certified engines" and to setting standards based on fleet average performance.[171] In 2015, EPA again reiterated its understanding that section 231 authorizes regulation of existing aircraft.[172]

EPA has not explained why it has abandoned these approaches. EPA should consider implementing regulations that apply to the most polluting aircraft, regardless of their status as existing or new.[173] At a minimum, EPA must consider applying its standards to all classes of aircraft, including in-service aircraft in addition to all new-in production aircraft and new designs, and provide a reasonable explanation for any decision not to regulate them.[174] [EPA-HQ-OAR-2018-0276-0150-A1, pp.24-25]

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[168] Aircraft are generally assumed to have about a 25-30 year lifespan. 73 Fed. Reg. at 44,471.
[169] 42 U.S.C. § 7571(a)(2)(A) (1990); compare section 7571(a)(2)(A), with section 7521(a)(1) (authorizing emission standards for "any class or classes of new motor vehicles or new motor vehicle engines"). "Where Congress includes particular language in one section of a statute but omits it in another section of the same Act, it is generally presumed that Congress acts intentionally and purposely in the disparate inclusion or exclusion." Bates v. United States, 522 U.S. 23, 29-30 (1997) (internal quotations and citations omitted).
[170] Control of Air Pollution from Aircraft and Aircraft Engines, 38 Fed. Reg. at 19,089.
[171] Regulating Greenhouse Gas Emissions Under the Clean Air Act, 73 Fed. Reg. at 44,472.
[172] Proposed Finding That Greenhouse Gas Emissions From Aircraft Cause or Contribute to Air Pollution That May Reasonably Be Anticipated To Endanger Public Health and Welfare and Advance Notice of Proposed Rulemaking, 80 Fed. Reg. at 37,791 n.203 (citing fuel venting and smoke number standards that applied to in-use aircraft and noting that "unlike the EPA's authority to promulgate emission standards for motor vehicles under CAA section 202(a) or for nonroad engines and vehicles under section 213(a), section 231 of the CAA does not restrict the EPA's authority to set standards for only new aircraft.").
[173] Such phase-out regulations could be modeled on FAA's regulations to phase out the loudest civil turbojet aircraft. See Adoption of Statutory Prohibition on the Operation of Jets Weighing 75,000 Pounds or Less That Are Not Stage 3 Noise Compliant, 78 Fed. Reg. 39,576 (July 2, 2013) (prohibiting the operation of jet airplanes with a maximum weight of 75,000 pounds or less in the contiguous United States after December 31, 2015, unless they meet Stage 3 noise levels).
[174] See, e.g., State Farm, 463 U.S. at 47-49 (reaffirming that "an agency must cogently explain why it has exercised its discretion in a given manner").

Organization: Chesapeake Bay Foundation, Inc. (CBF)

EPA should also add a deadline for in-service aircraft to comply with the GHG standards or be phased out. Although aircraft manufacturers are expected to meet the proposed standards when producing aircraft, some airlines have older fleets that would not meet the GHG standards if required to by 2028.[48] The average age of aircraft operating in the United States is between 11 and 13 years old, so applying the GHG standards to in-service aircraft will be essential to realizing aircraft GHG reductions.[49] [EPA-HQ-OAR-2018-0276-0093-A1, p.7]

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[48] Id. at 4-5.
[49] Id. at 4.

Organization: Environmental Protection Network (EPN)

EPA's requirements should apply to all aircraft taking off or landing at US airports, so they would serve to raise the bar for aircraft worldwide. [EPA-HQ-OAR-2018-0276-0155-A1, pp.1-2]

Organization: International Council on Clean Transportation (ICCT)

The recommended in-production standard should be applied soon to in-service aircraft and tightened over time.

The EPA can also exercise its regulatory authority over in-service aircraft and their engines, and through their procurement, operations, and retirement, emissions from airlines themselves. In its 2008 Advance Notice of Proposed Rulemaking, EPA argued that it could “directly regulate airline fleet average GHG emissions” through its authority over both new and in-service aircraft engines.[6] Regulation of in-service aircraft is reasonable given that the average new aircraft delivered in 2016, the year that the ICAO standard was finalized, already complied with the 2028 requirements. So the proposed standard lags state of the art technology by more than 10 years. While it is too weak to accelerate investments in new fuel-efficient aircraft and engines, ICAO’s recommended standard could support fleet renewal and expanded markets for new, more fuel-efficient aircraft if applied to airlines. [EPA-HQ-OAR-2018-0276-0168-A1, p.3-4]

Research suggests that ICAO’s recommended 2028 standard would be appropriate for inservice aircraft (i.e. most airlines would meet the 2028 standard even with their fleets). Specifically, one projection concluded that seven mainline carriers and all regional carriers, accounting for 82% of U.S. traffic in 2017, would pass the standard if applied to them in 2028.[7] Most of the remaining airlines would also comply after modest (less than 2%) fuel efficiency improvements. Note that this analysis does not take into account fleet turnover due to the COVID pandemic. Applying the in-production CO_2 standard to in-service aircraft, and requiring additional improvements over time, could promote early retirement of less fuel-efficient models and support U.S. airframe and engine manufacturers during this difficult economic period.[8] [EPA-HQ-OAR-2018-0276-0168-A1, p.4]

These include investigating a more ambitious phase of the new-type standard around 2030 and applying the 2028 in-production standard to in-service aircraft to promote the retrofit and retirement of older, less efficient designs. [EPA-HQ-OAR-2018-0276-0168-A1, p.6]

[The following comments were submitted as testimony at the virtual public hearing on September 17, 2020.]

we have thus far identified five areas of refinement in the proposed rule, namely that,

three, that the in-production standard should be tightened by applying it to in-service, rather than just new engines;

Three, the in-production standards should be tightened and applied to in-service aircraft. The EPA can also exercise its regulatory authority over in-service aircraft engines and through their procurement operations and retirement over airlines themselves. This is necessary because the average new aircraft delivered in 2016, the year before ICAO’s standard was finalized, already complied with the 2028 requirements. Thus, the proposed standard lags state-of-the-art technology by more than 10 years and cannot accelerate investments in more fuel-efficient aircraft and engines.

Research suggests that most airlines will meet the 2028 standards with their fleets. Specifically, seven mainline carriers and all regional carriers, accounting for more than 80 percent of U.S. traffic in 2017, would pass the standard if applied to them in 2028. Most of the remaining airlines would comply after less than 2 percent fuel efficiency improvements. Note that this analysis does not take into account recent fleet turnover due to the COVID pandemic. Applying the in-production CO_2 standard to in-service aircraft and requiring additional improvements over time would promote the early retirement of less fuel-efficient models and support U.S. airframe and engine manufacturers during this difficult period.

[6] Federal Register, Vol. 73, No. 174. 30 July 2008. pg. 44472.

[7] Graver, B.; Rutherford, D. (2018). "U.S. Passenger Jets under ICAO's CO_2 Standard, 2018-2038." International Council on Clean Transportation. https://theicct.org/publications/us-passenger-jets-icao-co2-standard
[8] See Rutherford, D. (2020) "Standards to promote airline fuel efficiency." International Council on Clean Transportation. https://theicct.org/publications/airline-standard-2020 for options to implement fuel efficiency requirements for airlines.

Organization: National Association of Clean Air Agencies

III. NACAA's Recommendations

Fourth, EPA should pursue opportunities for establishing standards to address emissions from in use aircraft – for example, by requiring that in-use aircraft be retrofitted with winglets to reduce aerodynamic drag and increase fuel efficiency. [EPA-HQ-OAR-2018-0276-0177-A1, p.4]

Organization: National Tribal Air Association

There are several possibilities for effectively lowering emissions from the aviation industry that are within the EPA's control:

2. Apply the standards to in-service aircraft, rather than only to new aircraft. [EPA-HQ-OAR-2018-0276-0179-A1, p.3]

Organization: Quiet Skies Coalition

Certifying individual aircraft engines for compliance for certain emission factors never considers the thousands of older, dirtier engines operating at a single location on a daily basis.

Emission estimates for Sea-Tac Airport aircraft and ground support vehicles for 2017 from EPA's use of AEDT model found toxic and criteria emissions to be 13,694 tons per year not considering CO_2. The sulfur alone at Sea-Tac is four times higher than the highest emitting industry in the entire region. The CO_2 is double the highest industry producer of GHG in Western Washington which was threatened with legal action by a state agency due to its inventory. But when you consider all emission sources in the State of Washington, Sea-Tac Airport is by far the single largest producing facility and the only one without any source controls. [EPA-HQ-OAR-2018-0276-0081-A1, p.2]

This same problem will curtail any real reductions in CO2 over time. Even though single aircraft engines will meet certain standards, overall aviation industry expansion will either negate any gains or even undo other sectors due to a massively increasing industry. If an engine meets a standard but 10 are added at the same time, it is of little gain, especially when the goals for reduction are so small and so far into the future. [EPA-HQ-OAR-2018-0276-0081-A1, p.2]

Airports themselves should be controlled as sources by EPA and rather than certifying individual engines, fuel use at airports should be kept at 2020 levels even if that means using alternate fuels or propulsion like hybrid or electric planes for short-hop commuter trips. [EPA-HQ-OAR-2018-0276-0081-A1, p.2]

Organization: Washington State Department of Ecology (Ecology)

Specifically, the rule should:

- Establish standards to address emissions from in-use aircraft — for example, by requiring that in-use aircraft be retrofitted with winglets to reduce aerodynamic draft and increase fuel efficiency. [EPA-HQ-OAR-2018-0276-0140-A1, p.5]

Organization: Hahnel, Tanya

[The following comments were submitted as testimony at the virtual public hearing on September 17, 2020.]

The fact that you are not taking this opportunity to regulate in-service engines and in-service planes, rather than just new ones is incredibly disappointing in my opinion because I know as someone who flies regularly that that is a missed opportunity. There are a lot of older-planes out there that are continuing to pollute at our airports and affect the health and welfare of the children and families who are breathing that air around the airports. And we could be regulating them. So I would like to see the EPA step up on that front.

Response:

The EPA agrees with commenters that it has the authority to regulate aircraft engines installed on in-service airplanes in addition to aircraft engines installed on newly produced airplanes. However, as part of this action the EPA has not established any record that would allow it to propose or finalize any GHG standards for in-service airplanes. For example, the technologies available to retrofit in-service airplanes are more limited than for newly produced airplane. Also, the cost and certification burden of the standard would be transferred from the manufacturer to the operator of the airplane. This rule was not intended to cover every possible aspect of GHG emissions from airplanes or be the EPA's final input on the topic. Rather as a starting point, the EPA decided that ICAO's initial approach to regulate newly built airplanes was appropriate. As we described in the Preamble there are significant benefits to harmonizing our rule with the ICAO standards. Thus, like ICAO, we are not at this time prepared to adopt standards for in-service airplanes.

5.5. Exceptions

Comments:

Organization: Airbus S.A.S. (Airbus)

Comment 8 – §1030.1(c)(4) – Applicability Exceptions

Extract: “(4) Airplanes initially designed, or modified and used, for specialized operations. These airplane designs may include characteristics or configurations necessary to conduct specialized operations that the EPA and the FAA have determined may cause a significant increase in the fuel efficiency metric value.”

Comment: There is no clear information proposed here to delineate what it really means. However, §V.B.3 “Exceptions” of this NPRM is more informative as it provides some examples of when such exception could be applicable, in line with guidance of ICAO document 9501 “Environmental Technical Manual Volume III” §2.1.3. We suggest that the rule provides such examples in Section 1030. [EPA-HQ-OAR-2018-0276-0148-A1, p.4]

Organization: Aerospace Industries Association (AIA)

Specific comments on the EPA’s proposed rule

AIA reiterates its support for the EPA’s proposal to adopt rules consistent with the ICAO CO_2 standard. In reviewing the draft rule, we have identified some specific areas where the EPA’s regulations would create inconsistency with what was developed through ICAO.

ICAO’s CO_2 standard explicitly acknowledges that it should only be applicable to civil aircraft, and shall not be applicable to state aircraft, such as those used by military, customs and police services. The ICAO standard also does not apply to amphibious aeroplanes, aeroplanes initially designed or modified for specialized operational requirements[11] and used as such, aeroplanes designed with zero reference geometric factor (RGF), and those aeroplanes specifically designed or modified and used for fire-fighting purposes.

These decisions around applicability of ICAO's CO_2 rule were made because "these special categories of aircraft are limited in numbers and have specific technical characteristics resulting in very different CO_2 metric values compared to all other aeroplane types in the proposed applicability scope".[12] As a result, it can be much more difficult and costly for these aircraft to meet the required standard. Subsequently, in its 2016 endangerment finding for aircraft greenhouse gas emissions, the EPA did not include emissions from aircraft outside of those that would be covered by the ICAO rule when making its determination that greenhouse gas emissions from certain classes of engines used in aircraft contribute to the air pollution that causes climate change endangering public health and welfare under section 231(a) of the Clean Air Act.

Given ICAO's decision to not subject these categories of aircraft to the international aircraft CO_2 standard, subsequently including these aircraft within the applicability of U.S. domestic regulations would put U.S. manufacturers of these aircraft at a substantial competitive disadvantage to those elsewhere. While the EPA's proposed regulatory text does state the rule will not apply to the same categories of aircraft that the ICAO rule excludes, the EPA should ensure that the final rule references the full list of specialized operational requirements listed by ICAO.

To aid understanding by manufacturers of future aircraft, the EPA should also include wording within the final regulatory text that explicitly states the rule does not apply to state aircraft, such as those used by military, customs and police services, or other types of aircraft such as rotorcraft or piston-engine aircraft, by firstly making the following amendments to Section 1030.1(a):

(a) Except as provided in paragraph (c) of this section, when an aircraft engine subject to 40 CFR part 87 is installed on an airplane that is a civil aircraft and described in this section and subject to Title 14 of the Code of Federal Regulations, the airplane may not exceed the Greenhouse Gas (GHG) standards of this part when certification under Title 14 is sought.

Secondly, by adding the following to the list of aircraft not covered by the rule in Section 1030.1(c):

(7) Military aircraft (including variants). For purposes of this definition a "military aircraft" shall be an aircraft described in paragraph (2) of the definition of "public aircraft" in section 1030.105.

(8) Airplanes that are initially certified as civil aircraft during the production process but immediately converted to military aircraft.

(9) Rotorcraft, including helicopters.

(10) Piston-engine aircraft.

And finally, by including the following definitions in Section 1030.105:

Civil Aircraft has the meaning given in 14 CFR 1.1, aircraft other than public aircraft.

Public aircraft has the meaning given in 14 CFR 1.1, any of the following aircraft when not being used for a commercial purpose or to carry an individual other than a crewmember or qualified non-crewmember:

(1) An aircraft used only for the United States Government; an aircraft owned by the Government and operated by any person for purposes related to crew training, equipment development, or demonstration; an aircraft owned and operated by the government of a State, the District of Columbia, or a territory or possession of the United States or a political subdivision of one of these governments; or an aircraft exclusively leased for at least 90 continuous days by the government of a State, the District of Columbia, or a territory or possession of the United States or a political subdivision of one of these governments.

(i) For the sole purpose of determining public aircraft status, commercial purposes means the transportation of persons or property for compensation or hire, but does not include the operation of an aircraft by the armed forces for reimbursement when that reimbursement is required by any Federal statute, regulation, or directive, in effect on November 1, 1999, or by one government on behalf of another government under a cost reimbursement agreement if the government on whose behalf the operation is conducted certifies to the Administrator of the Federal Aviation Administration that the operation is necessary to respond to a significant and imminent threat to life or property (including natural resources) and that no service by a private operator is reasonably available to meet the threat.

(ii) For the sole purpose of determining public aircraft status, governmental function means an activity undertaken by a government, such as national defense, intelligence missions, firefighting, search and rescue, law enforcement (including transport of prisoners, detainees, and illegal aliens), aeronautical research, or biological or geological resource management.

(iii) For the sole purpose of determining public aircraft status, qualified noncrewmember means an individual, other than a member of the crew, aboard an aircraft operated by the armed forces or an intelligence agency of the United States Government, or whose presence is required to perform, or is associated with the performance of, a governmental function.

(2) An aircraft owned or operated by the armed forces or chartered to provide transportation to the armed forces if -

(i) The aircraft is operated in accordance with title 10 of the United States Code;

(ii) The aircraft is operated in the performance of a governmental function under title 14, 31, 32, or 50 of the United States Code and the aircraft is not used for commercial purposes; or

(iii) The aircraft is chartered to provide transportation to the armed forces and the Secretary of Defense (or the Secretary of the department in which the Coast Guard is operating) designates the operation of the aircraft as being required in the national interest.

(3) An aircraft owned or operated by the National Guard of a State, the District of Columbia, or any territory or possession of the United States, and that meets the criteria of paragraph (2) of this definition, qualifies as a public aircraft only to the extent that it is operated under the direct control of the Department of Defense. [EPA-HQ-OAR-2018-0276-0167-A1, pp.7-10]

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[11] ICAO notes the following examples of specialized operational requirements within Doc 9501 Environmental Technical Manual Volume III – Procedures for the CO2 Emissions Certification or Aeroplanes First Edition, 2018, Chapter 2, 2.1.3: a) aeroplanes that are initially certified as civil aeroplanes during the production process but immediately converted to military aeroplanes; b) a required capacity to carry cargo that is not possible by using less specialized aeroplanes (e.g. ramped, with back cargo door); c) a required capacity for very short or vertical take-offs and landings; d) a required capacity to conduct scientific, research or humanitarian missions exclusive of commercial service; or e) similar factors.

[12] ICAO, Doc 9501 Environmental Technical Manual Volume III, Chapter 2, 2.1.2.

Organization: Boeing Company (Boeing)

EPA should make the following technical corrections to better align part 1030 to the ICAO standard:

(1) clarify in the final rule that part 1030 only applies to “civil aircraft” and that “public aircraft,” including military aircraft, are outside of the scope of those regulations consistent with the Chicago Convention and the ICAO standard;

(2) clarify in the final rule that it excepts from coverage airplanes that are initially certified as civil aircraft during the production process but immediately converted to public aircraft consistent with the Chicago Convention and the ICAO standard; and [EPA-HQ-OAR-2018-0276-0181-A2, pp.1-2]

V. EPA Should Clarify that the CO_2 Standard Only Applies to “Civil Aircraft” and Does Not Apply to “Public Aircraft,” Including Military Aircraft.

EPA should make clear in the text of the final rule that: (1) 40 C.F.R. part 1030 applies only to "civil aircraft" as defined in 14 C.F.R. § 1.1 and that, therefore, "public aircraft" as also defined in 14 C.F.R. §1.1 (including military aircraft) are outside of the scope of these regulations; and (2) part 1030 excepts from coverage airplanes that are initially certified as civil aircraft during the production process, but immediately converted to military aircraft. Both of these clarifications are consistent with the Chicago Convention, as well as the ICAO standard and its interpretation, both of which rely on the "certifying authorities" of Member States to implement the standard.146 [EPA-HQ-OAR-2018-0276-0181-A2, p.32]

A. The Chicago Convention and ICAO Standard Exclude "State Aircraft," Including All Military Aircraft, and EPA's Final CO_2 Standard Should Expressly Implement that Exclusion.

Pursuant to the Chicago Convention, the ICAO CO_2 Standard is limited to "civil aircraft" and does not include "state aircraft." As emphasized in the ICAO Environmental Technical Manual Vol. III (Procedures for the CO_2 Emissions Certifications of Aeroplanes First Edition, 2018),147 at section 2.1.1:

The Convention on International Civil Aviation, Article 3, specifically states that it is not applicable to state aircraft and provides some examples (see below), but this can also include specific flights carrying official government representatives:

"a) This Convention shall be applicable only to civil aircraft, and shall not be applicable to state aircraft.

b) Aircraft used in military, customs and police services shall be deemed to be state aircraft." [EPA-HQ-OAR-2018-0276-0181-A2, p.33]

Boeing believes that EPA intends that the part 1030 standard also apply only to "civil aircraft," consistent with the ICAO standard; the proposed rule text should be revised, however, to make even more clear that the scope of the rule is limited to "civil aircraft," and does not include "public aircraft" (the 14 C.F.R § 1.1 term equivalent to the ICAO term "state aircraft," as discussed below). [EPA-HQ-OAR-2018-0276-0181-A2, p.33]

The preamble to the proposed rule makes clear that EPA intends limit the scope of 1030 to "civil aircraft." In describing the entities to which the proposed rulemaking action would apply, EPA states:

This proposed action would affect companies that manufacture civil subsonic jet airplanes that have a maximum takeoff mass (MTOM) of greater than 5,700 kilograms and civil subsonic propeller driven airplanes (e.g., turboprops) that have a MTOM greater than 8,618 kilograms, including the manufacturers of the engines used on these airplanes.148 [EPA-HQ-OAR-2018-0276-0181-A2, p.33]

Similarly, in describing the covered airplane types, EPA states:

The proposed GHG rule would apply to civil subsonic jet airplanes (turbojet or turbofan airplanes) with certificated MTOM over 5,700 kg (12,566 lbs.) and propeller-driven civil airplanes (turboprop airplanes) over 8,618 kg (19,000 lbs.).149 [EPA-HQ-OAR-2018-0276-0181-A2, p.33]

Also, in the preamble to the proposed rule, EPA indicates:

For consistency purposes across the United States Code of Federal Regulations (CFR), the terms ''airplane,'' ''aircraft,'' and ''civil aircraft'' have the meanings found in title 14 CFR and are used as appropriate throughout the new proposed regulation under 40 CFR part 1030.150 [EPA-HQ-OAR-2018-0276-0181-A2, pp.33-34]

The referenced definition of "civil aircraft" indicates that "civil aircraft means aircraft other than public aircraft."151 In those same definitions, "pubic aircraft" (i.e., aircraft which are not civil aircraft) are defined as follows, in relevant part:

Public aircraft means any of the following aircraft when not being used for a commercial purpose or to carry an individual other than a crewmember or qualified non-crewmember:

(1) An aircraft used only for the United States Government; an aircraft owned by the Government and operated by any person for purposes related to crew training, equipment development, or demonstration; an aircraft owned and operated by the government of a State, the District of Columbia, or a territory or possession of the United States or a political subdivision of one of these governments; or an aircraft exclusively leased for at least 90 continuous days by the government of a State, the District of Columbia, or a territory or possession of the United States or a political subdivision of one of these governments

(2) An aircraft owned or operated by the armed forces or chartered to provide transportation to the armed forces if -

(i) The aircraft is operated in accordance with title 10 of the United States Code;

(ii) The aircraft is operated in the performance of a governmental function under title 14, 31, 32, or 50 of the United States Code and the aircraft is not used for commercial purposes; or

(iii) The aircraft is chartered to provide transportation to the armed forces and the Secretary of Defense (or the Secretary of the department in which the Coast Guard is operating) designates the operation of the aircraft as being required in the national interest.

(3) An aircraft owned or operated by the National Guard of a State, the District of Columbia, or any territory or possession of the United States, and that meets the criteria of paragraph (2) of this definition, qualifies as a public aircraft only to the extent that it is operated under the direct control of the Department of Defense.152 [EPA-HQ-OAR-2018-0276-0181-A2, p.34]

From this definition it is apparent that a wide variety of governmentally owned and operated aircraft are “public aircraft” outside of the scope of this rulemaking, particularly including, but not limited to, “aircraft owned or operated by the armed forces.” Consistent with this aspect of the definition of “public aircraft,” the preamble to the proposed rule and the Draft Technical Support Document indicate EPA’s intent to exclude “military aircraft” from the scope of the rule153 – although “military aircraft” is not defined and there is no express mention of “public aircraft.” [EPA-HQ-OAR-2018-0276-0181-A2, p.35]

Therefore, we request that EPA revise the proposed text in section 1030.1(a) to make clear that only “civil aircraft” are within the scope of the rule as follows:

“(a) Except as provided in paragraph (c) of this section, when an aircraft engine subject to 40 CFR part 87 is installed on an airplane that is a civil aircraft and described in this section and subject to Title 14 of the Code of Federal Regulations, the airplane may not exceed the Greenhouse Gas (GHG) standards of this part when certification under Title 14 is sought.” [EPA-HQ-OAR-2018-0276-0181-A2, p.35]

In addition, we request that the 14 C.F.R. § 1.1 definitions of “civil aircraft” and “public aircraft” be included in section 1030.105. [EPA-HQ-OAR-2018-0276-0181-A2, p.35]

B. Consistent with the Chicago Convention and the ICAO Standard, the CO_2 Standard Should Not Apply to Civil Aircraft Converted to Military Aircraft Immediately After Production

In addition to the change requested above, the proposed rule should be revised to expressly except from coverage in part 1030 aircraft that are initially certified as civil aircraft during the production process but immediately converted to military aircraft. Such an exception is consistent with the ICAO standard and related guidelines.[154] Boeing does not believe that EPA intends to cover such aircraft in the part 1030 standard, but the lack of specific discussion of such aircraft in the proposed rule creates an ambiguity that must be clarified. [EPA-HQ-OAR-2018-0276-0181-A2, p.35]

Both the ICAO standard and the proposed part 1030 standard except from coverage aircraft that are "initially designed or modified and used for specialized operational requirements ... ."[155] However, while ICAO's Environmental Technical Manual includes "aircraft that are initially certified as commercial during the production process but immediately converted to military aircraft" in a list of examples of such excepted aircraft with "specialized operational requirements,"[156] EPA's corresponding list of examples (included in the preamble to the proposed rule)[157] omits this example while otherwise mirroring the ICAO list of examples. This oversight should be corrected in the final rule.

Elsewhere in the proposed rule, it is clear that EPA does not intend to cover aircraft used by our Armed Forces, as EPA states that "military aircraft" are not covered,[158] and that only "civil aircraft" are covered.[159] As discussed above, this is consistent with the Chicago Convention and ICAO Guidance.[160] Therefore, the particular case of an aircraft that is initially certified as a commercial aircraft and then immediately converted to military use is worthy of specific consideration by EPA, and an express exception from coverage, lest there be any doubt regarding the inapplicability of the part 1030 standards in such initial civil certification processes. [EPA-HQ-OAR-2018-0276-0181-A2, pp. 35-36]

As an example of such aircraft, the Boeing 767 KC-46 is certified during production as a civil aircraft, then immediately modified to perform the specialized operational requirements of an aerial refueling "tanker," able to refuel other military aircraft in-flight.[161] Although the proposed regulation does not address the 767 KC-46, it expressly excepts analogous aircraft; for example, it excepts "airplanes specifically designed or modified and used for fire-fighting purposes,"[162] and recognizes that the fire-fighting exception may be "based on the use of the airplane after civil certification."[163] As both fire-fighting aircraft and aerial refueling tankers are modified civil aircraft designed to carry a heavy liquid payload and deliver that payload in-flight, there is no reason to not except the Boeing 767 KC-46 from coverage. Similarly, other civil-to-military conversions might be equipped with offensive and defensive weaponry, other defensive features, and communications and surveillance equipment (such as "roto-domes") allowing those aircraft to perform specialized operational requirements for the U.S. and allied militaries (including, for example, 747-8 aircraft modified to serve as "Presidential Aircraft"). All of these aircraft "require performance that was outside of the scope considered during the development of the ICAO standard."[164] [EPA-HQ-OAR-2018-0276-0181-A2, p.36]

Therefore, EPA should clarify in the final rule that aircraft that are initially certified as commercial airplanes during the production process, but immediately converted to military aircraft, are excepted from compliance with the standard set therein, consistent with the ICAO standard and its interpretation.[165] To accomplish this, we suggest the following revisions to proposed 40 C.F.R. § 1030.1(c):

"(c) The requirements of this part do not apply to:

(1) Subsonic jet airplanes having a MTOM at or below 5,700 kg.

(2) Propeller-driven airplanes having a MTOM at or below 8,618 kg.

(3) Amphibious airplanes.

(4) Airplanes initially designed, or modified and used, for specialized operations. These airplane designs may include characteristics or configurations necessary to conduct specialized operations that the EPA and the FAA have determined may cause a significant increase in the fuel efficiency metric value.

(5) Airplanes designed with a reference geometric factor of zero.

(6) Airplanes designed for, or modified and used for, firefighting.

(7) Airplanes that are initially certified as civil airplanes during the production process but immediately converted to military aircraft. For purposes of this definition a "military aircraft" shall be an aircraft described in paragraph (2) of the definition of "public aircraft" in section 1030.105." [EPA-HQ-OAR-2018-0276-0181-A2, pp.36-37]

(1) As explained in the ICAO Environmental Technical Manual (ETM), the ICAO standard is limited to "civil aircraft." The NPRM preamble states that the proposed standards "would not apply to . . . military airplanes" (85 FR 51,565) but the proposed regulatory text does not clearly indicate its limitation to civil aircraft. We would suggest making this principle clearer by including a statement to that effect in the rule text's applicability language and referencing the FAA definitions of "civil aircraft" and "public aircraft" in the definition section. (Please see blue highlights in the attachment). [EPA-HQ-OAR-2018-0276-0181-A4, p.1] [[See Docket Number EPA-HQ-OAR-2018-0276-0181-A5 for Attachment]]

(2) In addition, the ICAO ETM indicates that airplanes that are initially certified as civil aircraft during the production process but immediately converted to military aircraft are excepted from coverage as aircraft with specialized operational requirements. However, this provision is not reflected in the NPRM. We would suggest EPA consider specific language in the rule text to except these aircraft from coverage. (Please see grey highlights in the attachment). [EPA-HQ-OAR-2018-0276-0181-A4, p.1] [[See Docket Number EPA-HQ-OAR-2018-0276-0181-A5 for Attachment]]

Proposed 40 C.F.R. Part 1030 – Technical Corrections

§1030.1 Applicability.

(a) Except as provided in paragraph (c) of this section, when an aircraft engine subject to 40 CFR part 87 is installed on an airplane that is a civil aircraft and described in this section and subject to Title 14 of the Code of Federal Regulations, the airplane may not exceed the Greenhouse Gas (GHG) standards of this part when certification under Title 14 is sought.

(1) A subsonic jet airplane that has –

(i) A type certificated maximum passenger seating capacity of 20 seats or more;

(ii) A maximum take-off mass (MTOM) greater than 5,700 kg; and

(iii) An application for original type certification that is submitted on or after January 1, 2020.

(2) A subsonic jet airplane that has –

(i) A type certificated maximum passenger seating capacity of 19 seats or fewer;

(ii) A MTOM greater than 5,700 kg, but not greater than 60,000 kg; and

(iii) An application for original type certification that is submitted on or after January 1, 2023.

(3) A propeller-driven airplane that has –

(i) A MTOM greater than 8,618 kg; and

(ii) An application for original type certification that is submitted on or after January 1, 2020.

(4) A subsonic jet airplane that is a modified derived version of an airplane whose original type certificated version was not required to have GHG emissions certification under this part and has –

(i) A MTOM greater than 5,700 kg; and (ii) An application for an amended type certificate certification that is submitted on or after January 1, 2023;

(5) A propeller-driven airplane that is a modified derived version of an airplane whose original type certificated version was not required to have GHG emissions certification under this part and has –

(i) A MTOM greater than 8,618 kg; and (ii) An application for an amended type certificate that is submitted on or after January 1, 2023;

(6) A subsonic jet airplane that has –

(i) A MTOM greater than 5,700 kg; and

(ii) An original certificate of airworthiness issued on or after January 1, 2028;

(7) A propeller-driven airplane that has –

(i) A MTOM greater than 8,618 kg; and

(ii) An original certificate of airworthiness issued on or after January 1, 2028;

(b) Derived versions of airplanes. An airplane that incorporates modifications that change the fuel efficiency metric value of a prior version of airplane may not exceed the GHG standards of this part when certification under 14 CFR is sought. The change criteria for modified derived versions of airplanes are described in §1030.35. A modified airplane may not exceed the metric value limit of the prior version under §1030.30

(c) The requirements of this part do not apply to:

(1) Subsonic jet airplanes having a MTOM at or below 5,700 kg.

(2) Propeller-driven airplanes having a MTOM at or below 8,618 kg.

(3) Amphibious airplanes.

(4) Airplanes initially designed, or modified and used, for specialized operations. These airplane designs may include characteristics or configurations necessary to conduct specialized operations that the EPA and the FAA have determined may cause a significant increase in the fuel efficiency metric value.

(5) Airplanes designed with a reference geometric factor of zero.

(6) Airplanes designed for, or modified and used for, firefighting.

(7) Airplanes that are initially certified as civil aircraft during the production process but immediately converted to military aircraft. For purposes of this definition a "military aircraft" shall be an aircraft described in paragraph (2) of the definition of "public aircraft" in section 1030.105. [EPA-HQ-OAR-2018-0276-0181-A5, pp.1-2]

§1030.105 Definitions.

The following definitions in this section apply to this part. Any terms not defined in this section have the meaning given in the Clean Air Act. The definitions follow:

Aircraft has the meaning given in 14 CFR 1.1, a device that is used or intended to be used for flight in the air.

Aircraft engine means a propulsion engine that is installed on or that is manufactured for installation on an airplane for which certification under 14 CFR is sought.

Airplane has the meaning given in 14 CFR 1.1, an engine-driven fixed-wing aircraft heavier than air that is supported in flight by the dynamic reaction of the air against its wings.

Civil Aircraft has the meaning given in 14 CFR 1.1, aircraft other than public aircraft.

Derived version of an airplane is an individual airplane that incorporates modifications reflected in a change in type design approved in an amended type certificate prior to the issuance of that individual airplane's original certificate of airworthiness. A derived version of an airplane does not include an airplane to which modifications are made after an original certificate of airworthiness has been issued for that airplane (including modifications that might require a supplemental type certificate). Note.—Where FAA finds that the proposed change in design, configuration, power or mass is so extensive that a substantially new investigation of compliance with the applicable airworthiness regulations is required, the airplane will be considered to be a new type design rather than a derived version.

Exempt means to allow, through a formal case-by-case process, an airplane to be certificated and operated that does not meet the applicable standards of this part.

ICAO Annex 16, Volume III means Volume III of Annex 16 to the Convention on International Civil Aviation.

Greenhouse Gas (GHG) means an air pollutant that is the aggregate group of six greenhouse gases: carbon dioxide, nitrous oxide, methane, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride.

Type certificated maximum passenger seating capacity means the maximum number of passenger seats that may be installed on an airplane as listed on its type certificate data sheet, regardless of the actual number of seats installed on an individual airplane.

Maximum take-off mass (MTOM) is the maximum allowable take-off mass as stated in the approved certification basis for an airplane type design. Maximum take-off mass is expressed in kilograms.

Performance model is an analytical tool (or a method) validated using corrected flight test data that can be used to determine the specific air range values for calculating the fuel efficiency metric value.

Public aircraft has the meaning given in 14 CFR 1.1, any of the following aircraft when not being used for a commercial purpose or to carry an individual other than a crewmember or qualified noncrewmember:

(1) An aircraft used only for the United States Government; an aircraft owned by the Government and operated by any person for purposes related to crew training, equipment development, or demonstration; an aircraft owned and operated by the government of a State, the District of Columbia, or a territory or possession of the United States or a political subdivision of one of these governments; or an aircraft exclusively leased for at least 90 continuous days by the government of a State, the District of Columbia, or a territory or possession of the United States or a political subdivision of one of these governments.

(i) For the sole purpose of determining public aircraft status, commercial purposes means the transportation of persons or property for compensation or hire, but does not include the operation

of an aircraft by the armed forces for reimbursement when that reimbursement is required by any Federal statute, regulation, or directive, in effect on November 1, 1999, or by one government on behalf of another government under a cost reimbursement agreement if the government on whose behalf the operation is conducted certifies to the Administrator of the Federal Aviation

Administration that the operation is necessary to respond to a significant and imminent threat to life or property (including natural resources) and that no service by a private operator is reasonably available to meet the threat.

(ii) For the sole purpose of determining public aircraft status, governmental function means an activity undertaken by a government, such as national defense, intelligence missions, firefighting, search and rescue, law enforcement (including transport of prisoners, detainees, and illegal aliens), aeronautical research, or biological or geological resource management.

(iii) For the sole purpose of determining public aircraft status, qualified non-crewmember means an individual, other than a member of the crew, aboard an aircraft operated by the armed

forces or an intelligence agency of the United States Government, or whose presence is required to perform, or is associated with the performance of, a governmental function.

(2) An aircraft owned or operated by the armed forces or chartered to provide transportation to the armed forces if -

(i) The aircraft is operated in accordance with title 10 of the United States Code;

(ii) The aircraft is operated in the performance of a governmental function under title 14, 31, 32, or 50 of the United States Code and the aircraft is not used for commercial purposes; or

(iii) The aircraft is chartered to provide transportation to the armed forces and the Secretary of Defense (or the Secretary of the department in which the Coast Guard is operating) designates the operation of the aircraft as being required in the national interest.

(3) An aircraft owned or operated by the National Guard of a State, the District of Columbia, or any territory or possession of the United States, and that meets the criteria of paragraph (2) of this definition, qualifies as a public aircraft only to the extent that it is operated under the direct control of the Department of Defense.

Reference geometric factor is a non-dimensional number derived from a two-dimensional projection of the fuselage.

Round has the meaning given in 40 CFR 1065.1001.

Specific air range is the distance an airplane travels per unit of fuel consumed. Specific air range is expressed in kilometers per kilogram of fuel.

Subsonic means an airplane that has not been certificated under 14 CFR to exceed Mach 1 in normal operation.

We (us, our) means the Administrator of the Environmental Protection Agency and any authorized representatives. [EPA-HQ-OAR-2018-0276-0181-A5, pp.3-6]

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[146] ICAO, 2018: Environmental Technical Manual Volume III—Procedures for the CO2 Emissions Certification of Aeroplanes, First Edition, Doc 9501, at 2.5, available http://www.icao.int/publications/Pages/catalogue.aspx. The ICAO Environmental Technical Manual Volume III is found on page 77 of the English Edition 2020 catalog and is copyright protected.
[147] Id. at 2.1.
[148] 85 Fed. Reg. at 51,557 (emphasis added).
[149] 85 Fed. Reg. at 51,565 (emphasis added). See also id. at 51,556, 51,558-60, 51,564-67, 51587-88; Draft Technical Support Document at ES-1, 2, 50, and 52.
[150] 85 Fed. Reg. 51,557.
[151] 14 C.F.R. § 1.1 (definition of "civil aircraft"). See also 49 U.S.C § 40102(a)(16); 49 U.S.C § 40104(a) ("The Administrator of the Federal Aviation Administration shall encourage the development of civil aeronautics and safety of air commerce in and outside the United States.").
[152] 14 C.F.R. § 1.1 (definition of "public aircraft"). See also 49 U.S.C. §§ 40102(a)(41) and 40125.
[153] See 85 Fed. Reg. at 51,562 ("EPA also did not make a cause or contribute finding regarding GHG emissions from engines not used in U.S. covered aircraft (i.e., those used in smaller turboprops, smaller jet aircraft, piston-engine aircraft, helicopters and military aircraft)."); id. at 51,565 ("The proposed GHG rules would not apply to smaller civil jet airplanes (e.g., Cessna Citation M2), smaller civil turboprop airplanes (e.g., Beechcraft King Air 350i), piston-engine airplanes, helicopters, and military airplanes."). See also Draft Technical Support Document, at

4 (“Although the aircraft portion of this chart contains three aviation sectors that would not be covered by the proposed rule (e.g., military, helicopters, and airplanes operating on aviation gasoline) these three sectors comprised well under one percent of total transportation related GHG emissions in 2017.”), and at 83 (“In our analysis, we exclude military, piston engine and small light weight airplanes since they are not covered under the proposed rulemaking.”).

[154] ICAO Doc 9501, Environmental Technical Manual, Vol. III, § 2.1.1 (2018).
[155] ICAO, 2017: ICAO Annex 16, Environmental Protection Vol III – Aeroplane CO_2 Emissions, First Edition § 2.1.1 (July, 2017), compare with proposed 40 C.F.R. § 1030.1(c)(4) (“Airplanes initially designed, or modified and used, for specialized operations.”).
[156] ICAO Doc 9501, Environmental Technical Manual, Vol. III, § 2.1.3 (2018).
[157] 85 Fed. Reg. at 51,566.
[158] See, e.g., 85 Fed. Reg. at 51,565 (“The proposed GHG rules would not apply to smaller civil jet airplanes (e.g., Cessna Citation M2), smaller civil turboprop airplanes (e.g., Beechcraft King Air 350i), piston-engine airplanes, helicopters, and military airplanes.”); Draft TSD at 4.
[159] See, e.g., 85 Fed. Reg. at 51,557 (“This proposed action would affect companies that manufacture civil subsonic jet airplanes... . ”); Draft TSD at 2.
[160] In describing the applicability of the CO_2 standard, ICAO Doc 9501, Environmental Technical Manual, Vol. III, 2018, cites the Convention of International Civil Aviation (often referred to as the Chicago Convention). Article 3(a) of the Convention states that it “shall be applicable only to civil aircraft, and shall not be applicable to state aircraft.” Article 3(b) provides that “[a]ircraft used in military, customs and police services shall be deemed to be state aircraft.” Doc 9501 § 2.1.1(b) (emphasis added).
[161] https://www.boeing.com/defense/kc-46a-pegasus-tanker/.
[162] See proposed 40 C.F.R. § 1030.1(c)(6).
[163] 85 Fed. Reg. at 51,566.
[164] Id.
[165] ICAO Doc 9501, Environmental Technical Manual, Vol. III, § 2.1.1 (2018) (“The Convention on International Civil Aviation, Article 3, specifically states that it is not applicable to state aircraft and provides some examples ... : ‘a) This Convention shall be applicable only to civil aircraft, and shall not be applicable to state aircraft. b) Aircraft used in military, customs and police services shall be deemed to be state aircraft.’”); ICAO Annex 16 Vol. III, § 2.1.1 (“The Standards of this chapter shall, with the exception of amphibious aeroplanes, aeroplanes initially designed or modified and used for specialised operational requirements, aeroplanes designed with zero RGF, and those aeroplanes specifically designed or modified and used for fire-fighting purposes, be applicable to... .”); ICAO ETM Vol. III, § 2.2.3 (“Examples of specialized operational requirements include: a) aeroplanes that are initially certified as civil aeroplanes during the production process but immediately converted to military aeroplanes.”)

Organization: Embraer Commercial Aviation

ICAO’s CO_2 standard explicitly acknowledges that it should only be applicable to civil aircraft, and shall not be applicable to state aircraft, such as those used by military, customs and police services. The ICAO standard also does not apply to amphibious aeroplanes, aeroplanes initially designed or modified for specialized operational requirements and used as such, aeroplanes designed with zero reference geometric factor (RGF), and those aeroplanes specifically designed or modified and used for fire-fighting purposes[1]. [EPA-HQ-OAR-2018-0276-0174-A1, p.2]

These decisions around applicability of ICAO’s CO_2 rule were made because “these typically special categories of aeroplanes are limited in numbers and have specific technical characteristics resulting in very different CO_2 metric values compared to all other aeroplane types in the proposed applicability scope[2]” As a result, it can be much more difficult and costly for these aircraft to meet the required standard. [EPA-HQ-OAR-2018-0276-0174-A1, p.2]

Given ICAO’s decision to not subject these categories of aircraft to the international aeroplane CO_2 standard, including these aircraft within the applicability of U.S. domestic regulations would put manufacturers of aircraft for the U.S. market at a substantial competitive disadvantage compared to manufacturers of aircraft for other regions’ market. While the EPA’s proposed regulatory text does state the rule will not apply to the same categories of aircraft that the ICAO rule excludes, the EPA should ensure that the final rule references the full list of specialized operational requirements listed by ICAO. To aid understanding by manufacturers of future aircraft, the EPA should also include wording within the final regulatory text that explicitly states the rule does not apply to state aircraft, such as those used by military, customs and police services, or other types of aircraft such as rotorcraft or piston-engine aircraft. [EPA-HQ-OAR-2018-0276-0174-A1, p.2]

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[1] In ICAO doc 9501 (Environmental Technical Manual Volume III) the following examples of specialized operational requirements include:
a) aeroplanes that are initially certified as civil aeroplanes during the production process but immediately converted to military aeroplanes;
b) a required capacity to carry cargo that is not possible by using less specialized aeroplanes (e.g. ramped, with back cargo door);
c) a required capacity for very short or vertical take-offs and landings;
d) a required capacity to conduct scientific, research or humanitarian missions exclusive of commercial service; or
e) similar factors.

[2] ICAO Doc. 9501 Environmental Technical Manual Volume III, Chapter 2, paragraph 2.1.2.

[3] Control of Air Pollution From Airplanes and Airplane Engines: GHG Emission Standards and Test Procedures: Notice of Proposed Rulemaking; 85 Fed. Reg. 51566 (August 20, 2020).

Organization: General Electric Company (GE)

In finalizing the proposed standard, GE respectfully requests that EPA consider the following modifications to the rule. EPA should clarify that the final rule only applies to “civil aircraft” and that “public aircraft,” including military aircraft, are outside the scope of the standard. Additionally, EPA should clarify that aircraft initially certified as civil aircraft during production, but immediately converted to military aircraft are excepted from the standard coverage. [EPA-HQ-OAR-2018-0276-0157-A1, p.8]

1. EPA should clarify the CO_2 standard applies to “civil aircraft” and that civil aircraft that are immediately converted to military aircraft are not subject to the standard

GE respectfully requests that EPA revise the proposed rule to clarify that only “civil aircraft” and not “public aircraft” are within the scope of the rule. The preamble of the proposed rule is clear that the intent of the standard is to affect “companies that manufacture civil subsonic jet airplanes.” To clarify this in the text of the rule, EPA should revise the proposed text of section 1030.1(a) to state: “(a) Except as provided in paragraph (c) of this section, when an aircraft engine subject to 40 CFR part 87 is installed on an airplane that is a civil aircraft and described in this section . . .” Additionally, EPA should add the 14 C.F.R. § 1.1 definitions of “civil aircraft” and “public aircraft” to section 1030.105.

EPA should also consider revising the rule to clarify that aircraft initially certified as civil aircraft during production, but immediately converted to military aircraft, are excepted from the standard coverage. ICAO’s Environmental Technical Manual excepts from standard coverage any aircraft with a “specialized operational requirement,” which includes “aeroplanes that are initially certified as civil aeroplanes during the production process but immediately converted to military aeroplanes.”[19] To clarify any ambiguity in the rule, EPA should consider revising 40 C.F.R. § 1030.1(c), with the language Boeing suggests, and explicitly state in the list of aircraft the standard does not apply to: “airplanes that are initially certified as civil airplanes during the production process but immediately converted to military aircraft. For the purposes of this definition a ‘military aircraft’ shall be an aircraft described in paragraph (2) of the definition of ‘public aircraft’ in section 1030.105.” [EPA-HQ-OAR-2018-0276-0157-A1, pp.8-9]

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[19] ICAO Doc 9501, Environmental Technical Manual, Vol. III, § 2.1.3 (2018), https://www.icao.int/environmental-protection/Documents/Doc_9501_ETM_Vol_III_SGAR%202017.pdf.

Organization: Gulfstream Aerospace Corporation

3) Language in the current version of the NPRM changes the ICAO language involving exclusions for aircraft designed for special purposes. Gulfstream currently manufactures civil-certified aircraft that are used by United States and international governmental agencies for purposes that mandate extensive external modifications to the airframes with attendant CO_2 impacts. Operated by government agencies, these aircraft would not be subject to any EPA emissions requirements for civil aircraft, but the initial civil certifications these aircraft earn implies a requirement to meet the standard. Gulfstream prefers language explicitly excluding these types of aircraft from applicability of the standard. [EPA-HQ-OAR-2018-0276-0078-A1 p.2]

Organization: International Co-ordinating Council of Aerospace Industries Associations (ICCAIA)

ICAO's CO_2 standard explicitly acknowledges that it should only be applicable to civil aircraft, and shall not be applicable to state aircraft, such as those used by military, customs and police services. The ICAO standard also does not apply to amphibious aeroplanes, aeroplanes initially designed or modified for specialized operational requirements and used as such, aeroplanes designed with zero reference geometric factor (RGF), and those aeroplanes specifically designed or modified and used for fire-fighting purposes[1]. [EPA-HQ-OAR-2018-0276-0175-A1, p.3]

These decisions around applicability of ICAO's CO_2 rule were made because "these typically special categories of aeroplanes are limited in numbers and have specific technical characteristics resulting in very different CO_2 metric values compared to all other aeroplane types in the proposed applicability scope[2]" As a result, it can be much more difficult and costly for these aircraft to meet the required standard. [EPA-HQ-OAR-2018-0276-0175-A1, p.3]

Given ICAO's decision to not subject these categories of aircraft to the international aeroplane CO_2 standard, including these aircraft within the applicability of U.S. domestic regulations would put manufacturers of aircraft for the U.S. market at a substantial competitive disadvantage compared to manufacturers of aircraft for other regions' market. While the EPA's proposed regulatory text does state the rule will not apply to the same categories of aircraft that the ICAO rule excludes, the EPA should ensure that the final rule references the full list of specialized operational requirements listed by ICAO. To aid understanding by manufacturers of future aircraft, the EPA should also include wording within the final regulatory text that explicitly states the rule does not apply to state aircraft, such as those used by military, customs and police services, or other types of aircraft such as rotorcraft or piston-engine aircraft. [EPA-HQ-OAR-2018-0276-0175-A1, p.3]

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[1] In ICAO doc 9501 (Environmental Technical Manual Volume III) the following examples of specialized operational requirements include:
a) aeroplanes that are initially certified as civil aeroplanes during the production process but immediately converted to military aeroplanes;
b) a required capacity to carry cargo that is not possible by using less specialized aeroplanes (e.g. ramped, with back cargo door);
c) a required capacity for very short or vertical take-offs and landings;
d) a required capacity to conduct scientific, research or humanitarian missions exclusive of commercial service; or
e) similar factors.

[2] ICAO Doc. 9501 Environmental Technical Manual Volume III, Chapter 2, paragraph 2.1.2.

Organization: National Business Aviation Association (NBAA)

Special Mission Aircraft

> Due to the extraordinary capability and versatility of business aviation aircraft, they are often selected as platforms for special mission aircraft operated by various organizations and states. The roles for special mission aircraft regularly require modifications to the original Type Certificate (TC). NBAA supports language that would exclude these few unique aircraft, as identified in the proposed rule. [EPA-HQ-OAR-2018-0276-0091-A1, p.2]

Response:

EPA's responses to Commenters' points are set forth below:

5.5.1. Clarify that the rule doesn't apply to military airplanes

Consistent with the commenters' requests, the Preamble is explicit that this rule does not apply to military airplanes. Further, the 2016 Findings did not include military airplanes; therefore, this rulemaking cannot apply to them.

Additionally, part 1030 is clear that it doesn't apply to military airplanes. Part 1030.1(a) clearly states that it only applies to airplanes seeking certification under title 14. Military airplanes (e.g. F-22 or F-35) are not certified by the FAA under title 14, and therefore are not subject to this rule.

The word "civil" has been added to the end of 1030.1(a) to add clarity to the reader that it only applies to civil certification. So that it now reads "…civil certification under title 14 is sought". Note, that no other type of certification is offered under title 14, so while this may provide additional clarity to the reader, it makes no technical difference.

5.5.2. Civil to Military conversions

Commenters raised the issue that some airplanes are certified as civil airplanes by the FAA and then immediately converted to military airplanes. Commenters indicated that ICAO has ETM guidance stating that these airplanes may be excepted from the airplane CO2 standards and asked EPA to incorporate this guidance into US regulations. EPA notes that our regulations are consistent with ICAO Annex 16 Volume III regulations that do not except these conversions from the standards. It is up to national airworthiness authorities to determine how to take the ICAO ETM guidance into account in the context of their domestic certification procedures, and thus this issue is more properly addressed in subsequent certification rulemaking and guidance from the FAA.

As proposed, the GHG rule applies to engines installed on airplanes that are presented to the FAA for civil certification under title 14. To be clear, the EPA's standards, promulgated here, only apply to civil airplanes (§1030.1(a)) and do not apply to military airplanes. Section 232 of the Clean Air Act requires the FAA to enforce the EPA's standard, which occurs at the time of civil certification. Since the choice to seek civil certification in the United States belongs to an applicant, the issue is better addressed by the FAA as a certification matter.

The EPA's understanding is that, per the manufacturer's request, the FAA certificates an airplane like the Boeing 767 as a civil airplane that meets all of the civil requirements under Title 14. The FAA does not have certification standards for purely military equipment, such as for air refueling, external communications equipment, or defensive capabilities (when a 767 becomes a KC-46, for example). If those items are added to an airplane after certification, the airplane is no longer a civil airplane that is regulated under Title 14.

Civil aircraft (e.g., airplanes or helicopters) certificated for firefighting remain civil aircraft when used for that purpose, but comply with firefighting specific certification standards and operational restrictions under Title 14 for the life of the aircraft. The fact that a military air refueling airplane and a civil firefighting airplane share a similar characteristic such as the ability to haul and release fluids does not cause the certification and subsequent operational bases of the airplanes to be considered the same for regulatory applicability.

If civil certification for these airplanes continues to be desired by manufacturers after 2028, the FAA exemption provisions may provide a path for continued production.

5.5.3. Special categories of airplanes

We note the commenters supported our inclusion of exceptions to the standard for airplanes designed for specialized operations. ICAO Annex 16 excepts airplanes used for "specialized operations" from the CO_2 standards. The scope of part 1030 is consistent with ICAO Annex 16 and does not include any additional categories than those adopted by ICAO in Annex 16.

Some commenters also requested that the EPA go beyond Annex 16 and include examples of airplane types that may be used for specialized operations from the ICAO Environmental Technical Manual (ETM). The ETM is a guidance document; therefore, certification authorities have discretion about how they implement the contents domestically. The EPA included this guidance in the preamble to describe what may be considered as "designed or modified for specialized operations." This will be a case-by-case determination that is appropriate for the FAA to make at the time of certification rather than broadly as a part of this rule. (Note, ICAO includes the example of civil to military conversions as part of this list in the ETM. See the response above concerning those comments.)

5.5.4. Other categories of aircraft

When suggesting changes to the language of part 1030, commenters changed the term "airplane" to "aircraft," increasing the scope of the rule. The EPA intentionally used the word "airplane" to clearly state the scope of the rule to be the same as that adopted by ICAO. By specifying "airplane" the EPA is clearly leaving out aircraft that do not meet the definition of airplanes (such as rotorcraft or airships). The EPA is retaining the use of the term "airplane."

Commenters suggested adding language to except piston-engine airplanes from the standards. Consistent with our 2016 Findings that excluded piston-engine airplanes from the scope of the determinations, we have added this language to 1030.1(c). As a practical matter, we do not expect this provision would have any future application since no piston-engine airplanes of this size (greater than 8,618 kg MTOM) have been built in decades, and there was no suggestion from commenters that this will change.

5.5.5. Adding definitions of civil and public aircraft

The EPA will not be incorporating the concept of "civil aircraft" and "public aircraft" into our regulations.

It is reasonable and appropriate for the Chicago Convention to limit its scope to aircraft used in commerce and to not put limits on state aircraft. This limiting of the scope avoids bringing issues of national sovereignty and security into the international negotiations, and it is conducive to developing consistent international standards around the world. U.S. emissions standards have been developed at the aircraft type level, and U.S. emission standards do not consider how or where an aircraft or an aircraft engine will be used after it is certificated. The incorporation of either of these concepts would pose fundamental inconsistencies in the domestic certification process.

We have consulted with the FAA and understand the terms “civil aircraft” and “public aircraft” are operational terms used to define specific flights of an airplane when it is in service. Under Title 14 of the CFR, this operational status is not relevant to the type certification process that precedes it. The Title 14 type certification process does not differentiate whether an aircraft may be operated as "civil" or "public" when it is in service. That distinction is controlled by statute (See 49 U.S.C. §§40102(a)(41), 40125). Further, the operational designations of civil and public are not permanent for an individual aircraft, much less an aircraft type, and can change on a flight-by-flight basis. Since this designation can change, it is not a fundamental part of the aircraft, and therefore, the designation is not a basis for which to certificate an airplane type.

Civil certification under Title 14 is not the same as operation as a "civil aircraft." The commenters' claim confuses the terms. Title 14 certification is limited to civil aircraft based on the FAA's statutory authority under Title 49 of the United States Code. Certification by the U.S. military is not a Title 14 action within the scope of the FAA's Title 49 authority. Thus, the EPA cannot create a new distinction based on the utilization of an aircraft after it is certificated. Dedicated military aircraft such as the F-35, F-22, or C-5, go through a separate certification process that is determined by U.S. Department of Defense requirements and are not subject to Title 14 civil certification requirements.

5.5.6. Other Comments

Some commenters stated that the EPA's 2016 Findings only included airplanes that were covered by ICAO. That is a correct statement when referring to airplane sizes and the engines used on them. However, the commenter incorrectly argued that 2016 Findings didn't include state or police airplanes. As discussed above, under Title 14 civil certification there is no distinction between state, police, airline, or private use of an airplane after certification. Accordingly, these airplanes were not excluded from the 2016 Findings, unlike military airplanes that do not seek certification at FAA and were explicitly excluded.

6. Timing/Implementation Dates of Standards by Applicability

<u>Comments:</u>

Organization: Aerospace Industries Association (AIA)

> It is therefore vital that these regulations are finalized as soon as possible. While the majority of today's aircraft are not subject to the standard until January 1, 2028, airlines make decisions on the aircraft they purchase several years in advance. This means decisions are currently being made on deliveries that will extend through the end of this decade – after the CO_2 standard will take effect for in-production aircraft. Failure to adopt domestic standards in a timely fashion puts the U.S. aerospace industry at a significant disadvantage if airlines opt to seek greater regulatory certainty by purchasing aircraft manufactured elsewhere that already meet the requirements of their certificating authority's equivalent rules. AIA would like to highlight that rules consistent with ICAO CO_2 standard have already been implemented by the European Union Aviation Safety Agency (EASA) in Europe, as well as in other jurisdictions6. [EPA-HQ-OAR-2018-0276-0087-A1, pp.4-5]
>
> The impact of a scenario where the U.S. fails to introduce equivalent domestic rules to the ICAO CO_2 standard in a timely fashion could jeopardize sales to the effect of tens of billions of dollars. This could have catastrophic impacts on the future strength and competitiveness of the U.S. aerospace sector, especially in conjunction with the unprecedented downturn in activity that the sector is currently facing as a result of the COVID-19 pandemic. As our industry supports 920,000 direct jobs, a further 1.28 million jobs throughout the shared aerospace and defense supply chain, and contributes a positive trade balance of $79 billion, this would also be extremely detrimental to the national security and prosperity of the United States7. [EPA-HQ-OAR-2018-0276-0087-A1, p.5]

To ensure these affects are avoided, the EPA should finalize domestic adoption of these regulations by the end of 2020. This would afford the FAA sufficient time to promulgate their CO_2 regulations and U.S. aircraft manufacturers the time to perform the lengthy and expensive steps that will be required to demonstrate compliance with the ICAO CO_2 standard for all aircraft that will be in-production in 2028.[EPA-HQ-OAR-2018-0276-0087-A1, p.5]

Need for timely implementation of final CO_2 rules

While the majority of today's aircraft are not subject to the standard until January 1, 2028, airlines make decisions on the aircraft they purchase several years in advance. This means decisions are currently being made on deliveries that will extend through the end of this decade – after the CO_2 standard will take effect for in-production aircraft. Failure to adopt domestic standards in a timely fashion therefore puts the U.S. aerospace industry at a significant disadvantage if airlines opt to seek greater regulatory certainty by purchasing aircraft manufactured elsewhere that already meet the requirements of their certificating authority's equivalent rules. AIA would like to highlight that rules consistent with the ICAO CO_2 standard have already been implemented by the European Union Aviation Safety Agency (EASA) in Europe, as well as in other jurisdictions[15].

To ensure the negative effects outlined elsewhere in this response are avoided, the EPA should finalize domestic adoption of these regulations by the end of 2020. This would afford the FAA sufficient time to promulgate their CO_2 regulations and U.S. aircraft manufacturers the time to perform the lengthy and expensive steps that will be required to demonstrate compliance with the ICAO CO_2 standard for all aircraft that will be in-production in 2028. [EPA-HQ-OAR-2018-0276-0167-A1, pp.13-14]

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[6] European Union Commission Delegated Regulation (EU) 2019/897, March 12, 2019, Amending Regulation (EU) No 748/2012 as regards the inclusion of risk-based compliance verification in Annex I and the implementation of requirements for environmental protection.
[7] Aerospace Industry Association (2020), Facts and Figures: Aerospace and Defense
[15] European Union Commission Delegated Regulation (EU) 2019/897, March 12, 2019, Amending Regulation (EU) No 748/2012 as regards the inclusion of risk-based compliance verification in Annex I and the implementation of requirements for environmental protection.

Organization: Airlines for America (A4A) and Air Line Pilots Association, International (ALPA)

With this backdrop, we urge the Agency to finalize the Proposed Rule as expeditiously as possible. [EPA-HQ-OAR-2018-0276-0161-A1, p.2]

Organization: Arlington Chamber of Commerce

During these challenging economic times as businesses fight to recover from the pandemic, certainty in the regulatory landscape is more important than ever before. We urge the Agency to finalize the rule by the end of 2020 to bolster our economic growth and environmental stewardship, especially as our nation and the aviation sector recover from the economic and public health crises. [EPA-HQ-OAR-2018-0276-0139-A1,p.1]

Organization: Boeing Company (Boeing)

Because the ICAO CO_2 standard's first implementation date, January 1, 2020, has already passed, EPA must promptly act to adopt the proposed rule (with the modifications noted above). While the proposed rule promises to ensure the continued integration of advanced technologies into domestically manufactured aircraft, it is also of no small matter that by promptly issuing final standards EPA will enable domestic manufacturers to market aircraft for international use by harmonizing U.S. standards with those currently or soon to be in force in other ICAO Member States. Domestic manufacturers must meet the ICAO standard to market their airplanes globally. But in the absence of U.S. standards for implementing the ICAO standard, U.S. civil airplane manufacturers could be forced to seek CO_2 emissions certification from an aviation certification authority of another country (rather than the FAA) in order to market and operate their airplanes internationally. Thus, prompt finalization of this rule, with the limited modification requested in these comments, is critical to ensuring the continued competitiveness of the U.S. commercial aerospace manufacturing industry. [EPA-HQ-OAR-2018-0276-0181-A2, pp.2-3]

D. An ICAO-Equivalent Standard Should be Promptly Finalized in this Rulemaking and Consideration of Any Broader or More Stringent Standard Should be Deferred.

The first implementation date for the ICAO CO_2 standard was January 1, 2020. In the proposed rule, EPA and FAA have expressed the intent to have the CAA section 231 standards also take effect starting January 1, 2020.[137] While adoption of the standards would occur after they are already effective internationally, taking this action would allow the U.S. to come into conformance with current international standards as soon as reasonably practicable, and allow U.S. commercial aerospace manufacturers to begin the FAA certification process. It makes sense for EPA and FAA to put an ICAO-equivalent standard in place in 2020, rather than delay further to consider what broader or more stringent requirements could be put in place, as well as the timing for such requirements. This is particularly true since EPA retains authority under the CAA to revise that standard, and can do so in connection with the ongoing ICAO process to periodically review and revise as necessary the international CO_2 standard. [EPA-HQ-OAR-2018-0276-0181-A2, p.31]

Section 231(a)(2)(A) provides that the EPA Administrator "shall, from time to time, issue proposed standards applicable to … any class of classes of aircraft engines." The plain language of the section thereby gives EPA considerable leeway as to when the Agency should revise existing standards or promulgate new standards. EPA may only allow such standards to take effect after such time as EPA and FAA determine is needed for the development and application of requisite technology.[138] But the statute does not force the Agency to act on any specific schedule. [EPA-HQ-OAR-2018-0276-0181-A2, p.31]

EPA has utilized this authority repeatedly at different times in the past. The Agency promulgated final standards in 1973,[139] in 1982,[140] in 1997,[141] in 2005,[142] and 2012.[143] On each occasion apart from the 1973 standards, EPA acted following changes to ICAO international standards.[144] Thus, there is every reason to expect that EPA and FAA will continue to engage on behalf of the U.S. in the ICAO process and take appropriate domestic action if a revised standard is adopted by ICAO, consistent with their actions of the past five decades. [EPA-HQ-OAR-2018-0276-0181-A2, pp.31-32]

Revision of the ICAO standard within the next decade is highly likely. The CAEP has a history of re-examining emission standards every two to four cycles, or approximately on intervals of six to twelve years depending on advancements in proven technology. This multi-cycle process is necessary to allow for the development/maturation of new technologies and the gathering and assessment of information on the costs, noise impacts, and safety of those technologies. EPA and FAA may therefore reasonably rely on this process to assess what additional CO_2 standards may be appropriate in future timeframes, and need not decide now whether more stringent standards should be imposed to meet future international standards or needs. [EPA-HQ-OAR-2018-0276-0181-A2, p.32]

Conversely, the need to implement current ICAO standards to allow for the certification of U.S.-manufactured aircraft in the U.S. weighs strongly against any additional delay in finalization of the proposed rule. Even where EPA has acknowledged that "[m]ore stringent standards … will likely be necessary and appropriate in the future," the D.C. Circuit has upheld CAA section 231 standards that were part of "an ongoing phased approach … to address emissions from aircraft engines."[145] EPA would thus be on firm ground if it acted to implement the existing ICAO standard now, even while anticipating that revision may be appropriate in the future. [EPA-HQ-OAR-2018-0276-0181-A2, p.32]

Consistent with our record of leadership in regard to fuel efficiency, Boeing urges EPA to finalize the proposed rule before the end of 2020, with the technical corrections and adjustment to the 767F production timeline requested herein, so as to allow for prompt FAA certification of domestically-manufactured aircraft covered by the ICAO CO_2 standard. [EPA-HQ-OAR-2018-0276-0181-A2,p .47]

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[137] 85 Fed. Reg. at 51,567,
[138] CAA §§ 231(a)(2)(A), (b); 42 U.S.C. §§ 7571(a)(2)(A), (b).
[139] 38 Fed. Reg. 19,088 (July 17, 1972).
[140] 47 Fed. Reg. 58,462 (Dec. 30, 1982).
[141] 62 Fed. Reg. 25,356 (May 8, 1997).
[142] 70 Fed. Reg. 69,664 (Nov. 17, 2005)
[143] 77 Fed. Reg. 36,342 (June 18, 2012).
[144] It should be noted that although EPA's 1973 standards preceded action by ICAO, the Agency subsequently amended its regulations to conform to ICAO standards adopted in 1981. See 38 Fed. Reg. 19,088 (July 17, 1973).
[145] NACAA v. EPA, 489 F.3d at 1226 (citing 70 Fed. Reg. 69,664, 69,675-77 (Nov. 17, 2005)).

Organization: Federal Express Corporation

We commend the Agency for advancing this rulemaking initiative and respectfully request the Agency issue a final rule as soon as possible to provide the industry with the certainty it requires to compete globally by providing a regulatory framework that will ensure the continued recognition of U.S. manufactured and certificated civil aircraft for use in international operations.[EPA-HQ-OAR-2018-0276-0178-A1, p.1]

In addition to the comment provided below, FedEx supports the comments and recommendations made by Airlines for America, the Cargo Airline Association, the Aerospace Industries Association, Boeing, and GE. [EPA-HQ-OAR-2018-0276-0178-A1, p.1]

IV. Conclusion

FedEx Express appreciates the EPA's efforts to adopt the standards set forth by ICAO in a timely manner and respectfully requests that the Agency promulgate a final rule as soon as possible, incorporating the amendments offered in this comment [EPA-HQ-OAR-2018-0276-0178-A1, P.5]

Organization: General Electric Company (GE)

B. GE urges EPA to finalize the standards promptly, ideally by year end

The COVID-19 pandemic has created very serious challenges for the global aviation industry, making a prompt ICAO-equivalent rule more necessary than ever. According to the International Air Transport Association ("Association"), global passenger numbers for 2020 are expected to decline by 55 percent compared to 2019. The Association also predicts that global passenger traffic will not return to pre-COVID-19 levels until 2024.[1] EPA's proposed rule would provide the global aviation industry with much needed certainty and consistency as it weathers this unprecedented economic environment.

GE urges EPA to promptly finalize this proposed ICAO-equivalent standard, ideally by year end. EPA noted in the NPRM, "U.S. manufacturers have already developed or are developing technologies that will allow affected airplanes to comply with the ICAO standards . . ." In this challenging economic environment, EPA can avoid costly disruptions and provide the regulatory certainty the U.S. aviation industry needs to protect jobs and invest domestically by adopting the ICAO-equivalent standards promptly. [EPA-HQ-OAR-2018-0276-0157-A1, pp.4-5]

[The following comments were submitted as testimony at the virtual public hearing on September 17, 2020.]

Second, we would urge EPA to finalize ICAO-equivalent greenhouse gas emission standards promptly, ideally by the end of the year. The proposal is many years in coming. And the sooner the American aviation industry can get certainty on this issue, the better.

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[1] International Air Transport Association, Recovery Delayed as International Travel Remains Locked Down (July 28, 2020), https://www.iata.org/en/pressroom/pr/2020-07-28-02/.

Organization: International Co-ordinating Council of Aerospace Industries Associations (ICCAIA)

ICCAIA would like to highlight that rules consistent with ICAO CO_2 standard have already been implemented by the European Union Aviation Safety Agency (EASA) in Europe, as well as by the Agência Nacional de Aviação Civil (ANAC) in Brazil[4]. [EPA-HQ-OAR-2018-0276-0175-A1, p.7]

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[4] European Union Commission Delegated Regulation (EU) 2019/897, March 12, 2019, Amending Regulation (EU) No 748/2012 as regards the inclusion of risk-based compliance verification in Annex I and the implementation of requirements for environmental protection. Agência Nacional de Aviação Civil (ANAC) Regulamento Brasileiro da Aviação Civil RBAC n°38, Emenda 0 - Requisitos para emissões de CO2 de aviões (Aeroplane CO2 emissions requirements).

Organization: Ohio Chamber of Commerce

During these challenging economic times as businesses fight to recover from the pandemic, certainty in the regulatory landscape is more important than ever before. We urge the agency to finalize the rule by the end of 2020 to bolster our economic growth and environmental stewardship, especially as our nation and the aviation sector recover from this economic and public health crisis. [EPA-HQ-OAR-2018-0276-0116-A1, pp.1-2]

Organization: Ohio Manufacturers' Association (OMA)

During these challenging economic times, as businesses fight to recover from the coronavirus pandemic, certainty in the regulatory landscape is more important than ever. We urge the agency to finalize the rule by the end of 2020 to bolster our economic growth and environmental stewardship at this particularly challenging time. [EPA-HQ-OAR-2018-0276-0136-A1, p.2]

Organization: U.S. Chamber of Commerce

We urge EPA to finalize the rule this year to bolster economic growth and environmental stewardship, especially as our nation and the aviation sector recover from the economic and public health crises. [EPA-HQ-OAR-2018-0276-0142-A1, p.1]

[The following comments were submitted as testimony at the virtual public hearing on September 17, 2020.]

During these challenging economic times, as businesses fight to recover from the pandemic, certainty in the regulatory landscape is more important than ever before. We urge the agency to finalize the rule by the end of 2020 on time to bolster economic growth and environmental stewardship, especially as our nation and the aviation sector continue to work on the economic recovery from the public health crisis.

Organization: Virginia Chamber of Commerce

During these challenging economic times, as businesses fight to recover from the pandemic, certainty in the regulatory landscape is more important than ever before. We urge the Agency to finalize the rule by the end of 2020 to bolster our economic growth and environmental stewardship, especially as our nation and the aviation sector recover from the economic and public health crises. [EPA-HQ-OAR-2018-0276-0114-A1, p.1]

Response:

EPA acknowledges all of these comments expressing the desire for EPA to finalize the rule as soon as possible. The EPA endeavored to do so.

6.1. New Type Design Airplanes

Comments:

Organization: Airbus S.A.S. (Airbus)

Comment 1 – §V.B.4 New Airplane Types and In-Production Airplane Designation

Extract: "New type designs: Airplane types for which original certification is applied for (to the FAA) on or after the compliance date of a rule, and which have never been manufactured prior to the compliance date of a rule."

Comment: The definition of new type designs with regards to the application date to the FAA is only true for U.S. aircraft manufacturers. The reference date for non-U.S. aircraft manufacturers shall be the date of application to the certificating authority of their State of Design, and not the date of application to the FAA. [EPA-HQ-OAR-2018-0276-0148-A1, p.2]

Comment 2 – §V.C.1 Applicability Dates for New Type Designs

Extract: "…the proposed regulations would apply to all airplanes for which application for an original type certificate is made to the FAA on or after January 1, 2020. For subsonic jet airplanes over 5,700 kg MTOM with 19 passenger seats or fewer, the proposed regulations would apply to all airplanes for which an original type certification application was made to the FAA on or after January 1, 2023."

Comment: Similarly to Comment 1 above, the reference date for non-U.S. aircraft manufacturers shall be the date of application to the certificating authority of their State of Design, and not the date of application to the FAA.

Organization: International Co-ordinating Council of Aerospace Industries Associations (ICCAIA)

- Page 44 - §V.B.4 New Airplane Types and In-Production Airplane Designation

Extract: "New type designs: Airplane types for which original certification is applied for (to the FAA) on or after the compliance date of a rule, and which have never been manufactured prior to the compliance date of a rule."

Comment: The definition of new type designs with regards to the application date to the FAA is only true for U.S. aircraft manufacturers. The reference date for non-U.S. aircraft manufacturers shall be the date of application to the certificating authority of their State of Design, and not the date of application to the FAA. The same comment applies to §V.C.1, page 48. [EPA-HQ-OAR-2018-0276-0175-A1, p.4]

Response:

The commenters are correct that the relevant date for the applicability of the standards for new types is the application to the certificating authority in their state of design. The preamble has been amended to make this clear. The preamble text now states that "airplanes for which application for an original type certificate is made to the FAA as the first certificating authority."

Part 1030.1(a) has also been clarified to state that it applies when "original civil certification under title 14 is sought." The addition of the word "original" to 1030.1(a) removes any ambiguity for when the part applies.

Organization: Airbus S.A.S. (Airbus)

Comment 3 – §V.C.1 Applicability Dates for New Type Designs

Extract: "…[f]or subsonic jet airplanes over 5,700 kg MTOM and certificated with more than 19 passenger seats, the proposed regulations would apply to all airplanes for which application for an original type certificate is made to the FAA on or after January 1, 2020. For subsonic jet airplanes over 5,700 kg MTOM with 19 passenger seats or fewer, the proposed regulations would apply to all airplanes for which an original type certification application was made to the FAA on or after January 1, 2023."

Comment: The proposed wording does not fully reflect the intent of Annex 16 Volume III, Part II, Chapter 2, §2.1.1(a)(b). Indeed, a business jet aircraft over 60,000 Kg MTOM but configured with less than 19 seats would fall under §2.1.1(a) of Annex 16 Vol III, Part II, Chapter 2, with an applicability date from January 1st, 2020. On the other hand, §V.C.1 of U.S. EPA NPRM indicates that such an airplane model would have an applicability date from January 1st, 2023. [EPA-HQ-OAR-2018-0276-0148-A1, pp.2-3]

<u>Response:</u>

Airbus correctly points out that §V.C.1 of the NPRM did not fully describe the limited delay provision for smaller airplanes. In the preamble to the FRM, we provide a clearer explanation of this provision. Note that this provision was correctly described in the proposed regulatory text, 1030.1(a)(2), and no corresponding edits were needed for the final regulatory text.

Organization: International Council on Clean Transportation (ICCT)

ICCT agrees with EPA on the following aspects of the proposed rule:

3. That for a new-type standard to provide meaningful incentives for technology innovation and adoption, aircraft manufacturers need to be informed about the standard well before the targeted entry into service date for new designs. Note that ICAO's standard provided only four years of lead time for its new type standard, compared to EPA's recommended lead time of at least eight years, undermining its effectiveness. [EPA-HQ-OAR-2018-0276-0168-A1, p.2]

[The following comments were submitted as testimony at the virtual public hearing on September 17, 2020.]

Three, we agree that for a new type standard to provide meaningful incentives for technology innovation and adoption, it should provide manufacturers with at least eight years lead time. Note that ICAO's standard provided only four years lead time for new types, undermining its effectiveness.

With that as background, we have thus far identified five areas of refinement in the proposed rule, namely that, … two, that the new type standards should be strengthened and implemented with a longer lead time; …

Because of the long timeframe associated with fuel efficiency technology development and deployment, a meaningful new type standard is critical for long-term technology development in U.S. aviation. When analyzing stringency options, ICAO defined the upper limit of technological feasibility as widely available technologies of a technology-readiness level of eight or above in 2016. Technology scheduled to be integrated into concrete aircraft projects shortly thereafter were not used to establish standards for stringency.

As a result, the aircraft that dominate deliveries today easily pass ICAO's requirements. According to our analysis, new deliveries of commercial jet aircraft in 2019 were on average 6 percent more fuel-efficient than required by the standard in 2028. Advanced new-type aircraft that entered into service since 2016 passed the standard by 10 percent to 20 percent on average.

Response:

See Section IV.I.1 of the preamble for the EPA's response on stringency of the standards, which also pertains to earlier implementation or compliance dates.

Organization: Life:Powered, an initiative of the Texas Public Policy Foundation

Finally, the EPA is wrong to retroactively adopt a start date of January 1, 2020, on the basis that no new plane designs have been filed since that time. We are not aware of a legal precedent for a federal agency to apply a start date that is prior to the implementation of a new regulation. This action violates the usual standards of fair notice and due process and is further evidence that this rule was rushed into existence without proper consideration of alternatives and regulatory impacts. [EPA-HQ-OAR-2018-0276-0172-A1, p.3]]

Response:

There have not been any applications for a new type design that would be applicable to the rule since January 1, 2020. So, to date, no airplanes would have triggered this requirement. Moreover, the EPA is not aware of any manufacturers who would seek certification of any new type design airplanes in the near future. This comment has been addressed as we aligned the applicability date for new type design airplanes in §1030.1(a)(1)(iii) with the effective date of the final rule.

6.2. In-Production Airplanes

Comments:

Organization: National Association of Clean Air Agencies

III. NACAA's Recommendations

Second, EPA should accelerate its January 1, 2028 compliance date for in-production models. [EPA-HQ-OAR-2018-0276-0177-A1, p.4]

Organization: Washington State Department of Ecology (Ecology)

Specifically, the rule should:

- Accelerate the January 1, 2028 compliance date for in-production models. [EPA-HQ-OAR-2018-0276-0140-A1,p .5]

Response:

See Section IV.I.1 of the Preamble for the EPA's response on stringency of the standards, which also pertains to earlier implementation or compliance dates.

6.2.1. Request to extend applicability date for some in-production freighters

Comments:

Organization: Boeing Company (Boeing)

In addition, Boeing requests that EPA extend the proposed production cut-off date for a class of in-production mid-size widebody purpose-built freighters, including the Boeing 767-300F (767F), until January 1, 2038, as significant unexpected economic factors arising after the ICAO CO_2 standard was established, including the COVID-19 pandemic, have affected and continue to severely affect Boeing, its supply chain, and its customers, and warrant additional time for Boeing to upgrade or replace the 767F in a practicable and economically feasible manner, consistent with the ICAO terms of reference and the mandatory factors in CAA section 231(b). Such action would not result in more than a de minimis increase in emissions, consistent with EPA's simulation analysis discussed in the Notice of Proposed Rulemaking ("NPRM"), and in fact would be expected to reduce emissions due to the 767F's comparative trip fuel advantage over available and expected substitutes that could serve the domestic express freight market segment. Boeing recognizes that ICAO generally favors a high degree of uniformity by Member States in the standards and guidance they adopt for their regulated entities. Nonetheless, the Chicago Convention also recognizes that Member States may adopt differing domestic standards on the basis of impracticability or necessity within their sovereign borders, and may adopt their own unique standards applicable to their domestic operations. Boeing recognizes that, if EPA makes the requested accommodation, then any mid-size widebody purpose-built freighter produced in the United States after January 1, 2028, and benefiting from this accommodation might be limited to operations within the United States and other areas subject to its sovereign jurisdiction, as has been the past practice when the United States has made an exception to allow for continued domestic operations of a particular class of aircraft or aircraft engine. [EPA-HQ-OAR-2018-0276-0181-A2, p.2]

VII. EPA and FAA Should Adjust the Proposed Applicability Date for a Narrow Class of In-Production Purpose-Built Freighter Aircraft Including the Boeing 767-300F.

The rule as proposed would apply to all in-production airplanes manufactured in the United States on or after January 1, 2028. The unprecedented economic challenges faced by Boeing and its supply chain partners, however, mean that this applicability date is no longer feasible for one class of airplanes Boeing manufactures—namely, purpose-built freighters with MTOMs between 180,000 kg and 240,000 kg, including the Boeing 767F (and the Airbus A330-200F). Consistent with both the ICAO terms of reference and the mandatory factors in CAA section 231(b), which include "giving appropriate consideration to the cost of compliance within [the specified] period," Boeing respectfully requests that the applicability date for this single class of airplanes be extended in the final rule for a period of 10 years, from January 1, 2028, to January 1, 2038. This additional time is necessary to allow Boeing to produce a compliant freighter in a cost-effective and financially responsible manner. [EPA-HQ-OAR-2018-0276-0181-A2, p.39]

A. CAA Section 231 Allows EPA to Consider Compliance Costs and Provide Airplane Manufacturers Sufficient Time to Develop and Apply the Requisite Emission Reduction Technology.

Under the express terms of the ICAO framework, each Member State (including the United States) determines when and how to apply the international CO_2 standard to its domestically-manufactured and operated civil aircraft, including cargo aircraft.[169] In seeking to implement "the highest practicable degree of uniformity in aviation regulations and standards,"[170] EPA thus may determine when it is practicable to apply the ICAO standard to various classes of airplanes, including freighter airplanes like the Boeing 767F.[171] [EPA-HQ-OAR-2018-0276-0181-A2, p.39]

To that end, the CAA provides EPA broad authority to finalize a rule incorporating a new compliance deadline for the 767F and similar airplanes, even if doing so provides that class of airplane a longer time to comply than other airplanes or than provided under the corresponding ICAO standard. Further, that authority may be exercised by EPA even if doing so might, result in the restriction of such aircraft produced after the applicability date in the ICAO standard to U.S. domestic operations and operations in the jurisdictions of other ICAO Member States that are specifically willing to recognize and allow the operation of such aircraft. [EPA-HQ-OAR-2018-0276-0181-A2, p.39]

CAA section 231(b) expressly provides that: "Any regulation prescribed under [section 231] shall take effect after such period as the Administrator finds necessary (after consulting with the Secretary of Transportation) to permit the development and application of the requisite technology, giving appropriate consideration to the cost of compliance within such period" (emphasis added). As the D.C. Circuit has noted, "[w]hen Congress enacted §231 providing that the Administrator could, 'from time to time,' act 'in his judgment,' as 'he deems appropriate,' it conferred broad discretion to the Administrator to weigh various factors in arriving at appropriate standards."[172] Cost of compliance, and the amount of time compliance will take in light of those costs, are clearly among these factors, per the express language of the statute. Here, EPA has requested comment on "all aspects of the proposed standards," including "all aspects of the proposed in-production rule, including the level, timing, and differentiation between airplane categories,"[173] and it is permitted by statute to "issue such regulations with such modifications as [it] deems appropriate."[174] Thus, whether to set such a new deadline in the final rule is within the scope of EPA's request for comments and within the scope of its powers under the law. [EPA-HQ-OAR-2018-0276-0181-A2, p.40]

As we discuss in Sec. VII.B. below, EPA should provide for a 10-year extension of the proposed effective date for in-production purpose-built freighters with MTOMs between 180,000 kg and 240,000 kg for domestic use–from January 1, 2028 to January 1, 2038. This class would include both the Boeing 767F and the Airbus A330-200F.[175] The unprecedented financial impacts that the aircraft industry is suffering as a result of the COVID-19 pandemic – adverse conditions that the industry will likely experience for years to come – justify a significantly longer timeframe for purpose-built freighter aircraft manufacturers to develop and transition to more fuel-efficient aircraft. Section 231 expressly authorizes EPA to extend compliance deadlines based on such financial constraints, and EPA may reasonably exercise that authority in this rulemaking to provide Boeing the 10-year extension necessary to allow it to develop and manufacture a compliant airplane to replace the 767F in a cost-effective and financially responsible manner. [EPA-HQ-OAR-2018-0276-0181-A2, p.40]

Past EPA actions provide ample precedent for extending the compliance deadline for the 767F airplane based on the extraordinary events that have occurred since the ICAO standard was finalized. Those events have resulted in economic upset that will affect Boeing, and the commercial airplane manufacturing and airline industries more broadly, for years to come. [EPA-HQ-OAR-2018-0276-0181-A2, p.40]

First, the Agency has on multiple occasions extended section 231 standard compliance deadlines based on a variety of factors. Those extensions demonstrate that EPA has authority to grant an appropriate compliance extension in this rulemaking. For example:

EPA promulgated its first emission standards for aircraft engines in 1973.[176] Barely five months later, with regulatory deadlines fast approaching, EPA promulgated an amendment providing an extension of the effective date of fuel venting and smoke requirements based on concerns about the procurement and installation of equipment to prevent fuel venting, as well as the time that would have been required to obtain individual exemptions.[177] [EPA-HQ-OAR-2018-0276-0181-A2, pp.40-41]

In 1978, EPA proposed an additional 2-year extension of the effective date of the 1973 regulations, applicable to "all gaseous emission standards which would otherwise have been effective on January 1, 1979."[178] This extension was based on the need to reanalyze "the degree of the need for control of

NOx emissions from aircraft" and allowed the "continued manufacture of aircraft turbine engines between January 1, 1979 and the compliance date specified in the final amended standards [i.e., January 1, 1981]."[179] This extension was finalized the same day it was proposed.[180]

In 1980, EPA further extended the effective date for the gaseous emission standards for aircraft engines for an additional two years, to January 1, 1983.[181] That extension was based on EPA's delay in promulgating expected revisions to the standards.[182]

In 1982, when EPA finalized that standard, it issued a further one-year extension of the deadline for gaseous emissions, until January 1, 1984.[183] All told, EPA extended the initial compliance deadline for the gaseous emission standard more than a decade.

In two other rulemakings, EPA extended the compliance date for the smoke emission standard, first promulgated in 1973 and originally set for January 1, 1978. Ultimately, the final compliance deadline was set for January 1, 1985, a full seven years later.[184] While these actions were taken, in part, to synchronize the EPA smoke standards with FAA's phased compliance dates for noise standards,[185] EPA also considered delays in the development of a low smoke combustor, the time required for retrofitting existing engines, and the need to include time for a service evaluation program involving a pilot group of engines.[186] [EPA-HQ-OAR-2018-0276-0181-A2, p.41]

Second, EPA has also, in effect, extended compliance timeframes for ICAO standards in the process of incorporating them into 40 C.F.R. Part 87 pursuant to CAA section 231:

In 1997, EPA promulgated a final rule that codified ICAO NOx emission standards to bring the U.S. "into alignment with internationally adopted standards"[187] EPA set the effective date for those standards at July 7, 1997, even though the international standards had become effective 11 years earlier.[188] [EPA-HQ-OAR-2018-0276-0181-A2,pp.41-42]

In 2005, EPA again adopted ICAO standards that were already in effect prior to the date of the final EPA rule.[189] While the ICAO standard had an effective date of December 31, 2003, EPA's rule provided that they would take effect in the United States beginning on December 19, 2005.[190] [EPA-HQ-OAR-2018-0276-0181-A2,p.42]

Third, and perhaps most pertinently, EPA has granted exceptions or exemptions[191] from compliance where financial or other considerations have made earlier compliance infeasible:

In a 2012 rule, for example, EPA allowed potential exemptions for "newly manufactured engines that may not be able to comply with the first tier of the new NOx standards because of specific technical or economic reasons."[192] This exemption applied to Tier 6 NOx standards, and replaced a preexisting exemption in 40 C.F.R. § 87.7.[193] The primary purpose of the exemption was to "provide for an orderly implementation of the Tier 6 NOx production cutoff."[194] The exemption recognized that companies "may plan not to invest in upgrading the emissions of engine models that would be very near the end of their normal production cycles when compliance with the new standard becomes required."[195] [EPA-HQ-OAR-2018-0276-0181-A2, p.42]

Similarly, in a 1982 rule,[196] EPA included an exemption for low-production aircraft engines "which [were] nearly at the end of their production life [and] would be terminated prematurely because there would be insufficient future sales to justify incorporating emission controls."[197] EPA further noted that, as here, "production numbers are so small that there will likely be only negligible effects on overall fleet emissions."[198] EPA also determined that "[t]his type of exemption is equitable, since low production models do not compete significantly with higher production models."[199] [EPA-HQ-OAR-2018-0276-0181-A2, pp.42-43]

Thus, even while seeking to align U.S. standards with those approved by ICAO, EPA has implemented standards within the United States on timeframes substantially later or longer than those established by ICAO, or has exempted certain engines from the standards altogether. There is thus no question EPA has the authority to extend the production cut-off deadline in the proposed rule and that the Agency actually contemplated the possibility and the effects of doing so, via the various simulation analyses in the cost benefit analysis and supporting technical reports for the NPRM,[200] and its request for comment regarding the production timeline for in-production aircraft.201 And it is clear, based on the changed circumstances that have occurred since the ICAO standard was adopted and this rulemaking first initiated, as discussed below, that such an extension is warranted and consistent with EPA's obligations under the CAA to consider fleet evolution and technology response in light of current economic conditions and to make modifications to the proposed rule as the Administrator "deems appropriate" to provide the time necessary to permit "the development and application of the requisite technology" needed to upgrade or replace the 767F in the mid-size widebody purpose-built freighter market segment "giving appropriate consideration to the cost of compliance within such period," pursuant to Clean Air Act section 231(b). A 10-year extension would reasonably accommodate the unprecedented COVID-19 pandemic and the resulting operational and financial challenges that the airline and commercial aircraft manufacturing[202] industries have suffered since the ICAO standard was finalized. [EPA-HQ-OAR-2018-0276-0181-A2,p.43]

B. Extending Production of the 767F is Warranted in Light of the COVID-19 Pandemic, Which Has Had a Profound Negative Financial Effect on the Aircraft and Aircraft Engine Manufacturing Industries.

Given the unforeseen and extensive economic damage that the aircraft and aircraft engine manufacturing and airline industries have suffered, taking into account the low relative demand for, and utilization of, cargo aircraft for domestic use, and considering that greater emission reductions can be achieved by focusing Boeing's near-term product development efforts on higher volume market segments, EPA should allow for continued production of the 767F and similar freighter airplanes for 10 years after January 1, 2028, until January 1, 2038. The alternative—ending production of the 767F by 2028—could increase domestic freight shipping costs and CO_2 emissions (by driving domestic express freight transporters to larger, and, for that market segment, less fuel-efficient aircraft)[203] while reducing jobs across the U.S. economy. EPA and FAA have authority to allow continued production of the 767F, until January 1, 2038, benefitting not only the U.S. economy, but also the environment. [EPA-HQ-OAR-2018-0276-0181-A2,pp.43-44]

2. More Time Is Necessary to Develop and Certify a New or Derivative Purpose-Built Freighter for the Mid-Sized Widebody Market Segment.

Developing a new type purpose-built aircraft (aka a "clean sheet" aircraft) to serve the market segment currently served by the 767F will take many years, even in the best of circumstances. More years are then required for testing and certification of the new airplane. Development of a derivative aircraft based on the 767F would also take many years, again followed by years for testing and certification. These constraints have been further compounded by the financial impact of COVID-19. The consequence is that 10 additional years from the beginning of 2028 will be required to develop and deliver either a derivative or new type freighter that is compliant with EPA's new CO_2 standards in a practicable and economically feasible (cost-effective and financially responsible) manner. [EPA-HQ-OAR-2018-0276-0181-A2, p.45]

3. Any Environmental Impact of Granting the Extension Will be Minimal.

Importantly, finalizing a rule containing the requested 10-year extension should not result in more than a de minimis increase in total U.S. aviation CO_2 emissions. That is because, even in its current configuration, the 767F consumes less fuel and emits less CO_2 per trip for typical U.S. domestic express freight operations than any other alternative aircraft of similar capacity and capability currently available or expected to be available for the foreseeable future. Given the 767F's comparative trip fuel advantage over available and expected substitutes, extending production of the current 767F configuration until the end of 2037 would in-fact avoid the increased CO_2 emissions that would result were U.S. domestic express freight operators no longer able to choose the 767F and instead were forced to use larger, and, for that market segment, less fuel-efficient freighter airplanes. [EPA-HQ-OAR-2018-0276-0181-A2, p.46]

Even without taking into account these avoided emissions, continued production of the 767F for an additional 10 years would result in no more than a de minimis increase in CO_2 emissions, given the small number of mid-size widebody purpose-built freighters expected to be built after 2027 relative to the vast fleets of passenger aircraft expected to be built, and the relatively low average utilization of mid-size widebody freighter aircraft compared with passenger aircraft—approximately 4-5 hours per day versus approximately 9-10 hours per day, respectively.[210] [EPA-HQ-OAR-2018-0276-0181-A2,p.46]

C. Conclusion and Suggested Regulatory Language.

Throughout the COVID-19 pandemic, the 767F airplane has continued to be a workhorse of express freight operators' fleets, moving critical goods even while much of the world's economy was shut down. Boeing remains committed to its strategy of sequentially improving fuel efficiency across its product family, including in the mid-size widebody freighter market segment. Boeing recognizes the need to invest in the 767F (whether by a derivative or new type aircraft) to increase its efficiency for its customers and to achieve performance improvements necessary to meet the ICAO standard. A ten-year extension of the applicability date of EPA's CO_2 rule for in-production mid-size widebody freighter aircraft, until January 1, 2038, will allow Boeing, its supply chain partners, and its customers to recover from the economic consequences of this pandemic and enable the company to invest the resources necessary to develop a derivative or new type mid-size widebody freighter to replace the 767F. That additional time may also allow Boeing to take advantage of later advancements in airframe and engine technologies, with the potential to reduce emissions even beyond what is possible today, while also continuing to provide U.S. express freight operators the most fuel-efficient mid-size widebody freighter currently available or expected in the foreseeable future for their operations. [EPA-HQ-OAR-2018-0276-0181-A2, pp.45-46]

Boeing therefore respectfully urges EPA to finalize a standard that adopts a ten-year extension of the ICAO applicability date for mid-size widebody freighter aircraft, from January 1, 2028, to a new date of January 1, 2038. Based on economic conditions and the time necessary to permit "the development and application of the requisite technology" pursuant to Clean Air Act section 231(b), EPA should therefore establish an applicability date of no earlier than January 1, 2038, for subsonic jet airplanes that are purpose-built freighters with MTOMs between 180,000 kg and 240,000 kg for domestic use. This can be accomplished by excluding such aircraft from 40 C.F.R. § 1030.1(a)(6); adding a new 40 C.F.R. § 1030.1(a)(8) covering these aircraft as of January 1, 2038; adding a new line to the table in 40 C.F.R. § 1030.30(b) (i.e., a new 40 C.F.R. 1030.30(b)(9)) to establish the emissions standard for these aircraft; and adding a definition of "purpose-built freighter" in 40 C.F.R. § 1030.1(a)(8), as follows:

40 C.F.R. § 1030.1(a)

(6) Except for a subsonic jet that is a purpose-built freighter and that has a MTOM greater than 180,000 kg but not greater than 240,000 kg, a subsonic jet airplane that has –

(i) A MTOM greater than 5,700 kg; and

(ii) An original certificate of airworthiness issued on or after January 1, 2028;

(8) A subsonic jet that is a purpose-built freighter and that has –

(i) A MTOM greater than 180,000 kg but not greater than 240,000 kg and

(ii) An original certificate of airworthiness restricting operation of the aircraft to domestic use only issued on or after January 1, 2038.

40 C.F.R § 1030.30(b) [EPA-HQ-OAR-2018-0276-0181-A2, p.46] [[See page 46 of Docket Number EPA-HQ-OAR-2018-0276-0181-A2 for table]]

40 C.F.R. § 1030.105

Purpose-built Freighter is an airplane that is configured to carry cargo rather than passengers prior to receiving an original certificate of airworthiness. [EPA-HQ-OAR-2018-0276-0181-A2, p.47]

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[3] CAA § 231(a)(2)(A), 42 U.S.C. § 7571(a)(2)(A).
[169] Guidance is provided through the ICAO Doc. 9501, Environmental Technical Manual, CAEP10 (Feb. 2016). The manual is "intended to make the most recent information available to certifying authorities, aeroplane certification applicants and other interested parties in a timely manner, aiming at achieving the highest degree of harmonization possible." ICAO Doc. 9501 at v.
[170] 85 Fed. Reg. at 51,556, 51,557, and 51,559 (emphasis added). See also Chicago Convention, Art. 37.
[171] The EPA Administrator is to propose emission standards, from time to time, "applicable to the emission of any air pollutant from any class or classes of aircraft engines." CAA § 231(a)(2)(A), 42 U.S.C. § 7571(a)(2)(A). The Chicago Convention provides that "[a]ny State which finds it impracticable to comply in all respects with any such international standard or procedure, or to bring its own regulations or practices into full accord with any international standard or procedure after amendment of the latter, or which deems it necessary to adopt regulations or practices differing in any particular respect from those established by an international standard" is to provide notice of same to the Council. Chicago Convention, Art. 38.
[172] NACAA v. EPA, 489 F.3d at 1230.
[173] 85 Fed. Reg. at 51,556, 51,573 (emphasis added).
[174] 42 U.S.C. § 7571(a)(3).
[175] It does not include the 777F or the 747F.
[176] 38 Fed. Reg. 19,088 (July 17, 1973). The emission regulations were contained in a newly promulgated part, 40 C.F.R. Part 87. It should be noted that EPA was established by Executive Order on December 2, 1970, and thus the 1973 standards were the first aircraft engine standards promulgated by the Agency.
[177] 38 Fed. Reg. 35,000 (Dec. 21, 1973).
[178] 58 Fed. Reg. 12,615 (Mar. 24, 1978).
[179] Id.
[180] 58 Fed. Reg. 12,614 (Mar. 24, 1978).
[181] 45 Fed. Reg. 86,946 (Dec. 31, 1980).
[182] Similar to the final action taken in 1978, the 1980 rule permitted the continued manufacture of aircraft engines between January 1, 1981 and January 1, 1983. The Agency also cited circumstances that prevented completion of a planned study on aircraft engine emissions. Id.
[183] 47 Fed. Reg. 58,462, 58,465 (Dec. 30, 1982).
[184] 41 Fed. Reg. 54,861 (Dec. 15, 1976); 44 Fed. Reg. 64,266 (Nov. 6, 1979).
[185] 44 Fed. Reg. at 58,464.
[186] 41 Fed. Reg. at 54,861.
[187] 62 Fed. Reg. 25,356 (May 8, 1997).
[188] "The first NOx emission standard presented ... matches the ICAO standard that became effective in 1986." 62 Fed. Reg. at 25,359. That standard applies to engines certified on or before December 31, 1995 and manufactured on or before December 31, 1999. A second ICAO NOx standard became effective in 1996 for newly certified engines and in 2000 for newly manufactured engines. Id. EPA determined, however, that all but two engine models met the standards and that the two models that did not would be able to comply with the standards for newly manufactured engines.
[189] In the 2005 rule, EPA adopted ICAO NOx emission standards that were equivalent to ICAO February 1999 standards and March 1997 test procedures. 70 Fed. Reg. at 69,673.
[190] 70 Fed. Reg. at 69,674, 69,686. See 40 C.F.R. § 87.21(d)(1)(vii).
[191] Current EPA regulations distinguish between "exceptions" and "exemptions." Both are separately defined in 40 C.F.R. § 87.1. To "except" an aircraft engine from regulations standards is to "routinely allow engines to be

produced that do not meet (or do not fully meet) otherwise applicable standards." 40 C.F.R. § 87.1. EPA has previously applied exceptions to spare aircraft engines. EPA defines an "exemption" of an aircraft engine as "allow[ing] (through a formal case-by-case process) engines to be produced that do not meet (or do not fully meet) otherwise applicable standards." Id. In both cases, aircraft engines are considered to be subject to standards, but EPA effectively does not apply such standards to the aircraft engines. 40 C.F.R. Part 87, Subpart F contains currently applicable exemptions and exceptions with regard to NOx emissions, exemptions for flights of short duration, and spare engines.

[192] 77 Fed. Reg. 36,351 (June 18, 2012).

[193] Id. at 36,359-60; 36,384-36,386; 40 C.F.R. § 87.50.

[194] Id. at 36,362.

[195] Id.

[196] 47 Fed. Reg. at 58,468, 58,471 (Dec. 30, 1982).

[197] EPA proposed this exemption in 1978. 43 Fed. Reg. 12,615, 12,619 (Mar. 24, 1978).

[198] 47 Fed. Reg. at 58,468.

[199] 47 Fed. Reg. at 58,468. In the 1982 final rule, EPA provided an exemption for 20 units per year, not to exceed a total of 200 units. Id. See 40 C.F.R. § 87.7(b) (1983 ed.).

[200] See 85 Fed. Reg. at 51583-51584; see also Technical Report on Aircraft Emissions Inventory and Stringency Analysis, U.S. EPA Office of Transportation and Air Quality Assessment and Standards Division (July 2020) (summarizing the sensitivity studies and acknowledging that "even when we remove the continuous improvement assumption and extend the production of the A380 and 767-3ERF to 2030, the emissions reductions for all three scenarios are still quite modest"…and noting that the proposed standards have "no cost and benefit in scenarios 1 and 2 but produce a small environmental benefit (1.4 Mt CO_2 reductions in the U.S.) in Scenario 3."). Scenario 3 analyzed the impact of a three-year extension of the production cycle for the 767F.

[201] See 85 Fed. Reg. at 51,573.

[202] Katz, Benjamin, Airbus Plans to Cut 15,000 Jobs, Citing Impact of COVID-19, Wall Street Journal (June 30, 2020) (noting that air traffic may not return to pre-pandemic levels until 2023 or 2025 and that the reduction comes after "months of stalled air traffic that has resulted in a run of airline bankruptcies and restructurings around the world, including moves to reduce fleet numbers and cancel orders for new planes.").

[203] ICF, Aircraft CO_2 Cost and Technology Refresh Sept. 30, 2019) at 33, available at https://beta.regulations.gov/document/EPA-HQ-OAR-2018-0276-0027 at 33 ("The 767-3F is out of production by scenario 1's stringency year (2028) ... . As the 767 freighter fleet retires, ICF expects its routes will be taken up by A330 and 777 freighters.").

[210] FAA, Economic Values for Evaluation of FAA Investment and Regulatory Decisions; Section 3 - Aircraft Capacity and Utilization Factors, available at https://www.faa.gov/regulations_policies/policy_guidance/benefit_cost/media/econ-value-section-3-capacity.pdf.

Organization: Cargo Airline Association

In developing the final rule, it is prudent and necessary for EPA to evaluate the devastating impact that COVID-19 has had on the U.S. and global aviation industry, the recovery from which is still very much uncertain, and afford sufficient flexibility in the final rule to allow for the continued production of certain mid-size, purpose built freighters for use in the U.S. domestic market. Such consideration would be consistent with the ICAO standard, as well as the allowances afforded to ICAO member states in ICAO Annex 15 and comply with the requirements of the Clean Air Act. [EPA-HQ-OAR-2018-0276-0159-A1, p.6]

While the most immediate and severe impact of COVID-19 has been on commercial passenger service, U.S. domestic air cargo carriers have been affected, as evidenced by over $650 million afforded in federal assistance. Further, the impact on various aircraft manufacturers, including Airbus and Boeing, has been unprecedented and we anticipate that this may cause a delay in their ability to design, test, and certify compliant new aircraft designs, as well as modify production lines and train employees.[7] Prioritization of the design of new aircraft will likely be afforded to large, passenger aircraft intended for use in international operations, leaving a gap in the availability of new, mid-size, purpose built freighters. This is primarily because of the smaller market and demand for mid-size, purpose-built freighters. Considering the much shorter operating frequency of these freighter aircraft as reflected in EPA's own simulation analyses supporting the rule, and the de minimis impact on emissions that the operation of these aircraft would have, it would be appropriate for EPA to consider affording flexibility to allow for the continued production of these aircraft beyond January 1, 2028, to ensure a sufficient amount of new aircraft are available to support the U.S. domestic aviation industry. Such action is warranted when considering the cost and timing of compliance, as required under the Clean Air Act. [EPA-HQ-OAR-2018-0276-0159-A1, p.6-7]

The Cargo Airline Association supports an EPA rulemaking and its position to move forward to harmonize with ICAO GHG emissions standards, with the modifications noted above. We respectfully urge the agency to make changes to the regulatory text to ensure consistency and uniformity with the ICAO standards. Moreover, to the extent not inconsistent with the positions set forth herein, the Cargo Airline Association also supports and endorses the Comments filed in this proceeding by our member airlines, as well as Airlines for America (A4A), and the Aerospace Industries Association (AIA).[EPA-HQ-OAR-2018-0276-0159-A1, p.7]

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[7] See Airbus "Airbus Plans to Further Adapt to COVID-19 Environment", available at https://www.airbus.com/newsroom/press-releases/en/2020/06/airbus-plans-to-further-adapt-to-covid19-environment.html (June 30, 2020) (reporting involuntary workforce reductions as a result a 40% drop in commercial aircraft business activity); see also Boeing, "Boeing Forecasts Challenging Near-Term Aerospace Market With Resilience in Long-Term" available at https://boeing.mediaroom.com/2020-10-06-Boeing-Forecasts-Challenging-Near-Term-Aerospace-Market-with-Resilience-in-Long-Term (October 6, 2020) (adjusting its market outlook over the next decade to account for the impact of COVID-19 on demand).

Organization: Federal Express Corporation

II. Impact of COVID-19 and Need for Continued Production of Mid-size, Widebody Purpose-built Freighters, Including the Boeing 767F, Beyond January 1, 2028

FedEx Express recognizes the stated goal of the EPA to conform to the greatest degree possible to the ICAO standard. In doing so, however, the EPA must also comply with its obligations under section 231 of the Clean Air Act and consider the impact on safety, noise, and cost associated with compliance.[2] In light of the continued devasting economic impact of COVID-19 on the U.S. and global aviation industry, the EPA must consider the costs associated with compliance and provide the necessary flexibility in the final rule to enable the U.S. economic recovery from this crisis.[3] For this reason, FedEx Express respectfully requests the EPA extend the production of mid-size, widebody purpose-built freighters, including the Boeing 767F, for a ten-year period, through January 1, 2038. This extension is necessary to afford time for the industry to recover and invest, develop, test, and seek approval of compliant aircraft designs to replace the 767F, as well as modify production lines to support the manufacture of these aircraft. [EPA-HQ-OAR-2018-0276-0178-A1, p.3]

The COVID-19 pandemic has caused unprecedented financial impacts to the aviation industry that will take time to recover from, as some predict that air travel will not resume to pre-COVID-19 levels until 2023, or even as late as 2025.[4] Although the most immediate and severe impact of COVID-19 has been on commercial passenger travel, there has been a wide-spread, deepening impact on U.S. aircraft manufacturers, aircraft parts manufacturers, commercial airlines (including U.S. all-cargo carriers), and various aviation contractors. ICAO recently reported a 4.9% to 5.2% reduction in the world's gross domestic product in 2020, "far worse than the during the 2008-2009 financial crisis," and continues to question how deep and how long the global recession will be.[5] While there is still a great deal of uncertainty about the U.S. and global economic recovery, there is no doubt about the economic impact on the U.S. aviation industry and the EPA must account for that in developing the final rule. [EPA-HQ-OAR-2018-0276-0178-A1, p.3]

One manner in which the EPA can provide this much needed economic relief with negligible impact on its emissions reduction objective and international regulatory harmonization goal is to extend the production timeline for mid-size widebody purpose-built freighters, including the Boeing 767F. As noted earlier, the Boeing 767F has contributed and will continue to contribute significantly to FedEx Express' emissions reductions goals. A 10-year extension would not only support the U.S. economic recovery efforts and employment within the aviation manufacturing sector, but it would also result in, at most, only a de minimis increase in CO_2 emissions. [6] This is primarily because for the typical frequency and length of operation that the Boeing 767F supports (mostly domestic express freight operations), the 767F is the most fuel-efficient option resulting in reduced fuel needs and emissions. [EPA-HQ-OAR-2018-0276-0178-A1, p.3-4]

The EPA may afford such flexibility to the U.S. domestic aviation industry while still achieving its goal of conforming to the ICAO standard to promote international harmonization. The Convention on International Civil Aviation recognizes that member States may adopt their own unique standards that govern domestic operations that may be less restrictive, or in some cases, more stringent than what is adopted by ICAO. In doing so, the Convention has a number of other features designed to protect and advance international commerce, to include requiring States to recognize airworthiness certificates issued by other Member States provided those Member States' standards are at least as stringent as ICAO standards, and allowing Member States to prohibit the use of any aircraft within their airspace that does not meet ICAO standards. These protections ensure a consistent regulatory framework to enable international operations while also affording Member States the flexibility to address the unique needs of its domestic aviation industry. In this instance, given the devastating, continued impact of COVID-19 on the U.S. aviation industry, it would be appropriate for the EPA to adopt the standards as proposed to ensure the U.S. aviation manufacturing industry can compete globally with respect to aircraft manufactured and intended for international operations, while also extending the production timeline for mid-size, widebody purpose-built freighters, recognizing that aircraft produced after January 1, 2028, may be limited to operating in the U.S. or in the jurisdiction of other ICAO Member States' willing to recognize the certification of the aircraft. Such action would not only be consistent with the U.S. obligations under the Convention but also ensure compliance with the EPA's obligations under section 231 of the Clean Air Act that requires [EPA-HQ-OAR-2018-0276-0178-A1][EPA-HQ-OAR-2018-0276-0178-A1, p.4]

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[2] 42 U.S.C. §§ 7571(a)(2)(B)(ii), (b).

[3] See Bellamy III, Woodrow "Boeing Adjusts Commercial Production Rates Under On-going COVID-19 Uncertainty," available at https://www.aviationtoday.com/2020/07/30/boeing-adjusts-commercial-production-rates-ongoing-covid-19-uncertainty/ (July 30, 2020) (reporting continued deferral of aircraft orders and discussion of efforts to mitigate economic impact); see also "Airbus Plans to Further Adapt to COVID-19 Environment", available at https://www.airbus.com/newsroom/press-releases/en/2020/06/airbus-plans-to-further-adapt-to-covid19-environment.html (June 30, 2020) (noting plans to reduce size of workforce following a 40% drop in commercial aircraft business activity); U.S. Department of Treasury, "Update on Treasury Implementation of the Payroll Support Program for the Aviation Industry" available https://home.treasury.gov/news/press-releases/sm1008 (May 12, 2020) (recognizing that over $25 billion in grant funding had been awarded to 352 applicants, including all of the "major passenger carriers, more than 260 smaller passenger air carriers, and a significant number of cargo air carriers and contractors."); Congressional Research Service, "CARES Act Payroll Support to Air Carriers and Contractors," available at https://crsreports.congress.gov/product/pdf/IN/IN11482 (updated October 8, 2020).

[4] ICAO, "Effects of Novel Coronavirus on Civil Aviation: Economic Impact Analysis," available at https://www.icao.int/sustainability/Documents/COVID-19/ICAO%20COVID% 202020%2010%2008%20Economic %20Impact.pdf (October 8, 2020) (describing the devastating global economic impact, including recognizing a fall in global trade merchandise volume by between 13% and 32% in 2020 compared to 2019).

[6] See "EPA Technical Report on Aircraft Emissions Inventory and Stringency Analysis" (July 2020) (analyzing various production cycles for the 767F, including a three-year extension, and recognizing that such extensions would have a negligible impact on emissions given the expected number of 767Fs that would be produced and the

frequency and duration of all-cargo flights that this airplane supports). The confidential business information filed by FedEx Express confirms the operating assumptions made by the EPA and supports the conclusion that a 10-year extension also would have, at most, a negligible impact on emissions.

Organization: General Electric Company (GE)

Lastly, EPA should extend the proposed production cut-off date for in-production mid-size widebody purpose-built freighters for 10 years to January 1, 2038. [EPA-HQ-OAR-2018-0276-0157-A1, p.8]

3. EPA should extend the proposed production cut-off date for in-production mid-size widebody purpose-built freighters for 10 years to January 1, 2038

Under the ICAO standards, each Member State has the authority to determine when and how to adopt the international CO_2 standard. Under CAA Section 231(b), Congress tasked the EPA Administrator to put regulations into effect after "giving appropriate consideration to the cost of compliance within such period." And in the NPRM, EPA specifically requests comments "on all aspects of the proposed in-production rule, including the level, timing, and differentiation between airplane categories."

Here, following CAA Section 231(b) and the ICAO terms, GE respectfully requests that EPA extend the applicability date of the final rule to January 1, 2038, for in-production purpose-built freighters with a Maximum Take-Off Mass ("MTOM") between 180,000 kg and 240,000 kg. This class would include the Boeing 767F and Airbus A330-220F aircraft.

The COVID-19 pandemic has caused unprecedented financial impact to the aircraft industry that will continue to be felt for years to come. Section 231(b) is clear in allowing the EPA Administrator to consider these cost implications of compliance prior to putting a regulation into effect. Additionally, this request for a timing extension for mid-size widebody freighter aircraft falls into the scope of comments for EPA to consider because it is specific to timing with regards to the in-production rule.

More time would be needed than the 2028 deadline to develop and certify a new or derivative purpose-built freighter. To develop a new type purpose-built aircraft to serve the same market as the 767F would take years. In addition to the years needed to develop the new aircraft, years would be needed to test and certify the new aircraft. A derivative aircraft based on the 767F would also take years to develop, test, and certify. These issues are compounded by the financial impact that the COVID-19 pandemic has caused.

Lastly, finalizing the rule with the 10-year extension would result in a de minimis increase in CO_2 emissions. The 767F consumes less fuel and emits less CO_2 per trip for a typical U.S. domestic express freight operation than any alternative aircraft of similar capacity and capability that is currently available and is expected to be available in the future. Also, there is a very small number of mid-size widebody purpose-built freighters expected to be built after 2027 compared to the large fleets of passenger aircraft expected to be built and freighter aircraft have a relatively low average utilization compared with passenger aircraft.

GE therefore requests that EPA adopt the modifications suggested by Boeing for 40 C.F.R. § 1030.1(a)(6), 40 C.F.R. § 1030.1(a)(8), and 40 C.F.R. § 1030.30(b). [EPA-HQ-OAR-2018-0276-0157-A1, p.10]

Response:

For the specific points raised in the comments above to extend applicability date for some in-production dedicated freighters, we include and respond to those issues and points in the appropriate sections below of this Response to Comment document.

6.2.1.1. Use of Exemptions to Grant Relief

Commenters requested that the EPA provide relief for some classes of dedicated freight airplanes. Commenters did not provide production estimates, but it appears that there will be a low volume of production of the 767F's after 2028 (the applicability date for in-production airplanes). They also pointed to recent challenges nearly all businesses have faced as a result of the COVID crisis were unforeseeable in 2017 when ICAO adopted the international airplane CO_2 standards. Such rationale has been used in the past as part of the basis for considering exemptions from aircraft engine emission standards (discussed below in §6.2.1.5).

As described in Section IV.E of the Preamble, requests for exemptions are requests for relief from the enforcement of the airplane GHG standards (as opposed to a request to comply with a different standard than set by the EPA), and this rulemaking will continue the relationship between the EPA and the FAA for exemptions by directing any request for exemption be filed with the FAA under its established regulatory paradigm. The FAA will continue to consult with the EPA on all petitions for exemption. Thus, this rulemaking describes the mechanism for relief from the airplane GHG standards in the form of exemptions.

However, the commenters do not provide any, explanation, rationale or information on why the proposed exemption provisions and process through the FAA would be insufficient to meet their needs. Without this rationale and information, the EPA is not able to effectively evaluate this request because commenters have neglected to describe how the exemption process would not meet their needs.

Harmonization with the ICAO standards is a critical element of the EPA's decision making. Exemption provisions were included in the ICAO Airplane CO_2 Standards (ICAO Annex 16, Volume III[4]). By neglecting to say why exemptions wouldn't work for the Boeing 767F, commenters also neglected to say why the ICAO exemption provisions wouldn't work. Thus, commenters did not provide the EPA a basis to justify deviating from ICAO standards, and extending the deadline would prevent conformity with ICAO standards.

The EPA believes that by not providing an explanation or any discussion about an exemption request (or why it would not suit Boeing's needs for the 767F), the commenters have given the EPA insufficient rationale and information to justify extending the applicability date for some in-production dedicated freighters.

Further, the EPA believes that the commenters did not even provide enough information or adequate justification for a potential, future exemption request to be granted by FAA. The exemption process will be more fully defined in the FAA's implementation rule. Under 40 CFR part 87.50, for aircraft engines, information on such future production volumes and plans, estimates of the environmental impact (including other pollutants and community noise), and equity issues with competing parties are some of the parameters that haven't been addressed in their comments.

6.2.1.2. Covid-19/Financial hardship

[4]Annex 16, Vol. III, *Appendix 1. ICAO, 2017: Annex 16 Volume III – Environmental Protection - Aeroplane CO2 Emissions, First Edition,* 40 pp. See chapters 1 and 2. Available at: http://www.icao.int/publications/Pages/catalogue.aspx (last accessed July 15, 2020). The ICAO Annex 16 Volume III is found on page 16 of English Edition 2020 catalog and is copyright protected; Order No. AN 16-3. Also see: ICAO, 2020, Supplement No. 6 - July 2020, Annex 16 Environmental Protection - Volume III - Aeroplane CO2 Emissions, Amendment 1 (20/7/20) 22pp. Available at http://www.icao.int/publications/catalogue/cat_2020_sup06_en.pdf (last accessed October 27, 2020). The ICAO Annex 16, Volume III, Amendment 1, is found on page 2 of Supplement No. 6 - July 2020, English Edition, Order No. AN 16-3/E/01.

The EPA recognizes the economic impact that the COVID-19 pandemic has had on the aviation industry. However, it is expected that commercial aviation will continue to be a growth industry over the long term. It is difficult at this time to estimate either the severity or duration of the potential economic impacts of COVID-19.

The EPA notes that the commenters above consistently requested a ten-year delay in the timing of the in-production standard for mid-size freighters but did not provide any specifics on how that timing request aligned with COVID-19 related economic concerns, nor did they provide sufficient supporting information about financial resources or technological analyses and developments for Boeing to either bring the Boeing 767F into compliance or replace the 767F with an alternative airplane. Thus, it is difficult to assess the stated need for a ten-year delay in the absence of specifics as to the cost of compliance for the 767F or a Boeing replacement.

Further, some commenters imply that, rather than this delay request being related to a concern about a lack of resources in general, it is rather more about the allocation of resources in coming years. Commenters stated a preference to focus their product development on higher volume market segments (i.e. passenger airplanes, which already meet the standards) over working to toward compliance for the mid-size freighter market. Still, a lack of detailed comments regarding product plans prevents EPA from being able to conclude that revising the standards in the final rule as requested without supporting technical or financial information.

It is also notable that the other airplane manufacturer for which Boeing requested this 10-year-extension to apply, Airbus, did not second the request or otherwise address how or whether such an extension should reach its mid-size airplane that could be modified for freighter use. In any event, EPA does not believe that the issue of whether to provide for the requested extension, or any technical basis for it, was sufficiently raised by EPA's proposal to provide the public with a meaningful opportunity to comment on the issue.

6.2.1.3. Authority under the Chicago Convention

The beginning of §IV and within §IV.I.1 of the Preamble describe the EPA's response to comments regarding the US government's obligations under the Chicago Convention.

ICAO standards govern international operations. The commenters are correct that, under the Chicago Convention, Member states may adopt standards that are more or less stringent than ICAO for domestic operations. However, as discussed in §IV.I.1 of the Preamble and below there are significant practical challenges to adopting aircraft emission standards that are different than ICAO standards.

One commenter pointed to the foreword of the ICAO Environmental Technical Manual (ETM) where it says *"intended to make the most recent information available to certifying authorities, aeroplane certification applicants and other interested parties in a timely manner, aiming at achieving the highest degree of harmonization possible"* as part of the reason why the EPA could adopt standards less stringent than ICAO. It is unclear why they did this. The ETM is a guidance document meant to help certification authorities and manufacturers interpret or clarify regulations, or to provide equivalent procedures. The text quoted describes how this guidance document should be used; it is not an endorsement that different standards should be adopted by Member states. If anything, it is asking states to adopt standards in the most similar way possible. Standard and Recommended Practices are prescribed in ICAO Annex 16 Volume III.

6.2.1.4. Authority under the Clean Air Act

Section 231(b) of the CAA requires that any emission standards *"take effect after such period as the Administrator finds necessary … to permit the development and application of the requisite technology, giving appropriate consideration to the cost of compliance during such period."* Commenters are correct that under this section 231(b) the EPA would, after consultation with the Secretary of Transportation, need to provide manufacturers sufficient lead time to develop and implement requisite technology. The EPA would need to consider this lead time criteria along with all other factors, such as safety, emission reductions, cost, and energy factors. See Section 6.2.1.6 for discussion of the lead time manufacturers have been provided for these standards.

Furthermore, consistent with these factors, harmonization with ICAO standards, is a critical element in the EPA's decision making, as described earlier in Section IV.I.1 of the Preamble. The EPA invested significant effort and resources, working with the FAA and the Department of State, to gain international consensus within ICAO to adopt the first-ever international CO_2 standards for airplanes. In this context, it was commonly understood that although the Boeing 767F was an example of the rare subject airplane that did not already meet the in-production standards under consideration and did not already have a replacement airplane under development. The U.S. advocated for additional flexibilities for freight airplanes in the final standards. ICAO then adopted its standards imposing a 2028 date. EPA believes that this is an important step in addressing GHG emissions from airplanes and provides a basis for further work on addressing these emissions in the international arena. Ongoing international cooperation on airplane emission standards has the potential for achieving worldwide GHG emission reductions.

Finalizing implementation dates equivalent to international dates is necessary with U.S. obligations under ICAO. By adopting ICAO's implementation dates (as well as standards) for all in-production airplanes, including the dedicated freighters in the size class of the Boeing 767F, this action is the first step to satisfy the U.S. obligations under ICAO.

6.2.1.5. Past EPA Actions / Precedent

Commenters provided several historic examples of domestic aircraft engine emission standards differing from ICAO, and they argued that these examples serve as precedents for their request to extend the production by the 767F by 10 years. However, the commenters' arguments were incomplete and did not show how many of the examples provided were relevant to this issue. Moreover, upon more detailed review of the examples, there are significant differences between the situations being addressed at that time and the situation now being raised by commenters.

First, the commenters state there were examples from past EPA rulemakings in which the EPA extended the dates of compliance or implementation dates for emission standards. Practically, this is what the commenters are requesting, by delaying the applicability date for some freighters by 10 years. The examples provided by the commenters for where the EPA extended the implementation dates are provided below.

Commenters stated the following:

> EPA promulgated its first emission standards for aircraft engines in 1973.[176] Barely five months later, with regulatory deadlines fast approaching, EPA promulgated an amendment providing an extension of the effective date of fuel venting and smoke requirements based on concerns about the procurement and installation of equipment to prevent fuel venting, as well as the time that would have been required to obtain individual exemptions.[177] [EPA-HQ-OAR-2018-0276-0181-A2, pp.40-41]
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> In 1978, EPA proposed an additional 2-year extension of the effective date of the 1973 regulations, applicable to "all gaseous emission standards which would otherwise have been effective on January 1, 1979."[178] This extension was based on the need to reanalyze "the degree of the need for control of NOx emissions from aircraft" and allowed the "continued manufacture of aircraft turbine engines between January 1, 1979 and the compliance date specified in the final amended standards [i.e., January 1, 1981]."[179] This extension was finalized the same day it was proposed.[180]
>
> In 1980, EPA further extended the effective date for the gaseous emission standards for aircraft engines for an additional two years, to January 1, 1983.[181] That extension was based on EPA's delay in promulgating expected revisions to the standards.[182]

In 1982, when EPA finalized that standard, it issued a further one-year extension of the deadline for gaseous emissions, until January 1, 1984.[183] All told, EPA extended the initial compliance deadline for the gaseous emission standard more than a decade.

However, these past examples of the EPA extending the implementation dates are different than the current request to extend the production of the 767F by 10 years beyond the 2028 compliance date. These past EPA extensions of implementation dates were due to evolving modelling of local air quality effects and delays in aggressive technology developments for technology forcing standards. These early or first EPA rulemakings for aircraft engine emission standards in the 1970's and 1980's were promulgated during a time when the EPA was just beginning to better understand the public health and welfare effects or local air quality impacts from aircraft engine emissions, and this understanding continued to evolve over this time period. Ultimately, for the 1982 rulemaking, the rationale for the EPA changing its standards included revisions to earlier estimates of the effects on local air quality from aircraft engine emissions. However, the current understanding of the public health and welfare effects from aircraft engine GHG emissions is well established. In addition, the final airplane GHG standards that match ICAO standards are technology following standards, where nearly all the subject airplanes are already meeting the standards, and this situation was not the case during the time of the 1970's EPA rulemakings. The initial EPA rulemaking promulgated in 1973 (final rulemaking 38 FR 19088, July 17, 1973; proposed rulemaking 37 FR 26488, December 12, 1972), which was issued nearly a decade prior to the first aircraft engine emission standards established by ICAO, was for technology forcing standards of aircraft engine emissions.[5,6] Also, as described in the later 1970's EPA rulemakings, based on delays in the development of technology (or technology not progressing as expected) industry provided specific information for an extension in the compliances dates from the initial EPA rulemaking, including rationale for selecting these later dates (e.g., 41 FR 54861, December 15, 1976 and 43 FR 12615, March 24, 1978). The EPA believes these past rulemaking examples of extending the compliance dates were issued under completely different circumstances compared to the current request for the 767F. Thus, the EPA believes these past

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[5]The 1972 proposed rulemaking (37 FR 26488, December 12, 1972) preceding the 1973 final rulemaking (38 FR 19088, July 17, 1973) stated the following: "The 1979 gaseous emission standards proposed herein for turbine and piston engines represent design goals and are EPA's best estimates of achievable technology by 1979. EPA believes that the aircraft engine manufacturers and the airline industry passed the capability to translate these design goals into practice with reasonably aggressive and imaginative research and development programs. Thus, EPA fully expects the aircraft engine manufacturers and the airline industry to undertake such research and development programs as soon as possible to take full advantage of the lead time afforded by the 1979 effective date. In the case of turbine engines, these standards appear to be feasible in terms of current trends in combustion research results relating to combustor design and development."
Also, this proposed rulemaking stated the following in regard to consultation with the Secretary of Transportation on safety for the proposed rulemaking (37 FR 26489, December 12, 1972): "However, the Department of Transportation has advised that it is impossible to make conclusive judgements as to the effects of an emission standard on aircraft safety until engines designed to meet that standard have been developed, constructed, and tested. Therefore, there will be continue consultation on this issue between the agency and that Department, both prior to and after promulgation of the standards. Should the Secretary of Transportation determine at any point that an emission standard cannot be met within the specified time without creating a safety hazard, appropriate modifications will be made to that standard or its effective date."

[6]The 1973 final rulemaking (38 FR 19088, July 17, 1973) indicated the following: "Following a detailed study of the comments plus consultation with the National Aeronautics and Space Administration and the Air Force, the originally proposed 1979 standards applicable to gas turbine engines have been revised to become essentially equivalent to emission levels being used as design goals by these two agencies in planned and current research and development projects. A new set of standards, applicable to newly certified large engines only, has been set for January 1, 1981 to reflect the introduction of the same types of advanced combustor design technology originally expected in 1979. The technology necessary to meet these 1981 standards is in an early development stage."

rulemakings do not support action to delay the implementation for dedicated freighters in the size class of the 767F.

In addition, the commenters described examples from past EPA rulemakings where the EPA adopted standards at different or later times compared to the ICAO. These two examples are provided below.

Commenters stated the following:

> In 1997, EPA promulgated a final rule that codified ICAO NOx emission standards to bring the U.S. “into alignment with internationally adopted standards” EPA set the effective date for those standards at July 7, 1997, even though the international standards had become effective 11 years earlier.
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> In 2005, EPA again adopted ICAO standards that were already in effect prior to the date of the final EPA rule. While the ICAO standard had an effective date of December 31, 2003, EPA’s rule provided that they would take effect in the United States beginning on December 19, 2005.

In fact, the EPA is doing something similar right now in this rulemaking by promulgating the airplane GHG emissions standards for new type design airplanes after the ICAO effective date of January 1, 2020. Similar to the two past examples provided by the commenters, the reason for this current delay in promulgating the rulemaking or this provision is competing priorities at the EPA, which prevented us from adopting the standards by the ICAO applicability date (or implementation date). These delays in the past and current rulemakings are not related to the EPA providing adequate lead time for meeting the standards. As we discuss in the Preamble, this current delay in adopting the GHG standards, while less than desirable, has not impacted any airplanes subject to the new-type standards because no manufacturers have yet applied for type certification of a new type airplane designs.

The third set of examples provided by the commenter are based on past EPA rulemakings where exemptions or exceptions were promulgated by the EPA at the time of the rulemaking.

Commenters stated the following:

> In a 2012 rule, for example, EPA allowed potential exemptions for “newly manufactured engines that may not be able to comply with the first tier of the new NOx standards because of specific technical or economic reasons.”[192] This exemption applied to Tier 6 NOx standards, and replaced a preexisting exemption in 40 C.F.R. § 87.7.[193] The primary purpose of the exemption was to “provide for an orderly implementation of the Tier 6 NOx production cutoff.”[194] The exemption recognized that companies “may plan not to invest in upgrading the emissions of engine models that would be very near the end of their normal production cycles when compliance with the new standard becomes required.”[195] [EPA-HQ-OAR-2018-0276-0181-A2, p.42]
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> Similarly, in a 1982 rule,[196] EPA included an exemption for low-production aircraft engines “which [were] nearly at the end of their production life [and] would be terminated prematurely because there would be insufficient future sales to justify incorporating emission controls.”[197] EPA further noted that, as here, “production numbers are so small that there will likely be only negligible effects on overall fleet emissions.”[198] EPA also determined that “[t]his type of exemption is equitable, since low production models do not compete significantly with higher production models.”[199] [EPA-HQ-OAR-2018-0276-0181-A2, pp.42-43]

Commenters characterized these past examples of EPA granting exemptions or exceptions as the most relevant to the present situation with the Boeing 767F. The EPA agrees that these past challenges posed by manufacturers that resulted in these exceptions being granted are the most similar to the current situation with the 767F, as characterized by the commenters. However, we note, the commenters have not requested exceptions or exemptions be granted, and there are distinct differences between past requests that EPA has adopted and what is presented here by the commenters.

One important correction is with respect to EPA's authority to grant exemptions. Commenters stated that EPA granted exemptions to our rules as part of our engine emissions standards in 2012 and in 1982. This statement is incorrect. The EPA does not grant exemptions directly, but instead the FAA grants exemptions, after consulting with the EPA, within their role of enforcing the EPA's emission standards. See Section IV.E of the Preamble for further details on exemptions to the GHG standards. Yet, as discussed in §IV.I.2 of the Preamble, the commenters do not discuss or describe why exemptions could not remedy the situation with the 767F. Nor have the commenters described why exemptions requested from FAA would not be adequate to address their concerns.

In the 2012 rulemaking for NOx standards, the EPA included a provision that provided limited exceptions to the rule to resolve a specific well-defined issue raised by manufacturers. Manufacturers defined a very limited set of six aircraft engines that would be delivered shortly after the adoption of the rule. This short timeline prevented the standard exemption process from working as designed because there would not have been enough time to implement it before the engines were supposed to be delivered. This is different than the current situation with the 767F because there will still be multiple years after the EPA rulemaking and subsequent FAA rulemaking before the in-production standards become effective on January 1, 2028.

Additionally, this 2012 requestor detailed the exact scope and reasoning for their request. Of the six effected engines, four of them were expected to meet the standard, but their production and compliance testing would occur too close to the effective date for FAA to formally recognize the compliance. The other two engines were the last two engines expected to be produced of the model. Thus, the commenter stated that it was not economically feasible to redesign this model to conform with the Tier 6 NOx standards.

In response to the comments and under our authority under sections 231(a)(3) and (b), the EPA deemed it appropriate to include an exception provision in the regulations for the NOx standards that permitted any aircraft engine manufacturer to produce and enter into commerce up to six newly manufactured engines with a date of manufacture, as defined in the regulations, prior to August 31, 2013 that are not certificated to meet Tier 6 emission requirements. While only one manufacturer requested the exception, it was made available to all manufacturers to ensure that all parties were treated equally.

The commenters' current request seems to try to adopt this same approach by scoping the applicably of the delayed standard to include the Airbus A330F. We note that Airbus did not request this relief. It is not clear if delaying the implementation date for some purpose-built freighters is the same type of situation as the 2012 exemptions though. This request to delay the standard is substantially different compared to the limited number of exemptions requested in the 2012 NOx rule. Furthermore, while the Airbus A330F does not currently meet the standard, it is much closer to meeting the standards compared to the Boeing 767F. Additionally, Airbus recently re-engined the passenger version of the A330 so that it now meets the GHG standard. While not offered currently, it may be possible for Airbus to make a compliant freight variant by 2028. Offering a delay because of one product seems like it may introduce a market distortion by either delaying the introduction of a competing compliant freight airplane, or by discouraging operators from transitioning to newer more efficient airplanes.

Regarding the 1982 rulemaking, there are significant differences between how the 1982 low volume production exemption is characterized compared to how the commenters describe their situation that make it appear to be different situations. The 1982 rule describes the blanket exemption as a method to allow low production products to continue when it may not be economical to fix them. This is akin to the relief EPA granted in 2012 to the final two engines to be delivered by one manufacturer. However, Boeing doesn't characterize the production of the 767F as limited end of life production, rather they call it a low relative demand for cargo aircraft. Nor do they characterize the expense to improve the 767F as not economical. Rather, Boeing says greater emission reductions could be achieved by their focusing on other higher volume products. The EPA does not generally defer to a manufacturer's preferred product development plans when considering what standards or compliance dates to adopt.

6.2.1.6. Restrict Operations to US Domestic

In regard to response to comments about the potential restriction of airplane operations to U.S. domestic, see Section IV.I.2 of the Preamble for the response to comments on the Timing of the Standard - Extension of In-Production Applicability Date for Some Freight Airplanes.

6.2.1.7. Technology

As extensively described in the Preamble and TSD, the ICAO Aircraft CO_2 standards are technology following standards. All technology necessary to meet the ICAO standards was widely available by 2017 when the standards were agreed to at ICAO. Since the EPA is adopting standards consistent with the ICAO standards, this means that all technology necessary to meet the GHG standards is currently available in 2020.

The EPA recognizes that even with existing technology, it is a non-trivial matter to safely incorporate the improvements onto an existing airplane type and certify it with the FAA. This raises the question of timing of the standards and if sufficient time has been provided for manufacturers to comply.

However, as part of the justification for the 10-year delay from 2028, Boeing states that greater emissions reductions from its overall fleet could be achieved if it focused its near-term product development on higher volume market segments. This would seem to imply that Boeing could be working on bringing the 767F into compliance but would rather work on other, higher volume products, such a new passenger plane. While it is reasonable for Boeing to desire to work on higher volume or higher return on investment products, the Administrator is not obligated to consider a manufacturer's preferred product plan order when considering the appropriate timing of standards. This stated preference to work on other products before working to bring the 767F into compliance with the standards implies that Boeing could bring the 767F into compliance with the in-production standard before 2038 if it desired to.

Manufacturers, including Boeing and GE, were involved in the development of standards at ICAO since discussions there began in 2009 and were present when CAEP came to consensus and agreed on the final standards in 2016 (ICAO formally adopted the standards a year later in 2017). The in-production date was set 12 years after the standards would be agreed to at CAEP and 11 years after ICAO adopted the standards. This is a significant time period even in terms of airplane development timelines. Further, manufacturers knew what levels were under consideration and therefore what airplanes may be impacted a couple of years before that. Therefore, Boeing had to know that the 767F would likely not pass the ICAO in-production level for more than 12 years before the in-production date, and for nearly 5 years now.

Every airplane development or redesign program is different, but rough development timelines for several recent large commercial airplane projects (from program launch to type certification) suggest that eight to ten years to develop a clean sheet airplane and five to six years to develop a re-engined airplane are reasonable estimates. Thus, if Boeing had started development in 2017 when the ICAO standards were agreed to there would likely have been time to develop a clean sheet replacement and comfortably enough time to re-engine the 767. Insufficient rationale has been provided to support why ten extra years beyond the international implementation date is necessary. This would make the date 21 years after ICAO adopted the international CO_2 standards.

The EPA notes commenters' suggestion that the 767F may be replaced with a clean sheet (new type) purpose-built freighter. That would be an unprecedented product in the modern jet era, as the EPA is not aware of any commercial freight aircraft in recent decades that has not been derived from a passenger airplane design. Notably, both the Boeing 767F and the Airbus A330F were developed from the passenger versions of those airplanes. Given the large development costs for such a purpose-built freighter relative to the expected small production volumes, the EPA believes that it is extremely unlikely that Boeing would endeavor to develop a purpose-built mid-size freighter to replace the 767F.

6.2.1.8. Environment

The commenters' assertion that the 10-year extension would only result in a de minimis increase in CO_2 emissions is not supported by any data in their public comments. While the commenters made general assertions regarding the likely emissions impacts of a 10-year delay of the in-production applicability to a certain class of midsize freighters, the specifics of any analyses upon which these assertions were based were not presented to the EPA.

Further, simply comparing only absolute GHG emissions on a per trip basis may not be sufficient to make a determination about how emissions would change if the 767F were replaced with other airplanes. Absolute emission differences on a single flight do not account for differences in airplane capacity. For example, the Airbus A330F would be easier to improve to meet the standard[7], and while it is a "similar size" to the 767F, it is still larger. Thus, while on an absolute basis it might burn more fuel on a single flight, since it can carry more cargo, it may be able to carry the cargo more efficiently on a ton-mile basis. Details of their analysis were lacking in their public comments so we cannot make a any determination based on their analysis. Further, since the EPA hasn't established a record or allowed the public to comment an assessment of the environmental impact the EPA would need to assess the impact on the fleet.

Commenters did not provide sufficient information to allow the EPA to independently model the emissions impact of the requested extension for these airplanes. Based on the information on future airplane orders that the EPA has reviewed, there is very limited demand for the 767F after 2028. This could be because 2028 is sufficiently far in the future that orders for cargo airplanes are not made yet, or that the market has already accounted for the ICAO CO_2 standard and doesn't expect the 767F to continue production after that, or it could be that the demand will be waning by that time due to the age of the 767F. Whatever the reason, because commenters didn't include estimated production volume or carrier demand in their public comments, the EPA was not able to independently evaluate the emissions impact. Any estimate of future production over the 10-year extension would simply be a guess on the part of the EPA due to a lack specific information in the public comments or other publicly available information.

The EPA did evaluate a sensitivity case where the 767F continued production after 2028, but in that scenario the 767F was brought into compliance so that it met the in-production standard in 2028. Thus, it is not a direct comparison to the requested extension.

7. Fuel Efficiency Changes for Non-GHG Certificated Airplane Types

<u>Comments:</u>

Organization: Airbus S.A.S. (Airbus)

Comment 9 – §1030.35 – Change Criteria

Extract: "(c) For an airplane that meets the criteria of §1030.1(a)(4) or §1030.1(a)(5), after January 1, 2023 and until January 1, 2028, the airplane must demonstrate compliance with §1030.30 if it incorporates any modification that increases the fuel efficiency metric value by more than 1.5 per cent from the prior version of the airplane."

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[7] The margin to the in-production standard for the Airbus A330F is lower than the Boeing 767F. This means less improvement is required to pass the standard. Also, the passenger version of the A330 was recently re-engined to become the A330-NEO. While there is not currently a freight variant of the A330-NEO, the passenger version does pass the in-production standard.

Comment: ICAO Annex 16 Volume III includes another condition under which compliance with §1030.30 must be demonstrated, which is when the change is determined to be a significant CO_2 change. This condition does not appear anymore in the EPA proposed rule. [EPA-HQ-OAR-2018-0276-0148-A1, p.4]

Organization: Aerospace Industries Association (AIA)

In reviewing the applicability of the draft rule, AIA has also noted one further potentially serious set of discrepancies between the EPA's proposal and the ICAO standard. Sections 1030.1 (a)(4) and (a)(5) as written within the draft regulatory text could be interpreted as applying the standard to in-service aircraft, even though the EPA states within the NPRM that it intends to exclude these from the scope of the rule.

The proposed regulatory text within these sections refers to airplanes that are a derivative of an airplane whose original type certificated version was not required to have a greenhouse gas emissions certification under the proposed rule, when an application for an amended type certificate for that airplane is submitted between January 1, 2023 and December 31, 2027. The draft regulatory text however does not make the critical distinction between whether the application for an amended type certificate is prior to or subsequent to the receipt of that airplane's original certificate of airworthiness.

Under the ICAO CO_2 standard, when an application for an amended type certificate is submitted between January 1, 2023 and December 31, 2027, for an in-production airplane that meets various other applicability criteria and is modified before issuance of its first Certificate of Airworthiness, that airplane must be certified to the corresponding CO_2 standard level if the modification results in an increase to its ICAO CO_2 Metric Value of more than 1.5 percent. However, there is no corresponding requirement to be applied retroactively to in-service airplanes that have already received an original certificate of airworthiness which did not include a requirement to be certified to the ICAO CO_2 standard.

The final rule should make clear that its provisions do not apply to modifications made to an individual in-service aircraft, even when such modifications might require FAA approval and issuance of a supplemental type certificate for that aircraft. For instance, it should be clear from the text that the final rule does not apply to a conversion of an individual in-service passenger aircraft to one that is suitable for use as an all-cargo aircraft.

Within the proposed regulatory text, the EPA does make this critical distinction for in-production aircraft produced after January 1, 2028 in Sections 1030.1(a)(6) and (7), that makes clear applicability is only for those aircraft that meet the relevant criteria and for which "(ii) an original certificate of airworthiness issued on or after January 1, 2028" (emphasis added). To resolve this issue for in-production aircraft for airplanes produced between January 1, 2023 and December 31, 2027, we respectfully request that the Agency amend proposed sections 1030.1(a)(4) and (a)(5) as follows:

1030.1(a)(4) A subsonic jet airplane that is a modified derived version of an airplane whose original type certificated version was not required to have GHG emissions certification under this part and has –

(i) A MTOM greater than 5,700 kg; and

(ii) Prior to the issuance of the airplane's original certificate of airworthiness, aAn application for an amended type certificate certification that is submitted on or after January 1, 2023;

1030.1(a) (5) A propeller-driven airplane that is a modified derived version of an airplane whose original type certificated version was not required to have GHG emissions certification under this part and has –

(i) A MTOM greater than 8,618 kg; and

(ii) Prior to the issuance of the airplane's original certificate of airworthiness, aAn application for an amended type certificate certification that is submitted on or after January 1, 2023.

We also request the following conforming changes to ensure the regulation does not inadvertently imply applicability to in-service aircraft:

1030.1(b) Derived versions of airplanes. An airplane that incorporates modifications that change the fuel efficiency metric value of a prior version of airplane may not exceed the GHG standards of this part when certification under 14 CFR is sought. The change criteria for modified derived versions of airplanes are described in §1030.35. A modified airplane may not exceed the metric value limit of the prior version under §1030.30.

1030.35(c) For an airplane that meets the criteria of §1030.1(a)(4) or §1030.1(a)(5), after January 1, 2023 and until January 1, 2028, the any derived version of that airplane must demonstrate compliance with §1030.30 if it the derived version incorporates any modification that increases the fuel efficiency metric value by more than 1.5 per cent from the prior version of the airplane.

Finally, the EPA should adopt a definition of "derived version of an airplane" as follows:

Derived version of an airplane is an individual airplane that incorporates modifications reflected in a change in type design approved in an amended type certificate prior to the issuance of that individual airplane's original certificate of airworthiness. A derived version of an airplane does not include an individual airplane to which modifications are made after an original certificate of airworthiness has been issued for that individual airplane (including modifications that might require a supplemental type certificate). Note — Where FAA finds that the proposed change in design, configuration, power or mass is so extensive that a substantially new investigation of compliance with the applicable airworthiness regulations is required, the airplane will be considered to be a new type design rather than a derived version. [EPA-HQ-OAR-2018-0276-0167-A1, p.10-13]

Organization: Airlines for America (A4A) and Air Line Pilots Association, International (ALPA)

Most significantly, the Agency needs to ensure that the regulatory language it adopts is consistent with its stated intent that – consistent with the ICAO CO_2 Aircraft Standards – the EPA GHG Aircraft Engine Standards will not apply to in-service airplanes.5 [EPA-HQ-OAR-2018-0276-0161-A1, pp.1-2]

A. The Proposed GHG Aircraft Emissions Standards Need to Be Clarified to Ensure they Are Consistent with EPA's Intent, Consistent with the ICAO Aircraft CO_2 Standards, to Exclude In-Service Aircraft

Of greatest concern to A4A, ALPA and their members is that, as currently structured, it appears EPA's GHG Aircraft Engine Emissions Standards could – erroneously – be interpreted to apply to in-service aircraft. As highlighted above, we appreciate that in its preamble the Agency affirms its intent to exclude in-service aircraft from the GHG Aircraft Engine Emissions Standards.[33]

Excluding in-service aircraft is consistent with EPA's stated intent to adopt GHG Aircraft Engine Emissions Standards that are equivalent to the ICAO Aircraft CO_2 Standards. The ICAO standards carefully distinguish "in-production" and "new type" aircraft and EPA affirms it intends to carry this distinction forward: the "proposed rule recognizes differences between previously type certified airplanes that are in production and new type designs presented for original certification."[34] Generally, a "new type" aircraft is an aircraft that is the subject to an application for an original type certification while an "in-production" aircraft is an aircraft that is subject to an existing Type Certificate. The date of applicability of the standard and the stringency of CO_2 Metric Value to which an aircraft must be certified depends on the Maximum Take Off Mass ("MTOM") to which it is certified, the number of aircraft seats it is certified for, and whether the aircraft is a subsonic jet or turboprop ("propeller-driven") aircraft. During the period from January 1, 2023 to December 31, 2027, an in-production aircraft that meets the MTOM and is modified before issuance of its first Certificate of Airworthiness such that its ICAO CO_2 Metric Value increases by 1.5 percent or more must be certified to the applicable level. All in-production aircraft for which a Certificate of Airworthiness is first issued on or after January 1, 2028, that meet the MTOM and other applicable criteria must be certified to the applicable in-production level. The critical element that ensures that the ICAO CO_2 Aircraft Standard will not apply to any aircraft that is already in service is that the Standard cannot and will not apply to an aircraft that was issued a Certificate of Airworthiness without need to certify to the ICAO CO_2 Aircraft Standard.

The Agency does incorporate this element with respect to in-production aircraft produced on or after January 1, 2028 – defining, per proposed Section 1030.1(a)(6) and (7), aircraft as having a MTOM meeting the relevant threshold and "(ii) an original certificate of airworthiness issued on or after January 1, 2028" (emphasis added). Unfortunately, although EPA explicitly affirms that it intends its GHG Aircraft Engine Standards to be equivalent to the ICAO CO_2 Aircraft Standard, it has not incorporated this crucial element into its proposed regulatory scheme with respect to in-production aircraft produced on or after January 1, 2023 and before January 1, 2028.

To resolve this problem and ensure consistency with the ICAO CO_2 Standards, we respectfully request that the Agency add a definition of "Derived version of an airplane" to section 1030.105 and amend proposed sections 1030.1(a)(4) and (a)(5), 1030.1(b), and 1030.35(c) as suggested below:

Derived version of an airplane is an individual airplane that incorporates modifications reflected in a change in type design approved in an amended type certificate prior to the issuance of that individual airplane's original certificate of airworthiness. A derived version of an airplane does not include an airplane to which modifications are made after an original certificate of airworthiness has been issued for that airplane (including modifications that might require a supplemental type certificate). Note – Where FAA finds that the proposed change in design, configuration, power or mass is so extensive that a substantially new investigation of compliance with applicable airworthiness regulations is required, the airplane will be considered to be a new type design rather than a derived version.

1030.1(a)(4) A subsonic jet airplane that is a modified derived version of an airplane whose original type certificated version was not required to have GHG emissions certification under this part and has –

(i) A MTOM greater than 5,700 kg; and

(ii) An application for an amended type certificate certification that is submitted on or after January 1, 2023;

1030.1(a) (5) A propeller-driven airplane that is a modified derived version of an airplane whose original type certificated version was not required to have GHG emissions certification under this part and has –

(i) A MTOM greater than 8,618 kg; and

(ii) An application for an amended type certificate certification that is submitted on or after January 1, 2023

1030.1(b) Derived versions of airplanes. An airplane that incorporates modifications that change the fuel efficiency metric value of a prior version of airplane may not exceed the GHG standards of this part when certification under 14 CFR is sought. The change criteria for modified derived versions of airplanes are described in §1030.35. A modified airplane may not exceed the metric value limit of the prior version under §1030.30.

1030.35(c) For an airplane that meets the criteria of §1030.1(a)(4) or §1030.1(a)(5), after January 1, 2023 and until January 1, 2028, the any derived version of that airplane must demonstrate compliance with §1030.30 if it the derived version incorporates any modification that increases the fuel efficiency metric value by more than 1.5 per cent from the prior version of the airplane. [EPA-HQ-OAR-2018-0276-0161-A1, pp.10-11]

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[5] 85 Fed. Reg. at 51566 (the "proposed in-production standards would only be applicable to previously type certificated airplanes, newly-built on or after the applicability date . . . and would not apply retroactively to airplanes that are already in service"); 85 Fed. Reg. at 51567 ("in-service airplanes are not subject to the ICAO CO2 standards and likewise would not be subject to these proposed GHG standards").

[33] See footnote 5, above. We also note that the Administrative Record could not support adoption of standards that apply to in-service aircraft because none of the technical or economic data or analysis in the record addresses or analyzes potential impacts to in-service aircraft.

[34] 85 Fed. Reg. at 51566

Organization: Cargo Airline Association

It is clear from the preamble to the rule, the supporting cost benefit analysis, as well as technical standards document evaluating different stringencies and production timelines, that EPA, consistent with the ICAO standard, intends that "in-service" aircraft will not be covered by proposed rule. The ICAO standards make a clear distinction between "in-production" and "new type" aircraft and EPA extends this position to both the compliance date for changes to the type certificate made mid-production (the January 1, 2023 compliance date), before the airplane's original airworthiness certificate is issued, as well as the production cut-off date of January 1, 2028. The "proposed rule recognizes differences between previously type certified airplanes that are in production and new type designs presented for original certification."[4] From the all-cargo carrier perspective, this distinction must be clear in the regulatory text. Our industry relies on the FAA certification process which allows in-service aircraft to be converted from passenger use to freighter use, or even from one type of freighter to another with additional capabilities for transporting freight. Under these scenarios, when changes are necessary to meet the demand for air cargo transport, the FAA may require the issuance of a supplemental type certificate that follows each aircraft. Thus, a single aircraft could carry multiple STCs that are transferred multiple times to different owners and leasing companies. It is essential the EPA rule be clear that "in-service" aircraft are not covered, and the January 1, 2023, date does not apply to aircraft that have already been issued an original airworthiness certificate, are in-service, and may subsequently undergo a modification requiring the issuance of an STC. [EPA-HQ-OAR-2018-0276-0159-A1, p.4]

The industry and the FAA consider "new type" aircraft as aircraft that are the subject to an application for an original type certification while an "in-production" aircraft are aircraft that are subject to an existing, approved Type Certificate. During the period from January 1, 2023 to December 31, 2027, an in-production aircraft that meets the MTOM and is modified before issuance of its first Certificate of Airworthiness such that its ICAO CO_2 Metric Value increases by 1.5 percent or more must be certified to the applicable level as set forth in the proposed rule. All in-production aircraft for which a Certificate of Airworthiness is first issued on or after January 1, 2028, that meet the MTOM and other applicable criteria must be certified to the applicable in-production level. The critical element that ensures that the ICAO CO_2 standard will not apply to any aircraft that is already in-service is that the standard cannot and will not apply to an aircraft that has been issued an original Certificate of Airworthiness. [EPA-HQ-OAR-2018-0276-0159-A1, p.5]

The Agency does incorporate this element with respect to in-production aircraft produced on or after January 1, 2028 – defining, per proposed Section 1030.1(a)(6) and (7), aircraft to which the regulation would be applicable as having a MTOM meeting the relevant threshold and "(ii) an original certificate of airworthiness issued on or after January 1, 2028" (emphasis added). Despite the clear and numerous references throughout the preamble regarding this applicability,[5] EPA has not incorporated this crucial element into its proposed regulatory language with respect to in-production aircraft produced on or after January 1, 2023 and before January 1, 2028. We submit that changes are necessary to ensure the regulation does not inadvertently imply applicability to in-service aircraft. [EPA-HQ-OAR-2018-0276-0159-A1, p.5]

To ensure consistency, we respectfully request that the Agency amend proposed sections 1030.1(a)(4) and (a)(5) to reflect alignment with ICAO's intent and the preamble to the rule.[6] [EPA-HQ-OAR-2018-0276-0159-A1, p.6]

The Cargo Airline Association supports an EPA rulemaking and its position to move forward to harmonize with ICAO GHG emissions standards, with the modifications noted above. We respectfully urge the agency to make changes to the regulatory text to ensure consistency and uniformity with the ICAO standards. Moreover, to the extent not inconsistent with the positions set forth herein, the Cargo Airline Association also supports and endorses the Comments filed in this proceeding by our member airlines, as well as Airlines for America (A4A), and the Aerospace Industries Association (AIA).[EPA-HQ-OAR-2018-0276-0159-A1, p.7]

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[4] 85 Fed. Reg. at 51566

[5] See 85 Fed. Reg. at 51571 ("After January 1, 2023, and until January 1, 2028, an applicant that submits a modification to the type design of a non-GHG certificated airplane that increases the Metric Value of the airplane would be required to demonstrate compliance with the in-production rule. This proposed earlier applicability date for in-production airplanes, of January 1, 2023, is the same as that adopted by ICAO and is similarly designed to capture modifications to the type design of a non-GHG certificated airplanes newly manufactured prior to the January 1, 2028, production cut-off date." (emphasis added)); see also ICAO Annex 16, Vol. 3, sec. 2.1.1(d) &(e) and Chapter 1 (definitions of "derived version of a non-CO2-certified airplane" and "derived version of a CO2-certified aeroplane").

[6] We understand a regulatory scheme will be provided in the comments submitted by Airlines for America (A4A) and we support that approach.

Organization: Boeing Company (Boeing)

(3) clarify in the final rule that, consistent with the ICAO standard, the provisions of the standard addressing "modified versions" of an airplane (which we suggest should instead refer to "derived versions" of an airplane consistent with the nomenclature of the ICAO standard) or "modified airplanes" do not apply to modifications to a particular individual aircraft occurring after an original certificate of airworthiness has been issued for that aircraft (including modifications that might require a supplemental type certificate), and instead only potentially apply when a type-certificate holder seeks an amended type certificate. [EPA-HQ-OAR-2018-0276-0181-A2, pp.1-2]

VI. Consistent with the Chicago Convention and the ICAO Standard, the CO_2 Standard Should Apply Solely to New Type Aircraft and Derived Versions Requiring Amended Type Certificates.

EPA has already appropriately acknowledged that any final section 231 CO_2 standard will apply only to "newly manufactured" aircraft, [166] consistent with the ICAO standard. The proposed rule text, however, is subject to possible misinterpretation, such that it might be misread to apply as well to modified "in-service" aircraft. That was never EPA's intent,[167] and EPA should therefore revise the final regulatory text to make this clear. Specifically, EPA should revise the proposed provisions addressing "modified versions" of airplanes or "modified airplanes" to clarify that they apply only in certain limited circumstances in which there has been a modification to the type design of an aircraft—that is, a derivative aircraft for which an application for an amended type certificate is required by law.[168] The final rule should make clear that its provisions do not apply to modifications made to an individual in-service aircraft, even when such modifications might require FAA approval and issuance of a supplemental type certificate for that aircraft. For instance, it should be clear from the text that the final rule does not apply to a conversion of an individual in-service passenger aircraft to one that is suitable for use as an all-cargo aircraft. [EPA-HQ-OAR-2018-0276-0181-A2, pp.37-38]

To that end, Boeing recommends the following clarifying changes to the proposed regulatory text. First, to be consistent with the nomenclature of the ICAO standard and minimize ambiguities, the final rule should use the term “derived versions” instead of the terms “modified versions” and “modified airplanes.” Second, the final regulatory text should make clear that the provisions of the rule addressing such “derived versions” can only apply when a type-certificate holder changes the design of an aircraft mid-production, and that type-certificate holder seeks an amended type certificate for those in-production aircraft that will incorporate those design changes and for which no original airworthiness certificates have yet been issued. If such language is included in the final rule, then Boeing believes it will be clear that the rule does not apply to in-service aircraft for which an original airworthiness certificate has already been issued and which thereafter undergo a modification, even if that modification might require a supplemental type certificate approval issued by the FAA. [EPA-HQ-OAR-2018-0276-0181-A2, p.38]

To accomplish this, the final rule should include the following new definition of the term “derived version of an airplane,” and EPA should use this term consistently throughout the final rule instead of the terms “modified version” or “modified airplane”:

Derived version of an airplane is an individual airplane that incorporates modifications reflected in a change in type design approved in an amended type certificate prior to the issuance of that individual airplane’s original certificate of airworthiness. A derived version of an airplane does not include an individual airplane to which modifications are made after an original certificate of airworthiness has been issued for that individual airplane (including modifications that might require a supplemental type certificate). Note — Where FAA finds that the proposed change in design, configuration, power or mass is so extensive that a substantially new investigation of compliance with the applicable airworthiness regulations is required, the airplane will be considered to be a new type design rather than a derived version. [EPA-HQ-OAR-2018-0276-0181-A2, p.38]

Conforming changes should also be made to sections 1030.1, and 1030.35, as shown in the attached Boeing-Suggested Changes to the CAA Section 231 Aircraft CO_2 Standard Proposed Rule Text. [EPA-HQ-OAR-2018-0276-0181-A2, p.38]

(3) Finally, the ICAO standards are not intended to apply to aircraft already in service. Although the NPRM preamble states that the “proposed in-production standards . . . would not apply retroactively to airplanes that are already in-service” (85 FR 51,566), the proposed rule text does not clearly indicate this. Its discussion of “modified versions” of airplanes could be interpreted to apply to an in-service aircraft when it is converted to a different use (e.g., passenger to freighter) or undergoes a modification that requires FAA to issue a supplemental type certificate. We believe that the standards can apply when a type-certificate holder seeks an amended type certificate for a derived version of an airplane, but that modifications to a particular individual aircraft occurring after an original certificate of airworthiness has been issued for that aircraft (including modifications that might require a supplemental type certificate) should not trigger a compliance demonstration. We would suggest the Agency consider using the ICAO concept of “derived versions” and adding a definition of “derived version of any airplane” to be consistent with the ICAO language and make this distinction clear. (Please see green highlights in the attachment). [EPA-HQ-OAR-2018-0276-0181-A4, p.1] [[See Docket Number EPA-HQ-OAR-2018-0276-0181-A5 for Attachment]]

Proposed 40 C.F.R. Part 1030 – Technical Corrections [Please review attachment 5]

Derived version of an airplane is an individual airplane that incorporates modifications reflected in a change in type design approved in an amended type certificate prior to the issuance of that individual airplane's original certificate of airworthiness. A derived version of an airplane does not include an airplane to which modifications are made after an original certificate of airworthiness has been issued for that airplane (including modifications that might require a supplemental type certificate). Note.— Where FAA finds that the proposed change in design, configuration, power or mass is so extensive that a substantially new investigation of compliance with the applicable airworthiness regulations is required, the airplane will be considered to be a new type design rather than a derived version. [EPA-HQ-OAR-2018-0276-0181-A5, pp.3-6]

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[166] See 85 Fed. Reg. at 51566, n. 79 (explaining the meaning of in-production as "newly manufactured or built after the effective date of the regulations and already certificated to pre-existing rules.); see also id. at 51571 ("All airplanes type certificated prior to January 1, 2020, and newly built after January 1, 2028, would be required to comply with the proposed in production rule.").

[167] See 85 Fed. Reg. at 51567 ("As noted above in V.B.2, in-service airplanes are not subject to the ICAO CO2 standards and likewise would not be subject to these proposed GHG standards.").

[168] See 85 Fed. Reg. at 51571 ("After January 1, 2023, and until January 1, 2028, an applicant that submits a modification to the type design of a non-GHG certificated airplane that increases the Metric Value of the airplane would be required to demonstrate compliance with the in-production rule. This proposed earlier applicability date for in-production airplanes, of January 1, 2023, is the same as that adopted by ICAO and is similarly designed to capture modifications to the type design of a non-GHG certificated airplanes newly manufactured prior to the January 1, 2028, production cut-off date." (emphasis added)); see also ICAO Annex 16, Vol. 3, sec. 2.1.1(d) & (e) and Chapter 1 (definitions of "derived version of a non-CO2-certified airplane" and "derived version of a CO2-certified aeroplane").

Organization: Embraer Commercial Aviation

In reviewing the applicability of the draft rule, Embraer has also noted one further potentially serious set of discrepancies between the EPA's proposal and the ICAO standard. Sections 1030.1 (a)(4) and (a)(5) as written within the draft regulatory text could be interpreted as applying the standard to in-service aircraft, even though the EPA states within the NPRM that it intends to exclude these from the scope of the rule.[3] [EPA-HQ-OAR-2018-0276-0174-A1, p.3]

The proposed regulatory text within these sections refers to airplanes that are a derivative of an airplane whose original type certificated version was not required to have a greenhouse gas emissions certification under the proposed rule, when an application for an amended type certificate for that airplane is submitted between January 1, 2023 and December 31, 2027. The draft regulatory text however does not make the critical distinction between whether application for an amended type certificate is prior to or subsequent to the receipt of that airplane's original certificate of airworthiness. [EPA-HQ-OAR-2018-0276-0174-A1, p.3]

Under the ICAO CO_2 standard, when an application for an amended type certificate is submitted between January 1, 2023 and December 31, 2027, for an in-production airplane that meets various other applicability criteria and is modified before issuance of its first Certificate of Airworthiness, that airplane must be certified to the corresponding CO_2 standard level if the modification results in an increase to its ICAO CO_2 Metric Value increases of more than 1.5 percent. However, there is no corresponding requirement to be applied retroactively to in-service airplanes that have already received an original certificate of airworthiness which did not include a requirement to be certified to the ICAO CO_2 standard. [EPA-HQ-OAR-2018-0276-0174-A1, p.3]

Within the proposed regulatory text, the EPA does make this critical distinction for in-production aircraft produced after January 1, 2028 in Sections 1030.1(a)(6) and (7), that make clear applicability is only for those aircraft that meet the relevant criteria and for which "(ii) an original certificate of airworthiness issued on or after January 1, 2028" (emphasis added). To resolve this issue for in-production aircraft for airplanes produced between January 1, 2023 and December 31, 2027, Embraer respectfully requests that the Agency amend proposed sections 1030.1(a)(4) and (a)(5) as follows:

1030.1(a)(4) A subsonic jet airplane that is a modified derived version of an airplane whose original type certificated version was not required to have GHG emissions certification under this part and has – [EPA-HQ-OAR-2018-0276-0174-A1, p.3

(i) A MTOM greater than 5,700 kg; and

(ii) Prior to the issuance of the airplane's original certificate of airworthiness, aAn application for an amended type certificate certification that is submitted on or after January 1, 2023;

1030.1(a) (5) A propeller-driven airplane that is a modified derived version of an airplane whose original type certificated version was not required to have GHG emissions certification under this part and has –

(i) A MTOM greater than 8,618 kg; and

(ii) Prior to the issuance of the airplane's original certificate of airworthiness, An application for an amended type certificate certification that is submitted on or after January 1, 2023 [EPA-HQ-OAR-2018-0276-0174-A1,p.4]

We also request the following conforming changes to ensure the regulation does not inadvertently imply applicability to in-service aircraft:

1030.1(b) Derived versions of airplanes. An airplane that incorporates modifications that change the fuel efficiency metric value of a prior version of airplane may not exceed the GHG standards of this part when certification under 14 CFR is sought. The change criteria for modified derived versions of airplanes are described in §1030.35. A modified airplane may not exceed the metric value limit of the prior version under §1030.30.

1030.35(c) For an airplane that meets the criteria of §1030.1(a) (4) or §1030.1(a) (5), after January 1, 2023 and until January 1, 2028, the any derived version of that airplane must demonstrate compliance with §1030.30 if it the derived version incorporates any modification that increases the fuel efficiency metric value by more than 1.5 per cent from the prior version of the airplane. [EPA-HQ-OAR-2018-0276-0174-A1,p.4]

The US EPA should adopt a definition of "derived version of an airplane" as follows:

Derived version of an airplane is an individual airplane that incorporates modifications reflected in a change in type design approved in an amended type certificate prior to the issuance of that individual airplane's original certificate of airworthiness. A derived version of an airplane does not include an individual airplane to which modifications are made after an original certificate of airworthiness has been issued for that individual airplane (including modifications that might require a supplemental type certificate).

Note — Where FAA finds that the proposed change in design, configuration, power or mass is so extensive that a substantially new investigation of compliance with the applicable airworthiness regulations is required, the airplane will be considered to be a new type design rather than a derived version. [EPA-HQ-OAR-2018-0276-0174-A1, p.4-5]

[3] Control of Air Pollution From Airplanes and Airplane Engines: GHG Emission Standards and Test Procedures: Notice of Proposed Rulemaking; 85 Fed. Reg. 51566 (August 20, 2020).

Organization: Federal Express Corporation

III. Technical Correction: Application of January 1, 2023, Deadline to In-Production Aircraft Only

As recognized by the EPA in the NPRM and corresponding cost-benefit analysis, this rulemaking applies only to "newly manufactured" aircraft,[7] and does not apply to "in-service" aircraft.[8] As clearly noted in the preamble, the January 1, 2023, compliance date may only apply to modifications of aircraft designs sought for in-production aircraft that have not yet been issued an original airworthiness certificate, consistent with the ICAO standard.[9] As such, this compliance date does not apply to aircraft that have already been issued an original airworthiness certificate and are in service, and may subsequently undergo a modification that may require the U.S. Federal Aviation Administration's approval through the issuance of a supplemental type certificate, such as a conversion of a passenger aircraft to a freighter aircraft. Despite the clear and numerous references throughout the preamble regarding this applicability,[10] the corresponding proposed regulatory text is not clear and should be revised as provided in the suggested text offered by FedEx, Boeing, and A4A. Applying the definition of derivative aircraft as set forth in the ICAO standard and stating that the compliance date applies only to applications for amended type certificate applications will avoid any ambiguity in the application of this rule.[EPA-HQ-OAR-2018-0276-0178-A1, P.4-5]

7 See 85 Fed. Reg. at 51566, fn. 79 (explaining the meaning of in-production as "newly manufactured or built after the effective date of the regulations and already certificated to pre-existing rules.); see also id. at 51571 ("All airplanes type certificated prior to January 1, 2020, and newly built after January 1, 2028, would be required to comply with the proposed in production rule.").
8 See 85 Fed. Reg. at 51567 ("As noted above in V.B.2, in-service airplanes are not subject to the ICAO CO2 standards and likewise would not be subject to these proposed GHG standards.").
9 See Id.; see also 85 Fed. Reg. at 51566 (the standards "would not apply retroactively to airplanes that are already in service").
10 See 85 Fed. Reg. at 51571 ("After January 1, 2023, and until January 1, 2028, an applicant that submits a modification to the type design of a non-GHG certificated airplane that increases the Metric Value of the airplane would be required to demonstrate compliance with the in-production rule. This proposed earlier applicability date for in-production airplanes, of January 1, 2023, is the same as that adopted by ICAO and is similarly designed to capture modifications to the type design of a non-GHG certificated airplanes newly manufactured prior to the January 1, 2028, production cut-off date." (emphasis added)); see also ICAO Annex 16, Vol. 3, sec. 2.1.1(d) &(e) and Chapter 1 (definitions of "derived version of a non-CO2-certified airplane" and "derived version of a CO2-certified aeroplane").

Organization: General Electric Company (GE)

EPA should clarify that the standard will only potentially apply when a type-certificate holder seeks an amended type certificate, but modifications to an individual aircraft will not trigger compliance. [EPA-HQ-OAR-2018-0276-0157-A1, p.8]

2. EPA should clarify the GHG standard's applicability to derived aircraft versus modified "in-service" aircraft

EPA makes clear in the preamble to the rule that "in-production" means "newly-manufactured or built after the effective date of the regulations-and already certificated to pre-existing rules." This aligns with the ICAO definition for in-production airplane types. EPA also states in the preamble that the in-production standards "would not apply retroactively to airplanes that are already in-service." But, the current proposed rule is ambiguous and may be interpreted to also include modified “in-service” aircraft.

That is why GE supports the regulatory text modifications offered by Boeing. These modifications include EPA using the term “derived versions” instead of “modified versions” and “modified airplanes” to align with the ICAO standard. Additionally, GE supports Boeing’s suggested definition of the term “derived version of an airplane.” That definition clarifies that the final rule does not apply to in-service aircraft that have already been issued an airworthiness certificate and which subsequently undergo a modification. Even if that modification may require an FAA supplemental type certificate approval, the final rule would not apply. [EPA-HQ-OAR-2018-0276-0157-A1, p.9]

Organization: International Co-ordinating Council of Aerospace Industries Associations (ICCAIA)

In reviewing the applicability of the draft rule, ICCAIA has also noted one further potentially serious set of discrepancies between the EPA’s proposal and the ICAO standard. Sections 1030.1 (a)(4) and (a)(5) as written within the draft regulatory text could be interpreted as applying the standard to in-service aircraft, even though the EPA states within the NPRM that it intends to exclude these from the scope of the rule.[3] [EPA-HQ-OAR-2018-0276-0175-A1, pp.4-5]

The proposed regulatory text within these sections refers to airplanes that are a derivative of an airplane whose original type certificated version was not required to have a greenhouse gas emissions certification under the proposed rule, when an application for an amended type certificate for that airplane is submitted between January 1, 2023 and December 31, 2027. The draft regulatory text however does not make the critical distinction between whether application for an amended type certificate is prior to or subsequent to the receipt of that airplane’s original certificate of airworthiness. [EPA-HQ-OAR-2018-0276-0175-A1, p.5]

Under the ICAO CO_2 standard, when an application for an amended type certificate is submitted between January 1, 2023 and December 31, 2027, for an in-production airplane that meets various other applicability criteria and is modified before issuance of its first Certificate of Airworthiness, that airplane must be certified to the corresponding CO_2 standard level if the modification results in an increase to its ICAO CO_2 Metric Value of more than 1.5 percent. However, there is no corresponding requirement to be applied retroactively to in-service airplanes that have already received an original certificate of airworthiness which did not include a requirement to be certified to the ICAO CO_2 standard. [EPA-HQ-OAR-2018-0276-0175-A1, p.5]

Within the proposed regulatory text, the EPA does make this critical distinction for in-production aircraft produced after January 1, 2028 in Sections 1030.1(a)(6) and (7), that make clear applicability is only for those aircraft that meet the relevant criteria and for which “(ii) an original certificate of airworthiness issued on or after January 1, 2028” (emphasis added). To resolve this issue for in-production aircraft for airplanes produced between January 1, 2023 and December 31, 2027, ICCAIA respectfully requests that the Agency amend proposed sections 1030.1(a)(4) and (a)(5) as follows:

1030.1(a)(4) A subsonic jet airplane that is a ~~modified~~ derived version of an airplane whose original type certificated version was not required to have GHG emissions certification under this part and has –

(i) A MTOM greater than 5,700 kg; and
(ii) Prior to the issuance of the airplane’s original certificate of airworthiness, a~~A~~n application for an amended type certificate ~~certification~~ that is submitted on or after January 1, 2023;

1030.1(a) (5) A propeller-driven airplane that is a ~~modified~~ derived version of an airplane whose original type certificated version was not required to have GHG emissions certification under this part and has –

(i) A MTOM greater than 8,618 kg; and

(ii) Prior to the issuance of the airplane's original certificate of airworthiness, a~~A~~n application for an amended type certificate ~~certification~~ that is submitted on or after January 1, 2023

We also request the following conforming changes to ensure the regulation does not inadvertently imply applicability to in-service aircraft:

1030.1(b) Derived versions of airplanes. ~~An airplane that incorporates modifications that change the fuel efficiency metric value of a prior version of airplane may not exceed the GHG standards of this part when certification under 14 CFR is sought.~~ The change criteria for ~~modified~~ derived versions of airplanes are described in §1030.35. ~~A modified airplane may not exceed the metric value limit of the prior version under §1030.30.~~

1030.35(c) For an airplane that meets the criteria of §1030.1(a)(4) or §1030.1(a)(5), after January 1, 2023 and until January 1, 2028, ~~the~~ any derived version of that airplane must demonstrate compliance with §1030.30 if ~~it~~ the derived version incorporates any modification that increases the fuel efficiency metric value by more than 1.5 per cent from the prior version of the airplane. [EPA-HQ-OAR-2018-0276-0175-A1, p.6]

In addition to the above suggested edit on §1030.35, ICCAIA noticed that ICAO Annex 16 Volume III includes another condition under which compliance with §1030.30 must be demonstrated, which is when the change is determined to be a significant CO_2 change. This condition does not appear in the EPA proposed rule. [EPA-HQ-OAR-2018-0276-0175-A1, p.6]

The US EPA should adopt a definition of "derived version of an airplane" as follows:

Derived version of an airplane is an individual airplane that incorporates modifications reflected in a change in type design approved in an amended type certificate prior to the issuance of that individual airplane's original certificate of airworthiness. A derived version of an airplane does not include an individual airplane to which modifications are made after an original certificate of airworthiness has been issued for that individual airplane (including modifications that might require a supplemental type certificate). [EPA-HQ-OAR-2018-0276-0175-A1, pp.6-7]

Note — Where FAA finds that the proposed change in design, configuration, power or mass is so extensive that a substantially new investigation of compliance with the applicable airworthiness regulations is required, the airplane will be considered to be a new type design rather than a derived version. [EPA-HQ-OAR-2018-0276-0175-A1, p.7]

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[3] Control of Air Pollution From Airplanes and Airplane Engines: GHG Emission Standards and Test Procedures: Notice of Proposed Rulemaking; 85 Fed. Reg. 51566 (August 20, 2020).

Response:

7.1. Add Definition of a "Derived Version"

For the comments that requested the EPA add the definition of a Derived version of an airplane, **t**he EPA made an intentional change from the text of ICAO Annex 16 Volume III when we substituted "derived version" with "modified version" in the new part 1030. This change was made after consultation with the FAA and based on how the FAA certification process works. The terms "derived" and "derivative" do not have singular meanings within the context of FAA certification. Further, the meaning of “derived” in ICAO Annex 16 Vol. III is not consistent with how the term is currently used by the FAA. The term "modified" accurately describes what is intended here and was used in place of “derived” in order to avoid confusion within the context of FAA certification of newly produced airplanes. This use of “modified” instead of “derived” does not create any inconsistency between the EPA’s regulatory provisions and those of ICAO regarding a derived version of an airplane.

7.2. Clarification to §1030.1(a)(4) & (5) to Align with ICAO

Commenters raised concerns that the proposed regulatory text was different than ICAO Annex 16 Vol. III text and could unintentionally be read to apply to in-service airplanes such as conversions of passenger airplanes into freighters. The commenters' recommendation to resolve this by using the ICAO definition of "derived airplane" rather than "modified airplane" could not be used because of problems identified with the term "derived airplane" (discussed above) when seeking certification by the FAA. The ICAO definition of a "Derived version of a non-CO2-certified aeroplane" includes the requirement that the original airworthiness certificate for an airplane be issued after the modification to the airplane in production is made. This would mean the requirement would apply to newly produced airplanes from the manufacturer and would not apply to changes made after the airplane had entered service (e.g. converting an in-service passenger airplane into a freight airplane).

The proposed language in section 1030.1(a)(4) and (5) inadvertently left out the requirement regarding the first issuance of an airworthiness certificate. This requirement has been added into the applicability language at 1030.1(a)(4)(iv) and 1030.1(a)(5)(iv). No commenters raised issues with our preamble text; rather, some quoted the discrepancy between the preamble and the regulations. Nonetheless, §IV.D.1.i of the preamble includes new text intended to provide additional clarity.

8. No Fuel Efficiency Change Threshold for GHG-Certificated Airplanes

<u>Comments:</u>

Organization: Airbus S.A.S. (Airbus)

Comment 7 – §V.F.1 No Fuel Efficiency Change Threshold for CHG-Certificated Airplanes

Extract: “However, if the compliance margin for a type design is less than the no GHG change criteria, a manufacturer would be required to prove that it meets the rule to certify the adverse change.”

Comment: This is not how Airbus interprets ICAO Annex 16 Vol III requirements, nor how we interpret the ICAO Environmental Technical Manual (“ETM”) Volume III guidance material. As long as the change meets the no-CO_2 change criterion (i.e. the changed airplane is not a derived version of a CO_2-certified airplane), our understanding of the ICAO SARPs is that the change is considered a no-CO_2 change. In such a case, the airplane CO_2 Emissions Metric Value, as well as its margin to the limit, remain unchanged. As a result, a CO_2-certified airplane remains compliant with Annex 16 Vol III requirements when it is fitted with a change that is shown to be a no-CO2 change. [EPA-HQ-OAR-2018-0276-0148-A1, p.3]

Organization: Boeing Company (Boeing)

§1030.35 Change criteria.

(a) For an airplane that has demonstrated compliance with §1030.30, any subsequent derived version of that airplane must demonstrate compliance with §1030.30 (at the same metric value limit applicable to the prior version) if the subsequent derived version incorporates a modification that either increases –

(1) The maximum take-off mass; or

(2) The fuel efficiency metric value by more than:
(i) For airplanes with a MTOM greater than or equal to 5,700 kg, the value decreases linearly from 1.35 to 0.75 percent for an airplane with a MTOM of 60,000 kg.
(ii) For airplanes with a MTOM greater than or equal to 60,000 kg, the value decreases linearly from 0.75 to 0.70 percent for airplanes with a MTOM of 600,000 kg.
(iii) For airplanes with a MTOM greater than or equal to 600,000 kg, the value is 0.70 percent.

(b) For an airplane that has demonstrated compliance with §1030.30, any subsequent derived version of that airplane that incorporates modifications that do not increase the MTOM or the fuel efficiency metric value in excess of the levels shown in paragraph (a) of this section, the fuel efficiency metric value of the modified derived version of the airplane may be reported to be the same as the value of the prior version.

(c) For an airplane that meets the criteria of §1030.1(a)(4) or §1030.1(a)(5), after January 1, 2023 and until January 1, 2028, the any derived version of that airplane must demonstrate compliance with §1030.30 if it the derived version incorporates any modification that increases the fuel efficiency metric value by more than 1.5 per cent from the prior version of the airplane. [EPA-HQ-OAR-2018-0276-0181-A5, p.3]

Organization: Embraer Commercial Aviation

We also suggest applying the following changes to paragraph 1030.35 (a) in order to make it clearer. The suggested edit comes from the definition of a derived version of a CO_2-certified airplane in the ICAO Annex 16 Volume III, Part I, Chapter 1:

(a)For an airplane that has demonstrated compliance with §1030.30, any subsequent version of that airplane must demonstrate compliance with §1030.30 if the subsequent version incorporates a modification that either increases –

(1) The maximum take-off mass; or

(2) The fuel efficiency metric value by more than:

~~(i)For airplanes with a MTOM greater than or equal to 5,700 kg, the value decreases linearly from 1.35 to 0.75 percent for an airplane with a MTOM of 60,000 kg.~~

(i) 1.35 per cent at a maximum take-off mass of 5 700 kg, decreasing linearly to;

(ii) 0.75 per cent at a maximum take-off mass of 60 000 kg, decreasing linearly to;

~~(ii)For airplanes with a MTOM greater than or equal to 60,000 kg, the value decreases linearly from 0.75 to 0.70 percent for airplanes with a MTOM of 600,000 kg.~~

(iii) 0.70 per cent at a maximum take-off mass of 600 000 kg; and

~~(iii)For airplanes with a MTOM greater than or equal to 600,000 kg, the value is 0.70 percent.~~

(iv) a constant 0.70 per cent at maximum take-off masses greater than 600 000 kg. [EPA-HQ-OAR-2018-0276-0174-A1, p.5]

Organization: International Co-ordinating Council of Aerospace Industries Associations (ICCAIA)

- Page 66 - §V.F.1 No Fuel Efficiency Change Threshold for GHG-Certificated Airplanes

Extract: “However, if the compliance margin for a type design is less than the no GHG change criteria, a manufacturer would be required to prove that it meets the rule to certify the adverse change.”

Comment: This is not ICCAIA’s interpretation of ICAO Annex 16 Volume III requirements, nor of ETM Volume III guidance material. As long as the change meets the no GHG change criterion (i.e. the changed aeroplane is not a derived version of a CO_2-certified aeroplane), our understanding of the ICAO SARPs is that the change is considered as a no-CO_2 change. In such a case, the aeroplane CO_2 Emissions Metric Value, as well as its margin to the limit, remain unchanged. As a result, a CO_2-certified aeroplane always remains compliant with Annex 16 Volume III requirements when it is fitted with a change that is shown to be a no-CO_2 change.

Thus the ICCAIA proposes the following change:

“However, if the compliance margin for a type design is less than the no GHG change criteria, a manufacturer would be required to prove that it meets the rule no GHG change criterion to certify the adverse change.” [EPA-HQ-OAR-2018-0276-0175-A1, p.4]

Organization: Stimson, Donald

I participated, under contract with the FAA, in the development of the ICAO standards and guidance material for certification of airplane CO_2 emissions. [EPA-HQ-OAR-2018-0276-0109, p.1]

I would like to point out an apparent inconsistency between text in the preamble of this notice of proposed rulemaking and the propose regulation. This subject area where this inconsistency is present is in the application of the proposed "no fuel efficiency change thresholds for GHG certificated airplanes." In general, these proposed thresholds would be used to indicate whether a new fuel efficiency metric value must be determined for a previously GHG certified airplane that has undergone a design change or modification. If the design change or modification results in an adverse change to the fuel efficiency metric value that is less than the proposed threshold, then that design change or modification will be deemed to have had no effect on the fuel efficiency metric value, and the changed or modified airplane will retain the fuel efficiency metric value of the airplane design from with it was derived. [EPA-HQ-OAR-2018-0276-0109, p.1]

After describing the above general rule, the preamble text on 85 FR 51575 (August 20, 2020) goes on to state, "This feature of the proposed rule would not remove the requirement for a manufacturer to demonstrate that the airplane type would still meet the rule after a given change. If an airplane type has, for example, a 10 percent compliance margin under the rule, then a small adverse change less than the threshold may not require the re-evaluation of the airplane metric value. However, if the compliance margin for a type design is less than the no GHG change criteria, a manufacturer would be required to prove that it meets the rule to certify the adverse change." [EPA-HQ-OAR-2018-0276-0109, p.1]

Although it is unlikely that a compliance margin for a certificated type design would be less the no GHG change criteria, the requirement for a manufacturer to "prove" that a subsequent "no GHG change" modification "meets the rule" is both unclear and not a part of the proposed regulatory text. The preamble text is unclear in that it implies that compliance with a certain fuel efficiency metric value level (i.e., 1030.30) must be shown for the changed airplane, but it uses the term "meets the rule." Since "the rule" states in 1030.35(b) that for a "no GHG change" modification, the fuel efficiency metric value of the modified airplane may be reported to be the same as the value of the prior version." So, "the rule" will have been met, but without any need to provide further proof that the modified design's fuel efficiency metric continues to comply with 1030.30. [EPA-HQ-OAR-2018-0276-0109, p.1]

I would also like to point out that since the ICAO standards contain no such provision for "no- CO_2 change" changes to provide a further showing of compliance with the CO2 metric value stringency standards, including such a provision in the CFR would constitute a regulatory difference with those international standards. Consideration of tolerances on measurement accuracy was included in determining the "no-CO_2 change" criterion. Being within the "no-CO_2 change" criterion literally means that no adverse CO_2 change has occurred. [EPA-HQ-OAR-2018-0276-0109, p.1]

Response:

8.1. Preamble Description of Compliance Margin:

The commenters were correct that EPA's characterization in the proposal of how the No Fuel Efficiency Change Threshold would work was inconsistent with ICAO's. The descriptive text at the end of IV.F.1 in the Preamble for the NPRM stated that compliance must be shown even if the change is under the threshold, which was incorrect. The FRM preamble now makes it clear that if the compliance margin for a type design is less than the No Fuel Efficiency Change threshold and the proposed modification results in a change to the metric value that is less than the no fuel efficiency change threshold, then the airplane retains its original metric value, and the compliance margin to the regulatory limit remains the same.

Note that this inconsistency was contained only in the preamble, and the proposed regulatory requirements in 1030.35 do not need to be updated to reflect this change.

8.2. Request to Re-write 1030.35(a) Threshold to Match ICAO Annex 16:

The numerical limits in part 1030.35(a)(2) are exactly the same as in Annex 16 Vol. III. The EPA chose to re-word the requirements for our regulations so that each statement was independent from the next. Because these regulations align with ICAO, EPA is finalizing the text as proposed.

9. Annual Reporting Requirement

9.1. Justification for Reporting Requirement

Comments:

Organization: Aerospace Industries Association (AIA)

Re: Aerospace Industries Association comments on Information Collection Request for Airplane Greenhouse Gas Exhaust Emissions, EPA ICR number 2626.01, OMB Control Number 2060-0680; EPA Docket: EPA–HQ–OAR–2018–0276 [EPA-HQ-OAR-2018-0276-0087-A1, p.1]

The Environmental Protection Agency (EPA) is seeking approval for this ICR from the Office of Management and Budget (OMB), in relation to data reporting requirements within the EPA’s Notice of Proposed Rulemaking (NPRM) for Control of Air Pollution from Airplanes and Airplane Engines: Greenhouse Gas Emission Standards and Test Procedures. AIA supports the EPA’s proposal to adopt greenhouse gas emissions standards for aircraft into domestic law, but we do have concerns about the associated reporting requirements that have been proposed. For several reasons outlined in this response, these reporting requirements are not justified and we therefore request that OMB reject this ICR. AIA intends to submit separate comments to the EPA on other aspects of the NPRM. [EPA-HQ-OAR-2018-0276-0087-A1, pp.1-2]

Information Collection Provisions

While AIA strongly welcomes this proposed rulemaking and the adoption of the ICAO CO_2 standard into domestic regulations, we do not believe there is sufficient justification to support the Information Collection Request (ICR) the EPA has submitted for the reporting requirements it is proposing. AIA believes that such reporting would impose significant burdens on aircraft manufacturers – which are unnecessary given the duplicative aspects of much of the request, and that lack of environmental benefit would be derived from providing this data. [EPA-HQ-OAR-2018-0276-0087-A1, pp.5-6]

Duplication of already available data

As the EPA acknowledges, much of the data being requested will be available from other sources – in particular the CO_2 Certification Databank (CO2DB) that ICAO intends to develop. AIA therefore believes this burden is particularly unwarranted and disagrees with the EPA's characterization that our members may not provide data to the CO2DB or will fail to ensure it is updated as appropriate. AIA members – along with the EPA and FAA on behalf of the U.S. government – have supported the development of the CO2DB and have been involved with identifying appropriate data that manufacturers would be able to provide. As active and interested parties in CAEP processes, AIA members have a strong interest in ensuring other CAEP participants have access to accurate data through the CO2DB and that the models used by CAEP in the technology assessments and airplane emissions inventorying processes are robust and validated. Failure to ensure accurate information is uploaded to the CO2DB would mean CAEP standard setting processes would be informed by unreliable data which could have profound implications for how future environmental standards are set at the international level. This would not be in the interest of aerospace manufacturers. [EPA-HQ-OAR-2018-0276-0087-A1, p.6]

The other information the EPA has identified it requires that will not be available within the CO2DB is the Reference Geometric Factor (RGF) for each aircraft sub-model variant. We detail specific concerns about the commercially sensitive nature of this data below, but we also believe the requirement to provide this data is unnecessary duplicitous as this information is already provided to the FAA as part of aircraft certification requirements. [EPA-HQ-OAR-2018-0276-0087-A1, p.7]

Lack of environmental benefit to justify burden

The EPA's justification for imposing the reporting requirements within the proposed rule is that these are necessary for the agency to " conduct accurate technology assessments, compile airplane emission inventories, and develop appropriate policy"[10]. While AIA respects the need for the EPA to retain this capability, for several reasons we believe that the environmental benefit derived from these reporting requirements, beyond what would result from using already available data, is minimal. [EPA-HQ-OAR-2018-0276-0087-A1, p.7]

Firstly, AIA believes ICAO remains the most appropriate forum for addressing matters related to aviation's environmental impacts and there is limited benefit in seeking to address these matters on a unilateral basis. AIA members, along with other aerospace manufacturers, have routinely made data available through CAEP to support a wide range of analyses to inform policy options. This includes commercially sensitive information when appropriate safeguards are put in place. As an active participant in CAEP processes, the EPA would be able to access such data at the appropriate time. [EPA-HQ-OAR-2018-0276-0087-A1, p.7]

Conclusion

Given the burden that these reporting requirements would impose on manufacturers, that the proposal would duplicate information already provided – including to the U.S. government, and the low environmental benefit that would be associated with this reporting, AIA does not believe the proposed data collection is justified and urges OMB to reject this ICR. AIA believes similar arguments also apply for existing collections of emissions data for aircraft engines, and that steps should be taken to reduce these burdens when that ICR is next reviewed. [EPA-HQ-OAR-2018-0276-0087-A1, p.10]

[10] Supporting Statement: Airplane Greenhouse Gas Emissions. (2020) EPA ICR No. 2626.01, p. 4.

Organization: Airbus S.A.S. (Airbus)

II. Comments on the Information Collection Provisions: The EPA Should not Undermine the Global Consensus Reached by all 193 ICAO Member States by Mandating Additional Data Collection Requirements, Burdening a COVID-19 Stressed Industry While the Requisite Data is Already Available From Other Sources

ICAO developed the new CO_2 emissions standard applicable to subsonic civil airplanes through Standards and Recommended Practices ("SARPs") contained in the new Volume III of Annex 16. Many organizations (e.g., governmental, non-governmental, industry organizations, etc.) participated in this work, with the objective of defining harmonized requirements applicable in a similar manner throughout the world. This was backed by all 193 ICAO Member States including the United States. As such, Airbus welcomes EPA's proposed new rule that, if adopted, will implement the ICAO CO_2 emissions standard domestically in the US. [EPA-HQ-OAR-2018-0276-0077-A1, p.2]

Reporting obligations of CO_2 certified data were also extensively discussed at the ICAO level. The principle agreed to by all Member States forming the ICAO CAEP committee, including the United States, is based on voluntary reporting by manufacturers on a limited set of data associated with CO_2 certification in the ICAO-related CO_2 Certification Database ("CO2DB"). This set of data includes information on each aircraft model certified to the CO_2 emissions standard (e.g., company name, type certificate number, model designation, Maximum Take-Off Mass ("MTOM"), CO_2 emissions Metric Value, margin to the regulatory limit, etc.). It should be noted that this voluntary aspect is a key principle of CO_2 emissions certified data reporting by airplane manufacturers. [EPA-HQ-OAR-2018-0276-0077-A1, p.2]

Airbus fully supports the reporting obligations agreed to at ICAO but has concerns about the additional reporting requirements being proposed by the EPA rule in Section 1030.90. On top of the voluntary reporting in the CO2DB, this section also mandates that airplane manufacturers report directly to the EPA, on an annual basis, information of the same nature as the information already contained in the CO2DB, as well as these additional two aspects: 1) the annual production numbers; and, 2) the airplane reference geometric factor ("RGF"). [EPA-HQ-OAR-2018-0276-0077-A1, p.2]

The need for this new requirement is unclear and runs contrary to the ICAO spirit, constituting a breach in the search for global regulatory harmonization in civil aviation. Indeed, justifications are provided in section V.G, explaining that this information is needed "to understand how the proposed GHG standards affect the in-production fleet" and "to assess technology trends," and though those reasons may be valid, the need for a new data collection requirement is not. [EPA-HQ-OAR-2018-0276-0077-A1, p.3]

To achieve the above objectives, the information contained in the ICAO CO2DB, as well as the airplane production numbers available from public data sources, would cover the need and avoid burdensome double reporting. [EPA-HQ-OAR-2018-0276-0077-A1, p.3]

The aviation sector is currently going through an unprecedented crisis, and resource management is a challenge. EPA made an estimation in section VII.D.4 that the cost associated with this reporting requirement would represent an "estimated annual burden and cost of about 6 hours and $543 per manufacturer" because it would add "only 2 basic categories to those already requested by the CO2DB." This cost is indeed largely underestimated, and it is important that the proposed reporting requirements demonstrate actual benefits for environmental protection, to ensure optimum use of resources from the aviation sector. [EPA-HQ-OAR-2018-0276-0077-A1, p.3]

The ICAO CO2DB should constitute the reference database for the reporting of CO_2 emissions data certified by airplane manufacturers. This is to avoid the burden brought about by dual reporting that would disharmonize a process that took years to harmonize at the ICAO level. Airbus considers that the data voluntarily and timely reported by manufacturers into the ICAO CO2DB would be sufficient to allow EPA to assess technology trends. [EPA-HQ-OAR-2018-0276-0077-A1, p.4]

It is unclear what EPA's objective is with this reporting requirements in understanding the effect of the GHG standard on the in-production fleet. Any GHG standard should be environment-driven and not product-driven. GHG standards are designed to incentivize the incorporation of new technologies on airframes and propulsion systems that reduce the fuel burn and CO_2 emissions of aircraft. Those GHG standards do represent an important element of the mitigation strategies that are available to reduce the environmental footprint of the aviation standard, while maintaining a level playing field amongst manufacturers. [EPA-HQ-OAR-2018-0276-0077-A1, p.4]

ICAO is the right body to create international standards. Airbus believes that, in the absence of a worldwide harmonization process, regional requirements could produce unintended consequences that would harm the aviation industry. We therefore urge the EPA to adopt the proposed ICAO rule with no additional requirements. [EPA-HQ-OAR-2018-0276-0077-A1, p.4]

Organization: Airlines for America (A4A)

The Agency has incorporated provisions codifying the information collection activities for which it seeks OMB approval into a proposal to adopt greenhouse gas ("GHG") emissions standards for certain aircraft engines (the "Proposed Rule").[2] [EPA-HQ-OAR-2018-0276-0088-A1,p.1]

We do, however, have significant concerns about the ICR and the Reporting and Recordkeeping requirements EPA proposes to codify as 40 CFR §§ 1030.90, 1030.95 and 1030.98[3] and which EPA is asking OMB to approve. For the reasons detailed below, we respectfully urge OMB to disapprove these requirements. [EPA-HQ-OAR-2018-0276-0088-A1, pp.1-2]

A4A understands and supports the Agency's need to gather information that would genuinely be required to assess the effect its proposed GHG emissions standards and "develop appropriate policy."[4] While we strongly support the proposal to adopt the ICAO CO_2 Aircraft Standards into U.S. law, EPA itself acknowledges that it "proposes to collect additional elements or information beyond what ICAO will request for the voluntary CO2DB [the ICAO CO_2 Certification Database]. These additional elements would be the RGF [Reference Geometric Factor] and the annual production volume."[5] For the reasons detailed below, we respectfully request that OMB disapprove the ICR in its entirety, or alternatively, at least disapprove the provisions which would mandate submission of RGF and annual production volume data. [EPA-HQ-OAR-2018-0276-0088-A1, p.3]

Overall, EPA has failed to meet the requirements for imposing a new reporting burden as specified in the Paperwork Reduction Act, including, but not necessarily limited to, the requirements that the information collection be "necessary" for the Agency to fulfill its duties, that the Agency does not otherwise have access to relevant information and that its request not be duplicative or unduly burdensome.[6] Indeed, EPA offers no reasonable justification for collecting the information it seeks through a regulatory mandate. EPA asserts it "needs" to mandate annual collection of "information on technology, performance parameters, and emissions data" through regulation to "understand how the proposed GHG standards are affecting the in-production fleet," to "conduct technology assessments, compile airplane emission inventories, and develop appropriate policy."[7] The Agency also asserts that "[w]hile FAA [the Federal Aviation Administration] would have access to the information during certification, the EPA would not be able to access this information provided to FAA, and these circumstances reinforce the need for the EPA reporting requirement." None of these "justifications" withstand scrutiny. [EPA-HQ-OAR-2018-0276-0088-A1, p.3]

As an initial matter, EPA acknowledges that it participates directly in the ICAO Committee on Aviation Environmental Protection ("CAEP"), the international body charged with developing aircraft and engine emissions standards[8] and, in that capacity, worked for more than six years "from 2009 to 2016 within the ICAO/CAEP standard setting process on the development of the international Airplane CO_2 Emissions Standards."[9] Indeed, during this process EPA led key working groups that played a central role in gathering data on aircraft technology and design parameters that affect CO_2

emissions, much of which was highly sensitive and subject to stringent nondisclosure agreements. EPA also affirms that "[h]istorically . . . international emissions standards have first been adopted by ICAO, and subsequently the EPA has initiated rulemakings under CAA ["Clean Air Act"] section 231 to establish domestic standards that are at least as stringent as ICAO's standards."[10] As these EPA statements affirm, the ICAO process is rigorous and provides more than ample means to access information on "technology, performance parameters, and emissions data" to "conduct technology assessments" and "compile airplane emission inventories" as necessary to "develop appropriate policy." EPA provides no basis for concluding that it does not have sufficient access to information and data through its participation in the ICAO/CAEP process to inform any technical analysis needed to support the development of appropriate policy. Indeed, the Agency's own description of the ICAO/CAEP process and its role in that process, which led to emissions standards it now proposes to adopt without change, confirm there is no need to mandate collection of information it now asks OMB to approve. [EPA-HQ-OAR-2018-0276-0088-A1, pp.3-4]

EPA also asserts that "[h]aving the information updated every year will be most helpful in assessing technology trends and impacts and in a broader sense confirming, in a timely way, that manufacturers would be properly complying with regulatory requirements."[11] However, EPA itself affirms that under U.S. law (Section 231 of the Clean Air Act) its authority is limited to establishing – in consultation with FAA – aircraft engine emission standards for certain air pollutants, while "Section 232 . . . directs the Secretary of Transportation to prescribe regulations to ensure compliance with EPA's standards."[12] Accordingly, compliance with the CO_2 standard EPA proposes to adopt will be confirmed by FAA as it certifies the manufacturers' aircraft to that standard. Clearly, EPA does not require the information it seeks to collect to "confirm[] that manufacturers would be complying with regulatory requirements." [EPA-HQ-OAR-2018-0276-0088-A1, p.4]

Finally, because airlines are not subject to the proposed data collection airlines are not in a position to assess the burdens of compiling and reporting the data to EPA. However, we emphasize that given that EPA has not provided any reasonable basis for collecting the information identified in the ICR, it appears to us that any non-zero cost/burden of complying with the information collection requirements cannot be justified. [EPA-HQ-OAR-2018-0276-0088-A1, p.5]

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[2] 85 Fed. Reg. 51556 (August 20, 2020).
[3] We reserve any and all rights to comment on the Agency's underlying proposal to adopt the GHG Emissions Standards for certain aircraft engines on or before the comment deadline, October 19, 2020, including any further comments on the Agency's proposed Reporting and Recordkeeping requirements.
[4] Supporting Statement A, Information Collection Request – Control of Air Pollution from Airplanes and Airplane Engines: GHG Emissions Standards and Test Procedures at 1 (retrieved September 13, 2020 from https://www.reginfo.gov/public/do/PRAViewICR?ref_nbr=202008-2060-001) (hereinafter "EPA Supporting Statement").
[5] 85 Fed. Reg at 51589; EPA Supporting Statement at 1.
[6] 44 U.S.C. § 3506(c)(3).
[7] EPA Supporting Statement at 1, 3.
[8] A4A is fortunate to also participate in this process, albeit only as an observer.
[9] 85 Fed. Reg. at 51561.
[10] 85 Fed. Reg at 51559.
[11] EPA Supporting Statement at 4.
[12] 85 Fed. Reg at 51559.

Organization: Boeing Company (Boeing)

Boeing urges EPA to eliminate the proposed rule's reporting requirements because they overlap with reporting that civil aircraft manufacturers will be required to submit to the Federal Aviation Administration (FAA) when certifying their aircraft to the final section 231 standard. Because CAA section 232 assigns FAA the responsibility of enforcing the 231 standard through the certification process, FAA will collect the information necessary to carry out the mandates of the CAA, making the EPA-proposed reporting requirements unnecessary. The reporting requirements should be omitted from the final rule pursuant to the Administration's directives to minimize paperwork burdens.[2] [EPA-HQ-OAR-2018-0276-0089-A1, p.1]

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[2] See, e.g., Memorandum from Naomi Rao, Administrator, Office of Information and Regulatory Affairs, "Minimizing Paperwork and Reporting Burdens; Data Call for the 2018 Information Collection Budget (FY 2017 Data) (Aug. 6, 2018) (OIRA "reaffirms the importance of minimizing paperwork burdens as a component of comprehensive regulatory reform").

Organization: Gulfstream Aerospace Corporation

2) Gulfstream believes the Information Collection Request (ICR) reporting requirement as detailed in the NPRM will be more onerous than predicted in the EPA cost estimate. On an annual basis multiple personnel will be required to consult various data sources, crosscheck against other records, and seek necessary approvals to submit the data. Initial setup of a compliance structure will require additional effort the first year. Additionally, much of the production data are available from other sources and could be obtained without the participation of the airframe manufacturer. Thus, the ICR duplicates data available elsewhere with no additional benefit to the EPA or industry. [EPA-HQ-OAR-2018-0276-0078-A1, p.2]

Organization: International Co-ordinating Council of Aerospace Industries Associations (ICCAIA)

Engine manufacturers have been voluntarily providing data to the engine emissions databank for many years and it is expected that airplane manufacturers will consistently voluntarily provide data as well. Thus, the CO2DB will be sufficient in providing the CO_2 metric value data in the same timely manner as airplane CO_2 certifications change, thus supporting EPA's technology assessment. [EPA-HQ-OAR-2018-0276-0096-A1, pp.2-3]

Organization: Transport Canada, Civil Aviation (TCCA)

Representation 1

Section V/Details for the Proposed Rule/Subsection G/Annual Reporting Requirement/Page 51575. [EPA-HQ-OAR-2018-0276-0084-A2, p.1]

Comment

The NPRM states that the EPA "proposes to collect information about airplane GHG emissions and related parameters to help inform the development of future policy, assessments of emissions inventories, and specific technologies" in a reporting requirement. The additional reporting (frequency and data requested) goes beyond that required by ICAO Annex 16 Volume III for the certification process and the voluntary OEM submittal of data to the ICAO CO2DB. This additional requirement would mean that the USA would not be harmonized with other ICAO member states for the CO_2 regulation. [EPA-HQ-OAR-2018-0276-0084-A2, p.1]

Suggested resolution

Not to include additional reporting requirements but instead, rely on the ICAO CAEP to manage data gathering, modelling and reviewing of the CO_2 regulation, its impact and future potential stringencies. [EPA-HQ-OAR-2018-0276-0084-A2, p.1]

Response:

For the reasons provided in Section 9.2 of this document, the EPA not adopting the proposed reporting requirements at this time. Thus, the EPA is not responding to the public comments relating to the justification for the proposed reporting requirement. The EPA is making no judgement at this time regarding the validity of the assertions made in the comments but may consider these comments if additional action is taken to establish a reporting requirement. This does not preclude the EPA from revisiting an airplane GHG reporting requirement in the future.

9.2. RGF/SAR and CBI

Comments:

Organization: Aerospace Industries Association (AIA)

The other information the EPA has identified it requires that will not be available within the CO2DB is the Reference Geometric Factor (RGF) for each aircraft sub-model variant. We detail specific concerns about the commercially sensitive nature of this data below, but we also believe the requirement to provide this data is unnecessary duplicitous as this information is already provided to the FAA as part of aircraft certification requirements. [EPA-HQ-OAR-2018-0276-0087-A1, p.7]

Specific concerns on reporting of RGF data

While RGF data on its own is not commercially sensitive – it is used as part of a calculation involving three Specific Air Range (SAR) points used to derive the CO_2 metric. Reporting of both the CO_2 metric – which would be available within the CO2DB – and RGF data would therefore allow any party with access to this information to determine the SAR – a calculation of fuel performance – for a given aircraft. [EPA-HQ-OAR-2018-0276-0087-A1, p.9]

SAR is considered highly commercially sensitive by aircraft manufacturers. As a result, public disclosure of SAR data, or any information by which SAR data could be derived, would present manufacturers with significant legal and anti-trust concerns and it is for this reason that ICAO decided not to request this information for the CO2DB. While the EPA states in the NPRM that manufacturers would be able to identify information as Confidential Business Information (CBI), the NPRM explains that "CBI determinations are usually made on a case-by-case basis"[11]. Given these concerns and the lack of environmental benefit that would be derived from aircraft manufacturers providing this data to the EPA, AIA believes collection of RGF data is not justified. [EPA-HQ-OAR-2018-0276-0087-A1, p.9]

[11] Supporting Statement: Airplane Greenhouse Gas Emissions, p. 8.

Organization: Aerospace Industries Association of Canada (AIAC)

Regarding the NPRM and proposed annual reporting requirements, AIAC has concerns regarding EPA's request for the reference geometric factor (RGF) under 1030.90(d)(5) and annual production data under 1030.90(d)(9). [EPA-HQ-OAR-2018-0276-0082-A1, p.1]

RGF is used in the calculation of an aircraft's CO_2 metric; the CO_2 metric is available in ICAO's CO_2 Certification Database (CO2DB). Disclosure of RGF would allow an aircraft's Specific Air Range (SAR) to be calculated. SAR is a measure of an aircraft's fuel burn and is highly sensitive commercial information of manufacturers. Because of the sensitive nature of SAR data, RGF data is not provided to ICAO's CO2DB. AIAC does not consider the EPA's rationale in requesting RGF to be well founded and requests that this requirement be deleted in the final rule. [EPA-HQ-OAR-2018-0276-0082-A1, p.2]

Organization: Airbus S.A.S. (Airbus)

Regarding the RGF, Airbus would like to highlight that this information is Confidential Business Information ("CBI"). Indeed, the CO_2 emissions Metric Value is composed of a fuel-burn representative parameter, the Specific Air Range ("SAR"), as well as the RGF. The SAR is highly commercially sensitive information, thus making the RGF also commercially sensitive. Airbus is therefore deeply concerned that the EPA might improperly determine which information is CBI or not as stated in section V.G.1, and that this information may be made publicly available. [EPA-HQ-OAR-2018-0276-0077-A1, pp.3-4]

Organization: Airlines for America (A4A)

Similarly, EPA affirms that the ICAO Standard "controls aircraft engine GHG emissions through the use of the ICAO regulatory metric that quantifies airplane fuel efficiency"[13] and that the ICAO CO2DB calls for manufacturers to report the metric value ("MV") for each each aircraft type that is certified to the metric.[14] As a result, the ICAO CO2DB will, by definition, provide sufficient means to "assess technology trends" and the impact of the GHG Standards on the in-production fleet. However, EPA seeks to collect the information that would allow direct calculation of an aircraft's Specfic Air Range ("SAR"), which is another – but very commercially sensitive – measure of fuel efficiency at the aircraft level. ICAO adopted the MV as the appropriate measure of aircraft CO_2/fuel efficiency precisely because it is a more meaningful measure of CO_2/fuel efficiency at the aircraft level than SAR. Thus, the MV is most appropriate measure of technology trends and impact of standards on aircraft fleets. [EPA-HQ-OAR-2018-0276-0088-A1, p.4]

With respect to EPA's proposal to require reporting of RGF data, while we understand that this data is not commercially sensitive in and of itself, because the MV of an aircraft is a function of just two non-numerical components, RGF and SAR, with access to both the MV and RGF data, an aircraft's SAR can be readily calculated. As noted above, aircraft (and engine) manufacturers consider SAR to be extremely sensitive from a competitive standpoint. To be clear: our objection is not that EPA would have access to this information, but that once reported, there is a significant risk that it would be subject – as EPA acknowledges[15] – to public disclosure pursuant to the Clean Air Act section 114 and EPA regulations. While we generally agree that the law and regulations provide some measure of protection from disclosure where information is designated Confidential Business Information ("CBI"), there is no reason in this case to create a risk that CBI could be disclosed in the first place. Again, EPA has had and will continue to have access to commercially-sensitive information – including both RGF data and MV data – in the ICAO/CAEP process. [EPA-HQ-OAR-2018-0276-0088-A1, pp.4-5]

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[13] 85 Fed. Reg at 51558
[14] EPA Supporting Statement at 1.
[15] See 85 Fed. Reg. at 51577.

Organization: Boeing Company (Boeing)

If EPA nonetheless includes reporting requirements in the final rule, then it must take steps to ensure that civil aircraft manufacturers' trade secrets and confidential business information remain protected. It can do this most efficiently by declining to collect such information in the first instance. If EPA were to collect such information, then EPA must ensure that it is fully protected from disclosure pursuant to the Freedom of Information Act (FOIA) or otherwise. Of particular sensitivity to Boeing (and other aircraft manufacturers) is the protection of a manufacturer's Specific Air Range (SAR) data, which includes an airplane's Reference Geometric Factor (RGF) when made available together with its fuel-efficiency "Metric Value" (MV). An airplane's Specific Air Range is the distance the airplane can travel per unit of fuel consumed. Critically for purposes of this rule, an airplane's Specific Air Range can be readily calculated from other SAR data, such as an airplane's RGF and MV. SAR data is highly sensitive, treated by Boeing and other airplane manufacturers as a trade secret, and protected zealously from disclosure to competitors and the public. Because of the strategic value of SAR data, it can also be subject to federal export controls and sanctions regimes. [EPA-HQ-OAR-2018-0276-0089-A1, p.2]

There is also a risk that someone could wrongly argue that SAR data should be considered to be emissions data or "related technical information" that EPA must disclose. EPA should not collect SAR data unless the agency can guarantee it will be protected from public disclosure. Given the sensitivity of this data both for manufacturers and for the federal government's export control regime, EPA should not require reporting of that data. If it nonetheless requires reporting of SAR data, then EPA must ensure that data is protected from public disclosure, as discussed in Section IV of these comments. [EPA-HQ-OAR-2018-0276-0089-A1, p.2]

II.SAR Data is a Trade Secret and Must Be Protected from Public Disclosure

As discussed in ICAO's CAEP/10 Working Group 3 CO_2 Task Group proceedings (11-15 May 2015)[3] and CAEP Steering Group proceedings (11 -15 September 2017),[4] SAR data (including not only SAR values but also data from which SAR values can be derived) constitutes confidential business information that should not be publicly disclosed. SAR data is highly sensitive – it can be used by competitors to reverse engineer extremely confidential values such as an airplane's drag polars and other proprietary design aspects. Boeing considers SAR data to be a trade secret,[5] and it does not provide this data to third parties without a demonstrated need to know and a binding contractual obligation by that party to maintain its confidentiality. To retain trade secret protection for SAR data under the law, it must not be made publicly available.[6] [EPA-HQ-OAR-2018-0276-0089-A1, pp.2-3]

EPA need not collect SAR data to track airplane CO_2 emissions performance and verify compliance. ICAO agreed to the use and public reporting of an aircraft's MV for this purpose, because it is sufficient by itself to enable assessment of compliance with the CO_2 emissions standard, while continuing to maintain the confidentiality of manufacturers' SAR data.[7] Significantly, ICAO does not require public reporting of RGF (an important element of SAR data) precisely because it can be used to derive an airplane's SAR. [EPA-HQ-OAR-2018-0276-0089-A1, p.3]

As EPA has acknowledged, ICAO's public CO_2 Certification Database does not contain information beyond maximum take-off mass (MTOM) and MV, expressly in recognition of "the concerns of manufacturers to exclude commercially sensitive information."[8] Yet EPA proposes to require manufacturers to report to EPA the RGFs for their aircraft.[9] While EPA indicates that manufacturers can seek protection of reported information as confidential business information (CBI),[10] EPA also asserts that "[i]n general, emission data and related technical information collected under CAA section 114 cannot be protected as confidential business information (CBI)."[11] [EPA-HQ-OAR-2018-0276-0089-A1, p.3]

The proposal is noticeably vague about whether such submitted SAR data would be protected as CBI. Neither the regulatory definition of "emissions data" in 40 C.F.R. § 2.301(a)(2)(i) nor EPA's discussion of the scope of emission data in 56 Fed. Reg. 7042 (Feb. 21, 1991) answers this question. Because it is not clear that EPA can protect submitted SAR data as CBI due to its potential classification as "emissions data" (or "related technical information"), EPA should not require the reporting of such data in the final rule. [EPA-HQ-OAR-2018-0276-0089-A1, p.4]

The consequences of public disclosure of SAR data collected by EPA could be especially harmful to U.S. aircraft manufacturers, because it is not clear that EPA has the authority to enforce the proposed reporting requirements against foreign aircraft manufacturers. The international aviation regime is governed by a framework of multilateral and bilateral agreements, including but not limited to the Chicago Convention, that establish the jurisdiction of various countries' airworthiness authorities over product and operational certifications. These agreements provide, inter alia, for reciprocity in the recognition of airworthiness certifications issued by foreign countries of manufacture, and limit the ability of one country to impose regulatory mandates on foreign certificate holders. Accordingly, any assumption by EPA that it has authority to collect SAR data from foreign manufacturers would not appear to be reasonable. Because, as discussed above, it is not clear that EPA can protect SAR data from public disclosure, it would be particularly unreasonable for EPA to collect SAR data only from U.S. manufacturers and thereby place those manufacturers at a significant competitive disadvantage with their foreign competitors [EPA-HQ-OAR-2018-0276-0089-A1, p.4]

If EPA nonetheless decides to collect SAR data, then it must take strong steps to ensure that such data is protected from public disclosure. We discuss in Section IV how that might be done. [EPA-HQ-OAR-2018-0276-0089-A1, p.4]

III. Unauthorized Disclosure of SAR Data Could Violate U.S. Export Controls and Sanctions

As also discussed in the CAEP/10 Working Group 3 CO_2 Task Group proceedings (11-15May 2015)[12] and in the CAEP Steering Group proceedings (11 -15 September 2017),[13] the disclosure of SAR data in certain circumstances may violate federal export controls regulations. [EPA-HQ-OAR-2018-0276-0089-A1, p.4]

This specifically includes the U.S. Export Administration Regulations (15 C.F.R. Parts 730-774) (the "EAR"), which prohibit sharing or dissemination of information in certain circumstances absent an express export authorization from the U.S. Department of Commerce. [14] As a general matter, SAR data relating to Boeing's commercial aircraft is subject to EAR. Its public disclosure by EPA as potential "emissions data" could therefore result in a violation of EAR. [EPA-HQ-OAR-2018-0276-0089-A1, p.5]

The disclosure of SAR data by EPA may also violate U.S. sanctions programs (31 C.F.R. Parts 501-598) administered by the U.S. Department of the Treasury. Aside from the export control requirements noted above, the United States administers comprehensive and selected Sanctions Programs targeted against Iran, Cuba, North Korea, Syria, and other state actors. Some of these sanctions programs also specifically restrict disclosure of controlled information to individual legal entities (i.e., companies and persons). The public release of SAR data as emissions data, in certain circumstances, could make such restricted information available to these sanctioned state actors and individual legal entities in violation of these requirements. Because it is not clear that EPA can protect SAR data as required by the aforementioned U.S. export control and sanction regimes, EPA should not to collect such data. If it nonetheless does, then it must take concrete steps to ensure the protection of such data from public disclosure as discussed in Section IV of these comments. [EPA-HQ-OAR-2018-0276-0089-A1, p.5]

IV.EPA Should Either Not Require the Reporting of SAR Data or, If it Does, ThenTake Concrete Steps to Ensure the Protection of That Data

Because it is not clear to Boeing that SAR data can be protected from public disclosure once submitted to EPA, and because the public disclosure of SAR data would expose Boeing's trade secret information to its competitors and could also violate federal export control and sanction regimes, Boeing emphatically requests that EPA either:

(1)limit the reporting requirement in proposed 40 C.F.R. § 1030.90(d)(5) to MTOM andMV only, and not require the reporting of RGF or other SAR data, by striking the phrase "reference geometric factor" from proposed 40 C.F.R. § 1030.90(d)(5)); or

(2)clarify that EPA's regulatory definition of "emissions data" in 40 C.F.R. §2.301(a)(2)(i) and EPA's discussion of the scope of emission data in 56 Fed. Reg. 7042 (Feb. 21, 1991 excludes SAR data, including RGF, and create a highly secure reporting tool such as the e-GGRT (electronic greenhouse gas reporting tool) with an inputs verification tool (IVT) to verify the accuracy of the MV through the temporary use (but not storage) of SAR data, including RGF. In this manner, the SAR data, including RGF, would not be accessible by or in the possession of EPA and therefore would not be subject to disclosure under the Freedom of Information Act. If EPA determines to pursue this course, then it should defer any manufacturer's obligation to report SAR data, including RGF, until such reporting tool and input verification tool has been established and verified to be fully secure.[15] [EPA-HQ-OAR-2018-0276-0089-A1, pp.5-6]

Boeing-Suggested Changes to the CAA Section 231 Aircraft CO_2 Standard Proposed Rule Text

§1030.90 Airplane production report to the EPA.

Manufacturers of airplanes subject to §1030.1 must submit an annual report as specified in this section.

(a) You must submit the report for each calendar year in which you produce any airplanes that are subject to GHG emission standards under this part. The report is due by the following February 28. Include exempted airplanes in your report.

(b) Send the report to the Designated EPA Program Officer.

(c) In the report, identify your corporate name as listed on the airplane type certificate and the year for which you are reporting.

(d) Identify the complete name for each of your airplane sub-models and include the following information for each airplane sub-model that is covered by an FAA type certificate:

(1) Type certificate number from the FAA. Also identify type certificates issued by any organization other than the FAA. Identify the issue date of each type certificate (month and year).

(2) Submission date for the application to certify to the GHG emission standards in §1030.30.

(3) Edition number and publication date of the applicable standards under Annex 16, Volume III.

(4) For ~~modified~~ derived versions of airplanes under §1030.35, the most recently ~~certificated~~ version that has been granted an amended type certificate.

(5) Maximum take-off mass ~~and reference geometric factor.~~ [EPA-HQ-OAR-2018-0276-0181-A2, p.53]

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[3] See Working Paper CAEP10_WG3-8_CO2-9_WP16 (presented by ICCAA).
[4] See Working Paper CAEP-SG/20172-WP/46 (presented by ICCAIA and IBAC).
[5] A trade secret "means all forms and types of financial, business, scientific, technical, economic, or engineering information, …, whether tangible or intangible, and whether or how stored, compiled, or memorialized physically, electronically, graphically, photographically, or in writing if—(A) the owner thereof has taken reasonable measures to keep such information secret; and (B) the information derives independent economic value, actual or potential, from not being generally known to, and not being readily ascertainable through proper means by, another person who can obtain economic value from the disclosure or use of the information." 18 U.S.C. § 1839(3).
[6] Id.
[7] See Summary of Discussions and Decisions of the Third Meeting of the Steering Group, CAEP CAEPSG.20172-SD/3 (presented by the ICAO Secretariat).
[8] 85 Fed. Reg. 51556, 51577 (Aug. 20, 2020). Accessed at: https://www.govinfo.gov/content/pkg/FR-2020-08-20/pdf/2020-16271.pdf.
[9] Proposed 40 CFR 1030.90(d)(5), 85 Fed. Reg. at 51593.
[10] 85 Fed. Reg. at 51577.
[11] 85 Fed. Reg. at 51577. See also CAA § 114(c), 42 USC § 7414(c) (protecting "trade secret[s]" "other than emission data"). Under the plain language of CAA §114(c) and 40 C.F.R. § 2.301, CBI remains protected, with the exception of "emissions data," which by law must be available to the public. Based on this, Boeing believes that "related technical information" that is CBI also remains protected against disclosure, because it is not "emissions data." In the event that the final rule requires the reporting of SAR data, Boeing reserves all rights to assert that such data is CBI and is not emissions data, and therefore that it is entitled to protection against disclosure by EPA.
[12] See Working Paper CAEP10_WG3-8_CO2-9_WP16 (presented by ICCAA).
[13] See Working Paper CAEP-SG/20172-WP/46 (presented by ICCAIA and IBAC).

[14] To the extent the SAR data required to be reported relates to military aircraft or military variants of commercial aircraft, such data may be subject to the International Traffic in Arms Regulations (22 CFR Parts 120-130) (the "ITAR"), administered by the U.S. Department of State. The ITAR also prohibits sharing or dissemination of technical data subject to the ITAR in certain circumstances without an export authorization from the U.S. Department of State.

[15] See 79 Fed. Reg. 63750, 63755 & 63764 (Oct. 24, 2014). Accessed at https://www.gpo.gov/fdsys/pkg/FR-2014-10-24/pdf/2014-23780.pdf. ("IVT will use these entered data to calculate the equation results, conduct electronic verification checks on the entered inputs to emission equations, and generate a verification summary that informs the EPA about the verification results without specifying the entered inputs to emission equations. IVT will not retain the entered inputs to emission equations, which will not be electronically accessible to the EPA during their entry or anytime thereafter. ... [W]hen a reporter logs out of IVT, none of the data entered into IVT are retained in the EPA's electronic systems. ... Given that the EPA will have no access to, nor possession of, data entered into IVT, such data will not be considered to be agency records as defined by the Freedom of Information Act or the Federal Records Act, and the EPA cannot conceive ... which federal law would require the EPA to release information that it does not have. ... [I]nformation entered into IVT is not reported to or collected by the EPA. As a result, it does not become an agency record and, therefore, it is not subject to Freedom of Information Act or other required disclosures related to public records."

Organization: Bombardier Aviation

The following comments are concentrated only on the section for 40 CFR 1030, paragraph 1030.90 of the NPRM, "Airplane production report to the EPA". [EPA-HQ-OAR-2018-0276-0076-A1, p.1]

Bombardier is concerned that the NPRM incorporates some major differences from the ICAO reporting requirements in Annex 16, Volume III, particularly on the following: [EPA-HQ-OAR-2018-0276-0076-A1, p.1]

Introduction of Reference Geometric Factor (RGF) Reporting

Although the EPA's proposed annual reporting requirement requests content similar to what is in ICAO's CO_2 Certification Database (CO2DB), the additional annual reporting requirement of the Reference Geometric Factor is of concern to Bombardier. [EPA-HQ-OAR-2018-0276-0076-A1, p.1]

The CO_2 metric value is calculated using the Specific Air Range (SAR) at three mass points and the Reference Geometric Factor, a measure of the fuselage size. Specific Air Range is defined as the air distance traveled per unit of fuel and is considered highly commercially sensitive. Bombardier Aviation considers that Specific Air Range data, or any data by which SAR data can be derived, to be proprietary and highly confidential information. [EPA-HQ-OAR-2018-0276-0076-A1, p.1]

The CO_2 metric value will be available in the CO2DB. Based on the EPA's proposed annual reporting requirement, the SAR data can be easily reverse engineered if RGF was publicly available. This concern is the primary reason that ICAO agreed not to provide RGF in the CO2DB. [EPA-HQ-OAR-2018-0276-0076-A1, p.2]

If an applicant does not mark this data as Confidential Business Information (CBI), the EPA may make it available to the public without further notice. [EPA-HQ-OAR-2018-0276-0076-A1, p.2]

To harmonize with the ICAO CO2DB, Bombardier requests the exclusion of RGF in the annual reporting requirement. However, if it is required by the EPA for its technical assessments, due to the sensitivity of this data, Bombardier requests that RGF be specified in 40 CFR 1030.90 as Confidential Business Information and not be made publicly available. [EPA-HQ-OAR-2018-0276-0076-A1, p.2]

Organization: Embraer Commercial Aviation

In addition to the information populating the ICAO CO_2 DataBase (CO2DB), the US EPA requires from the aircraft manufacturer, for each of their types of product, the Reference Geometric Factor (RGF) and the volume of deliveries during the annual production number. [EPA-HQ-OAR-2018-0276-0090-A1, p.1]

With the RGF and the other information available in the ICAO CO2DB, one could determine the aircraft fuel consumption via reverse engineering. The fuel consumption is considered as highly confidential information and no manufacturer wishes to give access to this information. [EPA-HQ-OAR-2018-0276-0090-A1, p.1]

Embraer notes that an annual requirement to submit data associated with CO_2 certification data is defined in section 1030.90 of the NPRM. The specific request for CO_2 certification data and associated airplane information is provided and contains manufacturer detailed specific information. The ICAO's CO_2 Certification Database (CO2DB) will also include much of the same information as the data requested from the EPA in 1030.90. There are, however, two significant differences: the CO2DB will not include annual production numbers or Reference Geometric Factor (RGF). Embraer suggests that the EPA should use the same information and format as the ICAO CO2DB to satisfy their need to "access technology trends" since certified CO2 metric value and Max Takeoff Mass data will be provided into the CO2DB voluntarily by the manufacturers. [EPA-HQ-OAR-2018-0276-0090-A1, p.1]

In the NPRM it is stated that reported information can be identified by the manufacturer as Confidential Business Information (CBI), however, the NPRM also states that "CBI determinations are usually made on a case-by-case basis". In case RGF has to be provided to the US EPA and is indicated as CBI, Embraer requests confirmation from the US EPA that the RGF data will be treated as CBI and not made available to the public. [EPA-HQ-OAR-2018-0276-0090-A1, p.1]

Organization: General Aviation Manufacturers Association (GAMA)

However, EPA's proposed rule (Sec. V.G., Annual Reporting Requirement) would require manufacturers to report information (not required by ICAO) which could potentially jeopardize a company's competitive edge in that marketplace. While ICAO is developing a database of voluntary information (the CO_2 Certification Database, or CO2DB), the information requested by ICAO to go in the CO2DB will include only information that is not considered by industry to be commercially sensitive.

EPA, on the other hand, is asking in its proposed rule for information that ICAO does not request: The Reference Geometric Factor (RGF). This request for RGF is troublesome because it could lead to the discovery of highly sensitive and confidential business information. RGF, loosely defined as the measure of an airplane's fuselage size, is not highly confidential. However, as one value used in a metric equation to calculate an airplane's CO_2 emissions, it can easily lead to the determination of another value in that equation - an airplane's SAR (Specific Air Range). SAR is defined as the distance an airplane travels per unit of fuel consumed and is considered highly sensitive and confidential business information. GAMA recognizes that ICAO intentionally does not ask for this information and urges EPA to remain consistent with ICAO in this regard. [EPA-HQ-OAR-2018-0276-0143-A1, pp.2-3]

However, GAMA has serious concerns about requiring manufacturers to report information that is already publicly available as well as information that ICAO does not request in its CO2DB such as RGF and annual production volumes for airplane submodels. [EPA-HQ-OAR-2018-0276-0143-A1, p.3]

Organization: Gulfstream Aerospace Corporation

1) Gulfstream, like many other aircraft manufacturers, considers the Reference Geometric Factor (RGF) as a key parameter in protecting confidential business information. When combined with the CO_2 metric proposed in the NPRM, the RGF can be used to reverse-engineer proprietary information regarding aircraft performance and design. Gulfstream believes that the publicly available data provided as part of the CO_2 Certification Databank (CO2DB) offers sufficient information for the EPA to track the success of the standard for driving implementation of fuel-saving technologies. The additional collection of RGF data is unnecessary. [EPA-HQ-OAR-2018-0276-0078-A1, p.2]

Organization: International Co-ordinating Council of Aerospace Industries Associations (ICCAIA)

Related to the RGF, ICCAIA is concerned about providing RGF into a publicly available source of data such as that proposed by the EPA NPRM. The CO_2 Standard metric consists of a mathematical calculation using three Specific Air Range (SAR) points and the RGF. Specific Air Range information is a definition of the fuel burn of a product and is considered highly commercially sensitive by all ICCAIA members. Manufacturers consider that SAR data, or any method by which SAR data can be derived, is proprietary and highly confidential information – that is to say Confidential Business Information. Public disclosure of SAR data, or any information by which SAR data could be derived, present manufacturers with significant legal and anti-trust concerns. Since it is proposed in the NPRM that both the CO_2 metric value and the RGF would be disclosed –made public and if not be able to qualify as CBI – it would be possible for anyone to mathematically reverse-engineer the proprietary SAR data. This concern is the reason that ICAO agreed not to provide RGF in the CO2DB. Therefore, ICCAIA believes that reporting airplane RGF as part of the EPA reporting requirement should not be considered. [EPA-HQ-OAR-2018-0276-0096-A1, p.2]

Organization: National Business Aviation Association (NBAA)

Reporting Requirements

An additional area of difference is concerning the requirement to submit Reference Geometric Factor (RGF) data. The omission of RGF data in the ICAO CO_2 standard was deliberate, after careful consideration of concerns from manufacturers. The CO_2 Standard metric consists of a mathematical calculation using three Specific Air Range (SAR) points and the RGF. Specific Air Range information is a definition of the fuel burn of a product and is considered highly commercially sensitive. We feel that this information should then be identified as Confidential Business Information (CBI). However, should this not be the case, and the information made publicly available, it would be possible to calculate the SAR. NBAA suggests that the RGF data be excluded from the reporting requirements or be identified as CBI. [EPA-HQ-OAR-2018-0276-0091-A1, p.2]

Response:

The comments regarding the reporting of RGF covered several different areas of concern to the commenters. While RGF itself is not sensitive, RGF in conjunction with MV can be used to calculate SAR, which commenters argued is sensitive or confidential business information. Commenters argued that neither EPA's proposed rule nor its existing regulations on CBI were sufficient to prevent the public disclosure of RGF and MV, and by extension, SAR. Further, it was claimed that the public release of SAR could violate both sanctions regimes and export controls. The EPA believes that complex policy and legal issues raised regarding the reporting of RGF and the possible resultant public availability of SAR would require significant time and effort to evaluate and address. Further, any substantial reporting of data is not likely to occur before the in-production standard takes effect in 2028. Thus, the EPA is not adopting the proposed reporting requirement in the final rule. This decision will allow the EPA sufficient time to carefully consider and address these comments and possibly reconsider an airplane GHG reporting requirement in the future while having the added benefit of not delaying the rest of the rule given the importance of providing regulatory certainty to the affected industry.

While the EPA could elect to remove the reporting of the RGF from the reporting requirement and adopt the rest of the proposed reporting requirement upon addressing the rest of the relevant public comments, it is choosing not to do so at this time. Given the likely timing of the reporting of data, as discussed above, the EPA sees no value in adopting a reporting requirement in a piecemeal fashion and will instead not adopt any reporting at this time. This decision does not preclude the EPA from revisiting an airplane GHG reporting requirement in the future.

9.3. Production volumes

Comments:

Organization: Aerospace Industries Association (AIA)

The EPA identifies two items manufacturers would be required to report that are not available in the ICAO CO2DB – the first of which is production numbers for each aircraft and engine sub-model. While this information is not included in the CO2DB, there are other sources that the EPA could utilize to gather comparable information which would not impose a burden on manufacturers. One such example is the Cirium Fleet Analyzer[9] database, which provides detailed information on aircraft deliveries. AIA notes that deliveries do not correspond directly to production numbers, but for the purposes of assessing environmental impacts from aviation, they may be more appropriate. We elaborate further on this point below. [EPA-HQ-OAR-2018-0276-0087-A1, p.7]

Finally, AIA does not believe there is environmental benefit to be gained from the reporting of production numbers above what would be derived from the use of already available public data on aircraft deliveries. In fact the use of production numbers could provide unreliable information for analysis undertaken by the EPA – depending on whether or not non-U.S. manufacturers are required to provide information about aircraft produced outside of the U.S. that never operate within the U.S., as well as the extent to which these manufacturers will comply with this request. If non-U.S. manufacturers only reported data pertaining to aircraft which operate within the U.S., while U.S. manufacturers were required to report all aircraft they produced, this could provide a skewed basis for comparisons between the relative performance of different manufacturers' aircraft. Ultimately this could lead to unreliable analyses on the extent and impact of CO_2 emissions from U.S. aviation. AIA therefore suggests aircraft delivery data is more appropriate for considering the environmental impacts of aviation – especially when looking at the domestic impact of aircraft emissions outside of the ICAO process. [EPA-HQ-OAR-2018-0276-0087-A1, p.8]

AIA would also like to highlight that production numbers themselves are not always simple to validate for airframe manufacturers. While these are often reported as part of a company's quarterly report, they are not necessarily reported at sub-model level which the EPA is requesting. Due to the regulations surrounding financial reporting, there may also be restrictions on making such information available beforehand to the EPA or other parties. AIA therefore suggests that already existing public data on aircraft deliveries would be more appropriate as well as less burdensome for aircraft manufacturers. [EPA-HQ-OAR-2018-0276-0087-A1, p.8]

Other comments and concerns on reporting provisions

In addition to our above concerns, AIA would like to note several other observations on aspects of the proposed reporting requirements:

• The proposed reporting requirements indicate that manufacturers must report production numbers even for models where none were produced for the previous calendar year. It is not clear whether this is proposed for only aircraft that manufacturers continue to offer to customers, or to completely discontinued aircraft – which would have no benefit. [EPA-HQ-OAR-2018-0276-0087-A1, p.9]

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[9] Cirium Fleet Analyzer, https://dashboard.cirium.com/app/fleet/#/analyserhome

Organization: Aerospace Industries Association of Canada (AIAC)

Regarding the NPRM and proposed annual reporting requirements, AIAC has concerns regarding EPA's request for the reference geometric factor (RGF) under 1030.90(d)(5) and annual production data under 1030.90(d)(9). [EPA-HQ-OAR-2018-0276-0082-A1, p.1]

AIAC does not understand the reason for EPA's request for annual production data. Non-US based aircraft manufacturers generally deliver to customers throughout the world, including the US. While a foreign manufacturer requires an FAA type certificate for any aircraft registered in the US, the FAA type certificate does not imply that an aircraft type is produced for US customers in any given year. [EPA-HQ-OAR-2018-0276-0082-A1, p.2]

If EPA's objective is to monitor CO_2 improvements of the fleet of US registered aircraft over time, AIAC suggests that EPA use data readily available in the US aircraft registry database. If annual aircraft production data is absolutely required, AIAC recommends that publicly disclosed data (for example from manufacturers' annual reports) be used. [EPA-HQ-OAR-2018-0276-0082-A1, p.2]

Organization: Airbus S.A.S. (Airbus)

Regarding the annual production numbers, the global picture would be sufficient to achieve the mentioned objective – e.g., how many A320neo airplanes are delivered versus A320ceo airplanes, for instance. This information is publicly available in various data sources. However, going into the details of which aircraft model, engine type, MTOM variant, possible options and date of delivery will quickly become a burden when 800 aircraft a year are delivered by Airbus alone. [EPA-HQ-OAR-2018-0276-0077-A1, p.3]

Defining the applicability of the reporting based on FAA type certification, as proposed by EPA, puts an unnecessary burden for aircraft that are not registered in the US. EPA’s authority to mandate the reporting of production numbers of airplanes that will never be produced, delivered nor operated within the United States is unclear. [EPA-HQ-OAR-2018-0276-0077-A1, p.3]

Moreover, a large proportion of Airbus airplanes delivered each year around the world will never operate above the US territory. This therefore questions the EPA authority to request information about these serial numbers with regards to EPA obligations under the Clean Air Act. [EPA-HQ-OAR-2018-0276-0077-A1, p.3]

All Airbus aircraft are certified by the European Union Aviation Safety Agency (“EASA”) and validated by the FAA. There is no obligation for non-US manufacturers to apply for certification or validation of their aircraft models by the FAA. In the past, there have been specific variants of Airbus aircraft types that never obtained an FAA validation. These uncertainties on EPA’s authority may therefore create inconsistencies in the reporting of data that would not serve EPA’s objective. This is why Airbus believes that public sources of information regarding annual production numbers would be more appropriate to ensure consistency of information. [EPA-HQ-OAR-2018-0276-0077-A1, p.3]

Comment 10 – §1030.90 Airplane Production Report to the EPA

Airbus submitted comments on September 21st, 2020 related to the information collection provision aspects of §1030.90. These comments are attached in the Appendix. [EPA-HQ-OAR-2018-0276-0148-A1, p.4]

Organization: Airlines for America (A4A)

With respect to the request to approve the collection of “annual production volume” information, EPA also has not provided any reasonable basis for seeking this information. The Agency apparently covets this information so that it can assess “technology trends” and “fleet impacts” and derive “emission inventories” on an annualized basis. Again, the MV is the appropriate means for evaluating such trends and impacts. Absent some unusal circumstances triggering the need to re-certify an aircraft, the MV of an aircraft will not change year-to-year.[16] In addition, while EPA seeks “annual production volumes,” generally speaking aircraft manufacturers do provide data regarding delivered aircraft on their public websites and similar data is available for purchase from other private sources. Information regarding delivered aircraft is likely more useful and accurate to analyze environmental impacts. Given the availability of such information from alternative sources, EPA should not be compelling production of this data by manufacturers. [EPA-HQ-OAR-2018-0276-0088-A1, p.5]

[16] It also is unclear whether EPA can compel non-U.S. manufacturers to provide “annual production volume” data. Without access to data on non-U.S. manufactured / certified aircraft, it
is highly questionable that the information EPA seeks will be at all useful in assessing technology trends, emission inventories, etc.

Organization: Bombardier Aviation

Annual Production / Production Volume

The proposed annual reporting requirement as requested in the NPRM requires that all civil aircraft manufacturers worldwide submit their respective annual production volume / rate of an

aircraft type produced in the previous calendar year. However, like all business aircraft manufacturers, Bombardier Aviation considers its annual production rate as confidential information, proprietary to the company. Regardless, Bombardier currently report its aircraft deliveries on a quarterly basis to several public and industry organizations. Bombardier requests that this publicly available aircraft delivery information be considered by the EPA for usage in its technical assessments, as an alternative. [EPA-HQ-OAR-2018-0276-0076-A1, p.2]

Organization: General Aviation Manufacturers Association (GAMA)

Most everything else EPA proposes to require from aircraft manufacturers in the annual production report is already publicly available. GAMA does not believe manufacturers should spend the amount of time needed to prepare these reports that will only duplicate efforts which have already been made. This also includes EPA's request for production volumes of aircraft sub-models, which ICAO's CO2DB does not contain. [EPA-HQ-OAR-2018-0276-0143-A1, p.3]

However, GAMA has serious concerns about requiring manufacturers to report information that is already publicly available as well as information that ICAO does not request in its CO2DB such as RGF and annual production volumes for airplane submodels. [EPA-HQ-OAR-2018-0276-0143-A1, p.3]

Organization: International Co-ordinating Council of Aerospace Industries Associations (ICCAIA)

With the need for having a single Standard of paramount importance to ICCAIA, this response will focus on the differences in reporting procedures that have been identified between the EPA Proposed Rule and the internationally accepted ICAO Annex 16 volume III. [EPA-HQ-OAR-2018-0276-0096-A1, p.1]

1030.90 Airplane production report to the EPA

ICCAIA notes that an annual requirement to submit data associated with CO_2 certification data is defined in section 1030.90 of the NPRM. The specific request for CO_2 certification data and associated aeroplane information are specified, listing the required manufacturer-specific information including company name, type certificate number, airplane name, airplane maximum take-off mass (MTOM) and reference geometric factor, fuel efficiency metric value and calculated GHG emissions standard, and number of airplanes produced during the reporting period. Described in the NPRM Section V.G. is ICAO’s development of the CO2 Certification Database (CO2DB). The CO2DB will also include much of the same information as the data requested from the EPA in 1030.90 and can be used by the EPA to “assess technology trends” as noted in the pre-amble of the NPRM. There are, however, two significant differences: the CO2DB will not include annual production numbers or Reference Geometric Factor (RGF). [EPA-HQ-OAR-2018-0276-0096-A1, p.2]

Related to the annual production numbers, ICCAIA suggests that the EPA use the ICAO CO2DB to satisfy their need to “access technology trends” since certified CO_2 metric value and MTOM data will be provided into the CO2DB voluntarily by the manufactures. Production information are not part of the CO2DB, however annual delivery numbers can often be determined from public data sources, are very similar to production numbers in most cases and offer better representation of fleet CO_2 contributions for inventory calculations. [EPA-HQ-OAR-2018-0276-0096-A1, p.2]

ICCAIA ultimately believes that EPA annual reporting is not required because the CO_2 certification metric value will only change when an airplane type certificate is changed to incorporate an airplane design change. This is typically not done each year on a particular airplane, but rather once every several years or more. With each type certificate change it is expected that airplane manufacturers will voluntarily report the new CO_2 metric value data to the CO2DB. Engine manufacturers have been voluntarily providing data to the engine emissions databank for many years and it is expected that airplane manufacturers will consistently voluntarily provide data as well. Thus, the CO2DB will be sufficient in providing the CO_2 metric value data in the same timely manner as airplane CO_2 certifications change, thus supporting EPA’s technology assessment. [EPA-HQ-OAR-2018-0276-0096-A1, pp.2-3]

ICCAIA also has concerns with the authority of the EPA to request the reporting of production numbers for non-US deliveries and operations. It is understandable for EPA to require production information for airplanes produced for delivery to US operators that will operate within the US as these airplanes require US certification. However, it is not clear that EPA has the authority to request production information for airplanes that are delivered to non-US operators when they are not operated within the US or carry a US registration. For example, an airplane manufactured in Germany and delivered to Vietnam never produces CO_2 emissions within the United States and the EPA at no point has any jurisdiction of that particular airplane serial number. ICCAIA is concerned that based on this authority uncertainty, production numbers may be reported inconsistently with the consequence of providing EPA with incorrect data. ICCAIA suggests it would be better for EPA to acquire production or delivery data from other publicly available sources. [EPA-HQ-OAR-2018-0276-0096-A1, p.3]

Please note that these comments report only to the ‘Information Collection Provisions’ aspects of the above-mentioned Proposed Rulemaking as these sections require an earlier response than the full 60-day deadline. [EPA-HQ-OAR-2018-0276-0096-A1, p.3]

Organization: National Business Aviation Association (NBAA)

Reporting Requirements

The request to submit annual production numbers is not included in the ICAO CO_2 standards. Should it be decided that this information is necessary, it can be obtained using public data sources. [EPA-HQ-OAR-2018-0276-0091-A1, p.2]

Response:

For the reasons provided in Section 9.2 of this document, the EPA not adopting the proposed reporting requirements at this time. Thus, the EPA is not responding to the public comments relating to the reporting of production volumes for the proposed reporting requirement. The EPA is making no judgement at this time regarding the validity of the assertions made in the comments but may consider these comments if, additional action is taken to establish a reporting requirement. This does not preclude the EPA from revisiting an airplane GHG reporting requirement in the future.

9.4. Other

Comments:

Organization: Aerospace Industries Association (AIA)

Secondly, for the vast majority of data the EPA is requesting, there is no advantage to be gained from this being reported on an annual basis rather than on a single occasion through the ICAO CO2DB. As the majority of data being requested is certification data, it would only need to be updated if changes took place which resulted in changes to an aircraft's type certificate and CO_2 re-certification. Within the ICR, the EPA itself notes that the requested data is unlikely to change from year to year. While the EPA has proposed that manufacturers will be able to indicate that there is no change from previous values submitted, AIA believes this is unnecessary as the EPA would be able to access updated data submitted by manufacturers to the CO2DB. [EPA-HQ-OAR-2018-0276-0087-A1, p.8]

Other comments and concerns on reporting provisions

In addition to our above concerns, AIA would like to note several other observations on aspects of the proposed reporting requirements:

• The NPRM acknowledges that ICR reporting requirements are renewed triennially. As the reporting requirements are included within the text of the proposed rule and AIA expects that this regulatory text would not be updated in the event an ICR expired, we are uncertain about what compliance with the regulation would be required under this scenario.

• The preamble to the proposed rule states that manufacturers' reports would be due February 28 of each year, starting in 2020 – before the adoption of any domestic regulations.

• The ICR does not indicate the level of detail that manufacturers would be required to report for aircraft and engine sub-model information. AIA assumes that the EPA is requesting the same level that would be included in the CO2DB, otherwise this would create further unnecessary burdens which have not been accounted for.

• The regulatory text in § 1030.90 indicates that manufacturers would be required to report information for exempt airplanes, but does not define this as those aircraft for which relief is sought under §1030.10 as a result of inability to meet the proposed standard. Failure to provide this definition could create the impression that data would be required for aircraft that are not within scope of the proposed rule. [EPA-HQ-OAR-2018-0276-0087-A1, p.10]

Organization: Airbus S.A.S. (Airbus)

Comment 11 – General Comment on New Part 1030 Introduction

Airbus appreciates and supports the adoption of ICAO Annex 16 Volume III standards in the new proposed regulation under 40 CFR part 1030, with the exception of §1030.90 and 1030.95 related to reporting requirements, for which concerns were expressed in previous comments submitted on September 21st, 2020 (see Appendix). [EPA-HQ-OAR-2018-0276-0148-A1, p.4]

Organization: California Air Resources Board (CARB)

IV. EPA should require more robust reporting.

EPA should require the proposed data reporting, and should expand its proposed reporting requirements to include the criteria and toxic pollutants emitted by aircraft during cruise cycle. Additionally, the proposed rule omits data reporting from smaller aircraft such as subsonic jets with maximum takeoff mass (MTOM) below 5,700 kg and subsonic propeller-driven aircraft with MTOM below 8,618 kg. Considering that these smaller aircraft contribute to about 11 percent of industry GHGs emissions,[95] EPA should consider including data reporting requirements for these aircrafts as well.

The proposed rulemaking indicates that the EPA does not expect a full dataset on all in-production airplanes until after the in-production applicability date of January 1, 2028.[96] EPA should consider an earlier reporting requirement for in-production airplanes, as the information would be essential to support emissions inventory development, technology assessment, and policy development. Similarly, EPA should consider requiring reporting for in-service aircraft. The reported data should be made available to other government agencies and the general public as well. [EPA-HQ-OAR-2018-0276-0169-A1, pp.20-21]

[95] 85 Fed. Reg. at 51,563.
[96] Id. at 51,576-77.

Organization: International Co-ordinating Council of Aerospace Industries Associations (ICCAIA)

ICCAIA ultimately believes that EPA annual reporting is not required because the CO_2 certification metric value will only change when an airplane type certificate is changed to incorporate an airplane design change. This is typically not done each year on a particular airplane, but rather once every several years or more. With each type certificate change it is expected that airplane manufacturers will voluntarily report the new CO_2 metric value data to the CO2DB. [EPA-HQ-OAR-2018-0276-0096-A1, p.2]

The proposed reporting requirement requests data for the “Complete airplane sub-model name”. It is not clear to ICCAIA the level of detail being requested. ICCAIA suggests that this would include the same airplane name level of detail as defined in the CO2DB to ensure consistency between the CO2DB and any reporting to EPA. [EPA-HQ-OAR-2018-0276-0096-A1, p.3]

Organization: International Council on Clean Transportation (ICCT)

EPA’s reporting requirement should be broadened to cover a wider range of greenhouse gases and aircraft.

We recommend that EPA develop more detailed reporting requirements for the standard, such as collecting individual specific air range (SAR) test points along with pressure altitudes and Mach Numbers under which those SAR points were evaluated. As written, EPA’s proposed rule would not require manufacturers to disclose the “optimal” conditions under which test flight data were collected. This could lead to reduced public confidence in the data, and make it difficult for EPA, researchers, or the general public to verify that the MV data collected is representative of real-world operations. Collecting this data will ensure greater transparency and accountability on the part of aircraft manufacturers. [EPA-HQ-OAR-2018-0276-0168-A1, p.5]

EPA should also consider collecting two other types of data to support future policy development. First, the agency should consider collecting manufacturer data regarding other pollutants besides CO_2, notably short-lived pollutants like cruise NOx and fine particulate matter linked to contrails and cirrus formation (aviation-induced cloudiness). Second, CO_2 data could be collected from airlines for their in-service aircraft and disclosed publicly for use by other government agencies, researchers, industry, and the general traveling public. This data, provided at the time of booking, would allow consumers to choose lower emitting itineraries and carriers for their travel. [EPA-HQ-OAR-2018-0276-0168-A1, p.5]

EPA should likewise expand the GHG reporting requirement to in-service aircraft and other GHGs, [EPA-HQ-OAR-2018-0276-0168-A1, p.6]

[The following comments were submitted as testimony at the virtual public hearing on September 17, 2020.]

we have thus far identified five areas of refinement in the proposed rule, namely that, four, that EPA's reporting requirement should be broadened to cover a wider range of greenhouse gases and engines;

Four, we recommend that the reporting requirement be strengthened. We recommend doing so by adding more detailed reporting requirements for CO_2, including individual specific air range test points along with the evaluation conditions under which those SAR points were evaluated. These additional requirements will ensure more accurate measurement of aircraft performance along with greater transparency.

Moreover, EPA should use this opportunity to collect manufacturer data regarding other pollutants besides CO_2, notably short-lived climate pollutants like cruise NOx and particulates linked to contrails and cirrus formation. $C0_2$ data could also be collected from in-service engines and disclosed publicly for use by other government agencies, researchers, industry, and the general traveling public.

Organization: National Association of Clean Air Agencies

III. NACAA's Recommendations

Finally, EPA includes in the proposal a requirement for annual reporting of the number of airplanes produced, airplane characteristics and test parameters. EPA should also require reporting of aircraft cruise CO_2 emission rates. The data collected from such reporting would provide important insights into regulatory compliance and also inform future policy decisions. [EPA-HQ-OAR-2018-0276-0177-A1, p.4]

Organization: South Coast Air Quality Management District (South Coast AQMD)

Expand the Proposed Reporting Requirements to Cover NOx and Technologies That Are Being Developed and Demonstrated

Finally, in anticipation of EPA's development of new aircraft NOx engine standards, we would recommend that EPA expand the proposed reporting requirements for aircraft engine manufacturers to include NOx certified levels as well as detailed information about technologies being developed and demonstrated along with their potential emission benefits. Such information would prove helpful in future regulatory actions, as well as increase awareness of developing technologies. [EPA-HQ-OAR-2018-0276-0144-A1, p.3]

Organization: Transport Canada, Civil Aviation (TCCA)

Representation 4

Section V/Details for the Proposed Rule, Subsection G/Annual Reporting Requirement, published in US Federal Register on August 20, 2020 [85 FR 51556] [EPA-HQ-OAR-2018-0276-0084-A2, p.2]

Comment

The ICAO Annex 16 Volume III does not have an "Annual Reporting Requirement" as proposed by the EPA. Suggest that the EPA and the FAA present such proposal to ICAO CAEP Members for a change to Volume III Appendix 1. Volume III was harmonized amongst Civil Aviation Authorities including EPA Members that were active throughout the CAEP/8 cycle. [EPA-HQ-OAR-2018-0276-0084-A2, p.2]

Suggested resolution

Transport Canada Civil Aviation (TCCA) recommends that the US EPA and the FAA present to ICAO CAEP Members a proposal for revising the ICAO Annex 16 Volume III in order that harmonization is maintained. [EPA-HQ-OAR-2018-0276-0084-A2, p.2]

Organization: Washington State Department of Ecology (Ecology)

Specifically, the rule should:

- Add reporting of aircraft cruise CO_2 emission rates to inform regulatory compliance and future policy decisions. [EPA-HQ-OAR-2018-0276-0140-A1, p.5]

Response:

For the reasons provided in Section 9.2 of this document, the EPA not adopting the proposed reporting requirements at this time. Thus, the EPA is not responding to the public comments relating to any other aspects of the proposed reporting requirement. The EPA is making no judgement at this time regarding the validity of the assertions made in the comments but may consider these comments if additional action is taken to establish a reporting requirement. This does not preclude the EPA from revisiting an airplane GHG reporting requirement in the future.

10. Test and Measurement Procedures

Comments:

Organization: General Electric Company (GE)

Additionally, GE commends EPA for focusing the proposed standards on fuel efficiency. EPA's proposal appropriately adopts ICAO's CO_2 emissions test procedures, which are based on measuring the performance of the whole airplane rather than the airplane engines alone. The ICAO standards account for three airplane performance characteristics that determine the overall CO_2 emissions: aerodynamics, airplane weight, and engine propulsion technologies. Rather than focusing on a single chemical compound, the ICAO CO_2 emissions test procedures measure fuel efficiency based on how far an airplane can fly on a single unit of fuel at the optimum cruise altitude and speed. This flexible standard encourages innovative methods for improving airplane fuel efficiency [EPA-HQ-OAR-2018-0276-0157-A1, p.4]

Organization: Transport Canada, Civil Aviation (TCCA)

Representation 2

1030.25 (RGF) [EPA-HQ-OAR-2018-0276-0084-A2, p.2]

Comment

Should the regulation also include the figures from An16 Vol. III App 2 for clarity in 1030.25, to ensure an applicant understands the definition of RGF? [EPA-HQ-OAR-2018-0276-0084-A2, p.2]

Suggested resolution

Include 2 figures to describe RGF as shown in ICAO An16 Vol. III, App2. [EPA-HQ-OAR-2018-0276-0084-A2, p.2]

Response:

The EPA acknowledges GE's comments in support of adopting ICAO's test procedures for this rule.

The EPA does not believe there is a need to include the RGF figures from Annex 16 Volume III Appendix 2 into the domestic regulations. The figures TCCA is referencing simply provide a visual depiction of the method for determining RGF, which is clearly explained in the final regulatory text. Further, the EPA notes that the test and measurement procedures contained in Annex 16 Volume III are incorporated by reference in the regulatory text, and further that the regulatory text specifically refers the reader to the location of the Annex where these figures reside.

11. Controlling Two of the Six Well-Mixed GHGs

Comments:

Organization: Airlines for America (A4A) and Air Line Pilots Association, International (ALPA)

A necessary predicate for the Agency's action here was its 2016 Finding That Greenhouse Gas Emissions From Aircraft Cause or Contribute to Air Pollution That May Endanger Public Health and Welfare (the "2016 Findings").20 There, the Agency found that "[p]ursuant to CAA section 231(a)(2)(A) . . . emissions of the six well-mixed greenhouse gases (GHGs) from certain classes of aircraft engines used in certain types of aircraft . . . contribute to air pollution that may reasonably be anticipated to endanger the public health and welfare of current and future generations."21 The Agency was careful to acknowledge that of the "six well-mixed" GHGs, aircraft engines covered by the findings emit only CO_2 and N_2O, a fact it emphasizes in the present preamble as well.22 GHG emissions from aircraft engines are comprised almost entirely of CO_2, making up 99 percent of such emissions, while N_2O comprises less than one percent.

Of critical importance in this context, however, is that emissions of both CO_2 and N_2O are directly and linearly related to fuel burn, and thus, the fuel efficiency of the aircraft as whole. This is also confirmed, for example, in EPA's Inventory of Greenhouse Gas Emissions and Sinks: 1990-2018, which relies on data evaluating jet fuel combustion and applies emission factors (grams emitted / kilograms of fuel burned) to determine CO_2 and N_2O emissions from commercial aircraft. As a result, we agree with EPA's conclusion that the ICAO CO_2 Metric "as a measure of airplane fuel efficiency" is a reasonable "surrogate for GHG emissions from covered airplanes" . . . "because the fuel efficiency metric controls emissions of both CO_2 and N_2O."23 In these circumstances, EPA may adopt the ICAO CO_2 Aircraft Standards, which regulate aircraft fuel efficiency through the ICAO CO_2 Metric, as aircraft engine emission standards, because of the direct, linear connection between the GHG emissions it is regulating (CO_2 and N_2O) from aircraft engines and the fuel efficiency of the aircraft as a whole. Thus, we agree that EPA may exercise the authority conferred by Section 231 of the Clean Air Act to regulate GHG (CO_2 and N_2O) emissions from aircraft engines by adopting standards equivalent to the ICAO CO_2 Aircraft Standards.24 [EPA-HQ-OAR-2018-0276-0161-A1, pp.4-7]

Organization: Center for Biological Diversity, Earthjustice, on behalf of the Sierra Club and Friends of the Earth, and the Natural Resources Defense Council (NRDC)

These test procedures do not quantify emissions of any single chemical compound. Instead, they "measure fuel efficiency based on how far an airplane can fly on a single unit of fuel at the optimum cruise altitude and speed."[61] Following ICAO's approach, EPA proposes to use "airplane fuel efficiency as a surrogate for GHG emissions from covered airplanes" and "adopt [Maximum Takeoff Mass, or MTOM, thresholds] as a correlating parameter to be used when setting emissions limits."[62] [EPA-HQ-OAR-2018-0276-0150-A1, pp.8-9]

[61] Id. at 51,562.
[62] Id. at 51,565.

Organization: International Co-ordinating Council of Aerospace Industries Associations (ICCAIA)

The first inconsistency identified deals with one of the intended use of this proposed rule, as explained in the Summary section: Extract: "Airplane engines emit only two of the six well-mixed GHGs, CO_2 and nitrous oxide (N_2O). Accordingly, EPA is proposing to use the fuel-efficiency-based metric established by ICAO, which reasonably serves as a surrogate for controlling both the GHGs emitted by airplane engines, CO_2 and N_2O." While ICCAIA notes that the EPA's metric does not differ from that used within the ICAO standard and there is no proposal to introduce a separate metric for N_2O

emission. ICCAIA would like to highlight that the intention of ICAO Annex 16 Volume III aims is to reduce only aeroplane CO_2 emissions – not N_2O emissions. [EPA-HQ-OAR-2018-0276-0175-A1, p.2]

Some extracts from the ICAO fact sheet on the aircraft CO_2 emissions metric system provide more details: “The CO_2 metric system is a measure of aircraft fuel burn performance and therefore represents the CO_2 emissions produced by an aircraft.” and,

“Based on the CO_2 metric system, the CO_2 Standard will aim to reduce aircraft CO_2 emissions by encouraging the integration of fuel efficient technologies into aircraft design and development.” [EPA-HQ-OAR-2018-0276-0175-A1, p.2]

Response:

Each of the three commenters on this topic correctly describe the EPA's proposed approach of treating the fuel efficiency metric of ICAO as an appropriate means of controlling CO_2 and N_2O emissions, which in turn are the only two of the six "well-mixed GHGs" emitted by airplanes. None of these commenters challenge the EPA's proposed approach. The EPA agrees with ICCAIA's observation that ICAO's primary stated intent for its fuel-efficiency measure is to focus on CO_2 and that ICAO does not mention N_2O in that context. However, the EPA believes that the fact that fuel-efficiency also scales with N_2O is not inconsistent with ICAO's metric. Also, in this rulemaking it is appropriate to adopt ICAO's fuel-efficiency-based metric that will control both the GHGs emitted by airplane engines, CO_2 and N_2O.

12. Aggregate GHG and Fuel Burn Methods and Results

12.1. Full Flight Emissions

Comments:

Organization: Quiet Skies Coalition

The impact is global not just local. The AEDT model truncates emissions.

The model calculates what are considered the most harmful effects of emissions on ground-level air quality impacts in an area affected by aircraft flying at 3,000 feet and below. For criteria and toxic pollutants, this is an appropriate way to measure these emissions. However, using this method which covers a 10 minute landing pattern and a 2 minute takeoff is not appropriate for GHG which is not just a local, but also a global threat. [EPA-HQ-OAR-2018-0276-0081-A1, p.1]

It appears none of the data provided is correct because 1) truncated data; 2) divergence on calculations/methodology; 3) incomplete data.

Because the AEDT model only calculates a small fraction of the overall aircraft operation emissions, 90% of the impact on the globe from aviation GHG is left out and never shows up anywhere. The real figures are a mind blower and at many airports in the US would create a much greater concern from public, agencies, government and academia if fully disclosed. Aviation GHG is, at many airports in the US, rivalling those of a coal fired power plant, which to many states represent the greatest threat to climate. Directly related to that concern, many coal fired power plants in the US have been targets of legal action, slated for closure or conversion to alternate fuel. [EPA-HQ-OAR-2018-0276-0081-A1, p.1]

To provide an example of the variance between airports, agencies and reality, the airport provided a figure of 5.4 million metric tons of CO_2 for 2015 jet fuel use and operations and fuel use increased rapidly from 2015 to 2019 due to introduction of Delta Hub, larger aircraft and ever increasing operations that began in 2014. However, in 2017 EPA ran the AEDT model for CO_2 from Sea-Tac

Airport and provided an annual value of 1,195,637 tons per year. An airport consultant provided a figure of 396,306 for 2016. The variance is too great to account for operational increases between 2016 and 2017. The real figure for 2017 is above 6 million tons per year based on fuel use. In 2018, jet fuel use accounted for 6.6 million tons per year of CO_2. This figure would be higher for 2019. Since operations are climbing and fuel use is rising, as has been the trend for 50 years, it is doubtful that new emission standards will have any effect on reducing overall aviation GHG. [EPA-HQ-OAR-2018-0276-0081-A1, pp.1-2]

Response:

The commenter seems to raise concerns for emissions modeling that has been done outside the scope of this rulemaking. The analysis performed by EPA in support of this rulemaking assessed the GHG emissions of the full flight, not just LTO (Landing and Takeoff) or the portion of flight that is below 3000 feet.

12.2. Baseline CO_2 Emissions

Comments:

Organization: Chesapeake Bay Foundation, Inc. (CBF)

A. The Proposed GHG Emission Standards Do Nothing to Curb Rising Aircraft GHG Emissions.

Section VI of the Proposed Rule illustrates the baseline EPA used in creating the proposed standards. This baseline looks different than the one used by ICAO because EPA incorporates anticipated technology improvements whereas ICAO does not.[45] [EPA-HQ-OAR-2018-0276-0093-A1, p.6]

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[45] Proposed Rule, 85 FR at 51,582.

Response:

This commenter is correct that the EPA analysis considers a continuous improvement baseline and projects no emissions reductions from baseline. See Preamble, section V.B and V.C for discussions of the baseline and projected effects of stringency on GHG emissions.

12.3. Projected Fuel Burn

Comments:

Organization: Anonymous Public Comment 22

There are non-harmless, procedural defects for this proposed rule under Section 307(d) of the Clean Air Act:

In contravention of Section 307(d)(3) of the Clean Air Act and EPA's Scientific Integrity Policy, EPA relies extensively on the proprietary and seemingly non-peer-reviewed PIANO model for fuel burn and greenhouse gas emission estimates (85 FR 51579). [EPA-HQ-OAR-2018-0276-0171 p. 1]

Response:

PIANO is commercially available software that has been tested and benchmarked against many other state-of-the-art aircraft performance modeling tools. It is recognized by ICAO as one of a few officially approved tools for ICAO standard setting purposes[8]. Further, the emission inventory modeling for the NPRM has been peer-reviewed. Details information about the software can be found at www.piano.aero (last accessed March 16, 2020).

13. Technological Feasibility and Economic Impacts

13.1. Market Considerations

Comments:

Organization: Aerospace Industries Association (AIA)

In addition, the EPA's analyses understandably do not take into account the recent financial impact of the COVID-19 pandemic and the current financial health of the aerospace manufacturing industry, how this may impact product development resources, and implications of a production cut-off for in-service aircraft before more fuel efficient options are available for those market segments. The EPA should therefore consider these potential impacts on different passenger and freight market segments when setting the final rule. [EPA-HQ-OAR-2018-0276-0167-A1, p.6]

Organization: Anonymous Public Comment 22

EPA's accompanying technical support document and analysis suffers from a number of defects, many of which were exposed by interagency concerns:

EPA's analysis virtually ignores COVID-19, despite the dramatic effects on the international aviation sector and the likelihood of technology adoption from this global pandemic. [EPA-HQ-OAR-2018-0276-0171 p. 1]

Organization: Arlington Chamber of Commerce

Commercial airplane manufacturing accounts for nearly 8% of total U.S. exports and supports more than 1 million U.S. jobs. Approximately 75% of the aircraft built here are sold overseas. Aviation also contributes significantly to global economic activity and employment. [EPA-HQ-OAR-2018-0276-0139-A1, p.1]

Organization: Davis, Lauren and Nguyen, Johnnie Q.

ECONOMY One area of concern we found worthwhile to mention is the effect that this proposed rule would have economically. Boeing, the world's largest aerospace company and leading manufacturer of commercial jetliners[1], builds commercial airplanes that are modeled as the "Boeing 737" (a type of airplane). Boeing 737 models have a maximum takeoff weight (MTOW) of 110,000lbs[2]. As a result, all of Boeing 737 models are affected by the proposed rule change as the rule change affects all aircrafts with an MTOW above 5,700 kilograms (~12566.35lbs).

A question worthwhile asking is if this proposed rule change is being made with good. Due to the COVID-19 pandemic, the airline industry is struggling.[3] United and American Airlines just furloughed over 32,000 employees.[4] There is valid concern that implementing and imposing these new regulations

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[8] ICAO, 2016: Doc 10069 – Report of the Tenth Meeting, Montreal,1-12 February 2016, Committee on Aviation Environmental Protection, CAEP 10, 432pp., pages 271 to 308, is found on page 27 of the ICAO Products & Services English Edition 2020 Catalog and is copyright protected. For purchase available at: https://www.icao.int/publications/Pages/catalogue.aspx (last accessed March 16, 2020). The summary of technological feasibility and cost information is located in Appendix C (starting on page 5C-1) of this report

could create more hardship on airlines that are attempting to bounce-back from their loss of revenue in the pandemic. [EPA-HQ-OAR-2018-0276-0145-A1, pp.2-3]

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[1] https://www.boeing.com/company/
[2] https://en.wikipedia.org/wiki/Boeing_737
[3] https://www.cnbc.com/2020/08/16/a-flood-of-job-losses-looms-as-airlines-industry-struggle-in-coronavirus-pandemic.html
[4] https://www.npr.org/sections/coronavirus-live-updates/2020/10/01/919029571/united-and-american-airlines-tell-32-000-employees-theyre-now-on-furlough

Organization: Environmental Defense Fund

VI. EPA Must Set Stringent Standards In Order to Drive Development of Long-Lived Capital Stock

Aircraft, like power plants, have a lifecycle measured in decades. Immediately prior to the disruption of the Covid-19 pandemic, U.S. airlines were expected to invest in over 9,000 new aircraft, and globally airlines were expected to invest in over 44,000 new aircraft in the coming years.[76] Rapid action to set stringent standards for these long-lived investments is critical. The resources required to design a new jet engine are considerable – historically, up to a decade and investments in the billions have been needed.[77] As EPA proceeds with its rulemaking, it is essential to set stringent standards to drive new technologies to reduce GHG emissions and drive new technologies in an industry characterized by long-lived capital stock. [EPA-HQ-OAR-2018-0276-0158-A1, p.13-14]

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[76] Boeing, Commercial Market Outlook, 2019-2038, available at https://www.boeing.com/commercial/market/commercial-market-outlook/#/interactive-forecast (last visited Sept. 11, 2020).
[77] See 80 Fed. Reg. 37792, n.211.

Organization: Federal Express Corporation

I. Overview of Operations and Industry Leadership in Sustainability

FedEx Express is the express transportation subsidiary of FedEx Corporation, providing time definite, door-to-door transportation services to more than 220 countries and connecting markets that comprise more than 99 percent of the world's gross domestic product. As an FAA-certificated air carrier, at the core of our business, we enable economic growth for customers through market access and innovation, relying on our 679 aircraft and over 5,000 crewmembers to serve over 650 airports around the world. [EPA-HQ-OAR-2018-0276-0178-A1, p.1]

Given our global reach and purpose-driven mission, we are committed to connecting the world responsibly and resourcefully, relying on a simple, three-pronged approach to sustainability: Reduce, Replace, Revolutionize. At the core of this approach is our commitment to replacing and modernizing our air network. Since 2005, we have reduced aircraft emissions intensity by 24%. We have achieved this by optimizing fuel use in our flight operations, replacing and modernizing our fleet with more efficient aircraft, and revolutionizing our operations by investing in alternative fuels and industry-leading technologies. These efforts have contributed to an approximately 40% reduction in CO_2 emissions intensity across the enterprise from FY09 to FY19.[1] [EPA-HQ-OAR-2018-0276-0178-A1, p.1-2]

One of the ways FedEx Express has accomplished this feat is by optimizing fuel use. In FY19 alone, FedEx Fuel Sense programs saved more than 109.6 million gallons of jet fuel. This is equivalent to the power needed by the entire FedEx aircraft fleet for almost 34 days. These fuel savings also avoided more than 1,054,418 metric tons of CO_2 emissions, an increase of 15.6% over FY18 savings. [EPA-HQ-OAR-2018-0276-0178-A1, p.2]

Aircraft fleet modernization plans play a fundamental role in achieving emissions reduction goals. FedEx Express maintains one of the world's largest, fastest, and most innovative all-cargo aircraft fleets. Our aircraft modernization strategy resulted in over 140,587,382 gallons of fuel savings, avoiding 1,355,852 metric tons of CO_2 emissions in FY19 alone, a 28% increase in avoided emissions over the previous year. We have been working to reduce aircraft emissions since 2005, our baseline year, and announced our first reduction goal of 20% by 2020 in 2008. Three years later, in 2011, we revised this target upwards to 30%. In September 2019, we announced the retirement of the remaining twenty (20) MD-10-10 aircraft over FY20 and FY21. In the second quarter of FY20, FedEx Express permanently retired ten (10) Airbus A310-300 aircraft and twelve related engines. These aircraft have been replaced by the Boeing 777F and 767F. Both the 777F and 767F aircraft are more fuel efficient and provide enhanced reliability and operational flexibility. The Boeing 767Fs alone have contributed significantly to FedEx Express' fuel efficiency and emissions reductions, as they are 30% more fuel efficient than the MD-10s they have replaced. [EPA-HQ-OAR-2018-0276-0178-A1, p.2]

FedEx remains committed to testing and developing new technologies for future application as well. We expect to take our first delivery of sustainable aviation fuels from RedRock Biofuels in 2021, a necessary first step to meeting our goal to have 30% of FedEx Express' jet fuel sourced by biofuels by 2030. Further, in 2018, we continued our testing with Boeing by flying the 777F ecoDemonstrator, a flying testbed to improve the environmental performance and safety of future airplanes. These continuous, long-term collaborative industry efforts are essential to developing technologies that promote sustainability while ensuring a continued safe operation. [EPA-HQ-OAR-2018-0276-0178-A1, p.2]

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1 See "Multiplying Opportunities: FedEx 2020 Global Citizenship Report," available at www.fedex.com/sustainability (May 7, 2020).

Organization: General Aviation Manufacturers Association (GAMA)

GAMA appreciates that EPA recognizes these proposed standards would allow U.S. manufacturers of covered airplanes to remain competitive in the global marketplace. [EPA-HQ-OAR-2018-0276-0143-A1, p.2]

Organization: Office of the Comptroller of New York City, et al.

Further, the rule will not drive necessary improvements and associated investment in technologies, aircraft design and operational efficiencies, thereby undermining the competitiveness of the U.S. aviation industry in a carbon constrained world. [EPA-HQ-OAR-2018-0276-0164-A1, p.1]

Strong regulations are necessary to drive investment in technologies that will both ensure emissions reductions and enhance the global competitiveness of the U.S. aviation sector by spurring improvements in fuel efficiency. However, EPA's own analysis finds that, under its proposed standard, CO_2 emissions would increase by 40% - 53% by 2040.[5] Further, given that the average aircraft delivered in 2019 would meet the proposed 2028 standard, the standard evidently provides little incentive to invest in efficiency improvements.[6] [EPA-HQ-OAR-2018-0276-0166-A1, p.2]

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[5] A recent analysis concluded that stabilizing carbon dioxide emissions at 2020 levels (ICAO standard) does not correspond to a stabilized climate impact due to the contribution of radiative forcing and the fact that carbon dioxide accumulates at a faster rate than it can be removed by ICAO standards.
[6] https://theicct.org/publications/fuel-burn-new-comm-aircraft-1960-2019-sept2020

Organization: Ohio Chamber of Commerce

Commercial airplane manufacturing accounts for nearly 8% of total U.S. exports and supports more than 1 million U.S. jobs. Approximately 75% of the aircraft built here are sold overseas. Aviation also contributes significantly to global economic activity and employment. Prior to the pandemic, aviation flew over 4 billion people and carried nearly $7 trillion in goods every year while supporting 65.5 million jobs. [EPA-HQ-OAR-2018-0276-0116-A1, p.2]

Implementing this regulation will also help ensure that older, less efficient airplanes are replaced by newer, more efficient models, thereby enabling aviation to continue growing sustainably and responsibly. [EPA-HQ-OAR-2018-0276-0116-A1, p.2]

Today's aircraft are well over 70% more efficient than the first jets. Continued investment by manufacturers in new technologies will further improve efficiency and reduce emissions. [EPA-HQ-OAR-2018-0276-0116-A1, p.2]

Organization: Ohio Manufacturers' Association (OMA)

Commercial airplane manufacturing accounts for nearly 8% of total U.S. exports and supports more than 1 million U.S. jobs. Approximately 75% of the aircraft built here are sold overseas. Aviation also contributes significantly to global economic activity and employment. Before the pandemic, the aviation industry flew more than 4 billion people and carried nearly $7 trillion in goods every year while supporting 65.5 million jobs. [EPA-HQ-OAR-2018-0276-0136-A1, p.2]

Implementing this regulation will also help ensure that older, less efficient airplanes are replaced by newer, more efficient models, thereby enabling aviation to continue growing sustainably and responsibly. [EPA-HQ-OAR-2018-0276-0136-A1,p .2]

Today's aircraft are well over 70% more efficient than the first jets. Continued investment by manufacturers in new technologies will further improve efficiency and reduce emissions. [EPA-HQ-OAR-2018-0276-0136-A1, p.2]

Organization: U.S. Chamber of Commerce

Economic Rationale

The global economic impacts of the COVID-19 pandemic have been especially pronounced for the aviation sector. Airline traffic is down significantly compared to pre-pandemic levels and is not expected to rebound until the pandemic is fully over.

Given the devastating, continued impact of COVID-19 on the U.S. aviation industry, it would be appropriate for EPA to adopt the standards as proposed to ensure the U.S. aviation manufacturing industry can compete globally, while also ensuring the final rule affords sufficient flexibility to address the needs of U.S. domestic operations, particularly express freight operations, and assure that the standards are implemented in a cost-effective manner, as we continue our economic recovery from COVID-19. Such action would not only be consistent with the U.S. obligations under ICAO, but also ensure compliance with EPA's obligations under section 231 of the Clean Air Act that requires EPA to consider noise, safety, and cost in developing and phasing-in aircraft standards.

Commercial airplane manufacturing accounts for nearly 8% of total U.S. exports and supports more than 1 million U.S. jobs. Approximately 75% of the aircraft built in the U.S. are sold overseas. Aviation also contributes significantly to global economic activity and employment. Before the pandemic, aviation flew more than 4 billion people and carried nearly $7 trillion in goods every year while supporting 65.5 million jobs. Implementing this regulation would help ensure that older, less efficient airplanes are replaced by newer, more efficient models, thereby enabling aviation to continue growing sustainably and responsibly. [EPA-HQ-OAR-2018-0276-0142-A1, pp.1-2]

[The following comments were submitted as testimony at the virtual public hearing on September 17, 2020.]

Implementing this regulation will help ensure that older, less efficient airplanes are replaced by newer, more efficient models, as several other speakers have mentioned, thereby enabling aviation to continue growing sustainably and responsibly.

In conclusion, when finalized, this critical rule promises to provide equipment manufacturers with predictability, a critical component of getting back on their feet and reducing emissions in this most cost-effective way while maintaining their competitiveness in world markets.

Organization: Virginia Chamber of Commerce

Commercial airplane manufacturing accounts for nearly 8% of total U.S. exports and supports more than 1 million U.S. jobs. Approximately 75% of the aircraft built here are sold overseas. Aviation also contributes significantly to global economic activity and employment. Before the pandemic, aviation flew over 4 billion people and carried nearly $7 trillion in goods every year while supporting 65.5 million jobs. [EPA-HQ-OAR-2018-0276-0114-A1, p.1]

Implementing this regulation will also help ensure that older, less efficient airplanes are replaced by newer, more efficient models, thereby enabling aviation to continue growing sustainably and responsibly. [EPA-HQ-OAR-2018-0276-0114-A1, p.1]

Today's aircraft are well over 70% more efficient than the first jets. Continued investment by manufacturers in new technologies will further improve efficiency and reduce emissions. [EPA-HQ-OAR-2018-0276-0114-A1, p.2]

Response:

See section IV.I.1 of the Preamble for the EPA's response to these comments on stringency of the GHG standards, and see sections VI.A, VI.B., VI.C, and VI.E of the Preamble and Section 2 of the TSD for detailed discussions on market considerations and technological feasibility in setting the GHG standards.

13.2. Business as Usual Technology Improvement

Comments:

Organization: Airlines for America (A4A) and Air Line Pilots Association, International (ALPA)

C. EPA's Methodology for Assessing Aircraft Technology Significantly Underestimates of the Both the Costs and Benefits Associated with the GHG Aircraft Engine Standards

As discussed at length above, the ICAO/CAEP process for developing, considering and approving standards such as the ICAO CO_2 Aircraft Standards is rigorous and exhaustive, ensuring that any such standards meet the CAEP TOR. We again underscore that ICAO/CAEP's assessment of each of the criteria it must consider under the TOR (technical feasibility, economic reasonableness, environmental benefit and the potential interdependencies with noise and other emissions) is directly related to the decisions that EPA (and FAA) must make when establishing aircraft emission standards under Section 231 of the Clean Air Act. The current Administrative Record contains information, data and analyses that directly support and describe ICAO/CAEP's decisions sufficient to support the adoption of the ICAO CO_2 Aircraft Standards into U.S. law as EPA has proposed in this EPA GHG Aircraft Engine Standards rulemaking. Thus, while in this section we make clear our reasons for disagreeing with the "different approach" EPA used for assessing aircraft technologies – and thus, its assessment of the costs and benefits attributable to the standard – we emphasize that the Administrative Record is sufficient to support the expeditious finalization of the GHG Aircraft Engine Standards the Agency proposes.[35]

To assess aircraft technology EPA relied on an analysis completed by its contractor, ICF. EPA sums up the approach ICF used as follows:

In assessing the airplane GHG rule proposed in this action . . . ICF . . . was able to use a different approach for technology responses. ICF based these responses on technology that would be available at TRL 8 by 2017 and assumed continuous improvement of CO_2 metric values for in-production and indevelopment (or on-order) airplanes from 2010 to 2040 based on the incorporation of these technologies onto these airplanes over the same timeframe. . . . The ICF approach differed from ICAO's analysis for years 2016 to 2020 and diverged even more for years 2021 and after. . . . ICF was able to differentiate between airplane GHG technology improvements that would occur in the absence of the proposed standard (business as usual ["BAU"] improvements) compared against technology improvements/responses that would be needed to comply with the proposed standard.[36]

As described by EPA, the "short- and mid-term methodology" used by ICF to assess aircraft technologies through 2029 involved evaluating "potential GHG reduction[s]" each technology "could" achieve, passing each technology "through technical success probability" and "commercial success probability" screenings, to ultimately "generate GHG emission reduction projections by technology and by airplane model."[37] EPA reports that ICF modestly refers to this as its "expected value methodology" which provides a "projection of the annual fuel efficiency metric value improvement."[38] ICF terms its "long-term methodology" a "parametric approach," which, as used by ICF, depends on an even greater degree of speculation. Here, ICF predicates its approach on its ability to "predict that around the 2030 timeframe a new round of technology implementation will begin"[39] then extrapolates the progress of that implementation using two "prospect scoring indices" – a "fuel burn reduction prospect scoring index" and a "long-term market prospect scoring index" – to assign what it calls a "metric value improvement acceleration index" to each technology.

In short, the approach described above amounts to prognostication rather than analysis. As noted above, it is critically important in the context of setting aircraft and aircraft engine standards to ensure that the safety of air transportation is maintained at all times. This imperative is embedded in ICAO/CAEP's "technological feasibility" TOR, which requires aircraft and aircraft engine standards to be based on technologies that meet TRL8, ensuring that standards cannot and will not compromise air safety. The ICF/EPA predictive approach is not consistent with ensuring "technological feasibility" in that, for purposes of evaluating the effect of the GHG Aircraft Engine Standards, it assumes the emergence of technologies and that they will mature such that they attain TRL8 at some point in the future, regardless of any number of conditions that could prevent that. Moreover, the approach assumes that technologies, in some sense, are capable of being inserted into aircraft production at a constant rate over time. This is contrary to the practical reality, in which advances in aviation technology are implemented in step changes, coming only intermittently over time – usually in 10-to-15 year cycles.

The approach taken by ICF, assuming technology change and insertion as "business as usual," in turn assumes that the standards will be achieved without cost to industry, ignoring the billions of dollars required for research and development, testing and demonstration borne by airframe and engine manufacturers to bring the necessary technologies to market safely, integrated across the fleet. It also ignores the fact that airlines will need to spend billions to acquire the technologies in the form of new aircraft and aircraft engines. The other side of this coin is that the approach also assumes the large reductions in GHG emissions these technologies would enable will be realized as a matter of course. It is on the basis of this erroneous approach that EPA concludes that there will be no "emissions reductions associated with the proposed GHG regulations" and no costs "of engineering and integration, testing (flight and ground testing) and tooling, capital equipment, and infrastructure."[40]

EPA's "logic" here is apparently that the costs and associated emissions reductions are not "caused by" its GHG standards. In this sense, EPA's position appears to be that for costs and benefits to be attributable to a standard, the standard must be aggressively technology-forcing and/or beyond that which was agreed at ICAO. However, as EPA repeatedly affirms, aircraft and aircraft engines that do not comply with these standards will not be permitted to operate internationally and, therefore, will not be marketable. For example, EPA affirms "[a]irplane and airplane engine manufacturers make business decisions and respond to the international market by designing and building products that conform to ICAO's international standards."[41] In fact, EPA itself explicitly acknowledges that "based on the manufacturers' expectation that ICAO standards will be implemented globally, the EPA anticipates nearly all affected airplanes to be compliant by the respective effective dates for new type designs and for inproduction airplanes."[42] This rightly acknowledges the reality that the manufacturers' expectations and actions in the marketplace are plainly related to the existence of standards, which, in this case, were adopted at the international level over three years ago. Stated differently, the costs and benefits of the standards are appropriately attributable to the standards because manufacturers have no choice but to comply with the standards (and airlines have no choice but to acquire and operate compliant aircraft and aircraft engines).

We are proud of the aviation sector's long history of improving aircraft and aircraft engine technologies that have enabled us to greatly reduce our impact on the environment and the cost of air travel for the public. We also anticipate and are hopeful that this progress will continue into the coming decades. As we emphasized at the outset of these comments, we have a strong record of improving our environmental performance as we have grown and supported the expansion of our global, national and local economies. Achieving this record has required dedication, commitment, and investment of hundreds of billions of dollars. Extending our record into the future will require continual rededication and recommitment to making the investments and taking the actions necessary to achieve our environmental goals and meet the GHG Aircraft Engine Standards proposed here. It is simply incorrect to conclude there are or could be no costs or benefits attributable to the standards.

As noted, the approach ICAO took in assessing the technologies needed to meet the standards and the costs and benefits associated with implementation of those technologies are well established in the Administrative Record for this rulemaking. While we are not calling for EPA to redo its analysis, we urge EPA to acknowledge the effect of the approach taken in the ICF analysis, i.e., that it should be viewed as highly presumptive in terms of technology development and highly conservative in terms of resulting cost and benefit determinations. [EPA-HQ-OAR-2018-0276-0161-A1, pp.12-15]

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[35] As noted above, EPA provides extensive information in its Draft TSD regarding ICAO/CAEP's analysis, including the costs and benefits of the ICAO CO_2 Standards as evaluated by ICAO/CAEP. See Section 2.5.2 ("providing a comparison of the NRC [non-recurring costs] in our analysis to the NRC costs in the CAEP analysis"); Section 2.6 ("For a further description of the rationale on the fuel savings difference in the EPA analysis results and CAEP results, see the earlier discussion on costs in this chapter [2]. In addition, refer to Chapter 5 which further discusses the differences between the EPA and CAEP methods and assumptions for modeling emission reductions and fuel savings.") (footnote omitted)). Additional information and detail on ICAO/CAEP's analysis has been made publicly available by EASA in its Notice of Proposed Amendment 2017-01 (See especially, Section 6.3.4 – Information on the methodology and data used to develop the new aeroplane CO_2 emissions Standard.).
[36] 85 Fed. Reg. at 51585 (emphasis added).
[37] 85 Fed. Reg. at 51585 (emphasis added)
[38] 85 Fed. Reg. at 51585 (emphasis added)
[39] ICF, Aircraft CO_2 Cost and Technology Refresh (September 30, 2018) at 48. We note that EPA decided to characterize ICF's "prediction" as a "projection" in its preamble. 85 Fed. Reg. at 51586.
[40] 85 Fed. Reg. at 51558 and 51587. The only cost EPA foresees is the "small cost associated with the proposed annual reporting requirement," which EPA asserts is not attributable to the GHG Aircraft Engine Standards, but the independent reporting requirement and which, as noted above – we strongly oppose. Further, although EPA's adoption of these standards triggers the non-discretionary duty for FAA, pursuant to Section 232 of the Clean Air Act, to develop certification requirements and regulations to enforce the standards, EPA dismisses these costs as attributable solely "to the FAA rulemaking" "to enforce compliance to these standards." 85 Fed. Reg at 51587.

[41] 85 Fed. Reg. at 51584 (emphasis added).
[42] 85 Fed. Reg. at 51558 (emphasis added).

Organization: Airlines for America (A4A)

[The following comments were submitted as testimony at the virtual public hearing on September 17, 2020.]

> Third, we do have some concerns about the proposal but believe that these can be constructively addressed as the rule is finalized. For example, we believe that EPA's approach in assuming a certain evolution in technology is short shrift to the overriding safety and reliability mandates and also assumes both the cost and benefits of the proposed standards or it underestimates both the costs and benefits of the proposed standards. An analysis that followed the approach agreed and applied in the ICAO process would affirm the benefits of the standards and strengthen the justification for incorporating those standards into U.S. law.
>
> We present our concerns in more detail in our written comments. However, we want to make clear that we believe these concerns can be reasonably addressed and do not undermine the validity of the proposal to adopt the ICAO CO_2 standards into U.S. law.

Organization: Aerospace Industries Association (AIA)

> AIA does disagree with some aspects of the analysis the EPA has used to inform its assessment of future aircraft technologies' contributions to reductions in greenhouse gas emissions. The EPA's approach does not take into the account the development cycles of new technologies, and the economic and technological considerations that will ultimately determine whether these are incorporated into aircraft platforms that are purchased by operators. As a result, this analysis has led the EPA to underestimate the extent to which the standard will drive improvements in aircraft efficiency and therefore the analysis also underestimates the costs for both aircraft manufacturers and operators, and the standard's environmental benefit. AIA endorses the more detailed comments on this matter submitted by Airlines for America in their response to the NPRM. While AIA disagrees with the EPA's approach to conducting this analysis, this does not negate the benefits associated with domestic adoption of these standards nor the rationale for the EPA finalizing these arrangements. [EPA-HQ-OAR-2018-0276-0167-A1, p.6]

Response:

As stated in the proposed rulemaking, the long-established ICAO/CAEP terms of reference[9] were taken into account when deciding the international Airplane CO2 Emission Standards (which match the final airplane GHG standards), principal among these being technical feasibility. "For the ICAO CO_2 certification standard setting, technical feasibility refers to any technology expected to be demonstrated to be safe and airworthy proven to Technology Readiness Level[10] (TRL) 8 by 2016 or shortly thereafter (per CAEP member guidance; approximately 2017), and expected to be available for application in the short

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[9] CAEP's terms of reference indicate that "CAEP's assessments and proposals are pursued taking into account: technical feasibility; environmental benefit; economic reasonableness; interdependencies of measures (for example, among others, measures taken to minimize noise and emissions); developments in other fields; and international and national programs." ICAO: CAEP Terms of Reference. Available at http://www.icao.int/environmental-protection/Pages/Caep.aspx#ToR (last accessed November 25, 2020).
[10] TRL is a measure of Technology Readiness Level. CAEP has defined TRL8 as the "actual system completed and 'flight qualified' through test and demonstration." TRL is a scale from 1 to 9, TRL1 is the conceptual principle, and TRL9 is the "actual system 'flight proven' on operational flight." The TRL scale was originally developed by NASA. ICF International, CO2 Analysis of CO2-Reducing Technologies for Aircraft, Final Report, EPA Contract Number EP-C-12-011, see page 40, March 17, 2015.

term (approximately 2020) over a sufficient range of newly certificated airplanes."[11] This means that the analysis that informed the international standard considered the emissions performance of in-production and on-order or in-development[12] airplanes, including types that were to first enter into service by about 2020.

In assessing the airplane GHG rule, the 2018 ICF updated analysis, which was completed a few years after the ICAO analysis, used a different approach for technology responses. ICF identified the most effective metric value-reducing technologies available at technology readiness level 8 (TRL8)[13] by 2017 that could be inserted into in-production airplanes and estimated the cost effectiveness of each (i.e., the amount of investment likely required to achieve a percent of improvement in fuel efficiency). Their analysis also evaluated which technologies were available airplane family by airplane family. As a matter of course, technologies are inserted into different airplanes at different times, at which point there is a step improvement in that airplane's metric value performance. However, given the timing and choice of technology is unknown going forward, ICF developed a metric value forecast from 2010 to 2040 that smoothed these step improvements. They have not assumed continuous improvement, but projected a smoothed improvement based on technologies likely to be inserted during the production life of the airplane. Also, ICF considered the end of production of airplanes based on the expected business-as-usual technology insertion into airplanes. The ICF approach differed from ICAO's analysis for years 2016 to 2020 and diverged even more for years 2021 and after. Since ICF was able to use the final effective dates in their analysis of the final airplane GHG standard (for new type design airplanes 2020, or 2023 for airplanes with less than 19 seats, and for in-production airplanes 2028), ICF was able to differentiate between airplane GHG technology improvements that would occur in the absence of the final standard (business as usual improvements) compared against technology improvements/responses needed to comply with the final standard.

The differences between the results of the ICAO analysis' and ICF's results are expected. CAEP's technology responses were based on technology available in 2016-2017 (or frozen technology 2016-2017) --compared to the EPA's responses that considered technology available by 2017 and projected smoothed improvement until 2040 based on the incorporation of these technologies onto airplanes. The smoothed improvement forecast is a projection of the annual fuel efficiency metric value improvement for all the technologies that would be applied to each airplane (or business as usual improvement in the absence of a standard). Therefore, the technologies and costs needed for airplane types to meet the proposed standards were compared to the improvements that are expected to occur in the absence of standards. Based on that comparison, we anticipate no incremental costs will be incurred and no incremental emission reductions will be realized from complying with these proposed final standards.

Some industry commenters stated that the costs and emission reductions resulting from business as usual improvements should be attributed to the proposed standards. Moreover, they seem to be indicating that these business as usual improvements would not occur without the standards. However, historically, airplane fuel efficiency has continually improved on an annual basis (for the in-service fleet of airplanes

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[11] ICAO, 2016: Report of the Tenth Meeting, Montreal, 1-12 February 2016, Committee on Aviation Environmental Protection, Document 10069, CAEP10, 432pp, is found on page 27 of the English Edition of the ICAO Products & Services 2020 Catalog and is copyright protected: Order No. 10069. For purchase available at: https://www.icao.int/publications/Pages/catalogue.aspx (last accessed March 16, 2020). The statement on technological feasibility is located in Appendix C (page 5C-15, paragraph 6.2.1) of this report.

[12] Airplanes that are currently in-development, but were anticipated to be in production by about 2020.

[13] TRL is a measure of Technology Readiness Level. CAEP has defined TRL8 as the "actual system completed and 'flight qualified' through test and demonstration." TRL is a scale from 1 to 9, TRL1 is the conceptual principle, and TRL9 is the "actual system 'flight proven' on operational flight." The TRL scale was originally developed by NASA. ICF International, CO2 Analysis of CO2-Reducing Technologies for Aircraft, Final Report, EPA Contract Number EP-C-12-011, see page 40, March 17, 2015.

and new jet airplanes). For example, GE stated the following on the annual fuel efficiency improvement of the in-service airplane fleet: “[o]ver the past 30 years, installing more technologically advanced and fuel-efficient GE Aviation and CFM International engine models has equated to the fleet in airline service reducing its fuel burn every year on average by 1 to 1.5%.” Also, GE indicate that “[t]his tradition of innovation continues, and we expect that percentage reduction to continue as well.” In addition, the 2020 fact sheet issued by the Air Transport Action Group (ATAG), whose members include Airbus, Boeing, the International Air Transport Association (IATA), Airports Council International, (ACI), ATR, CFM International, and Civil Air Navigation Services Organisation (CANSO), stated that airlines have continued to improve their global fuel efficiency between 2009 and 2019 at an average annual rate of 2 percent.[14] Moreover, the ATAG fact sheet indicated that the cumulative fuel efficiency improvement of the fleet was 21 percent between 2009 and 2019, 38 percent between 2000 and 2019, and 54 percent between 1990 and 2019. Also, the 2020 IAE tracking report indicated that the energy intensity of commercial passenger aviation has decreased 2.8 percent per year on average since 2000, but improvements have slackened over time.[15] The 2020 Annual Energy Outlook indicates that the energy use per seat miles available of travel from aircraft is projected to continue to decrease annually for the long term, about 1 percent per annum from 2019 to 2050, because of the economically driven adoption of energy-efficient technology and practices.[16]

For new jet airplanes, ICAO’s 2019 CAEP/11 Independent Experts (IE)[17] Review projected that annual reduction rates in fuel burn as follows: single aisle airplanes from 2017 to 2027 is 1.3 percent and from 2017 to 2037 is 1.2 percent -- twin aisle airplanes from 2017 to 2027 is 1 percent and 2017 to 2037 is 1.3 percent. This annual improvement rate represented the independent experts view of challenging, but achievable technology goals for new airplanes. Also, the 2019 ICAO Environmental Report[18] stated that under an optimistic-trends scenario the long-term fuel efficiency improvement per year would be about 1.4 percent, and it includes the combined improvements associated with both technology and operations. The individual contributions from technology and operations improvements are .98 percent and .39 percent, respectively. The ICAO Environmental Report stated that the .98 percent technology improvement (fuel efficiency improvement for new jet airplanes) is slightly lower than the 1.3 percent annual improvement cited in the 2019 CAEP/11 IE Review for single aisle airplanes. In addition, the 2020 ICCT white paper[19] for new commercial jet airplanes indicated that from 1960 to 2019, annual fuel burn reductions averaged 1.1 percent (1.1 percent on the ICAO metric value and 1.3 percent on the block fuel intensity metric). Also, ICCT stated that a comprehensive technology assessment found that the rate of fuel burn improvement for new airplanes could be accelerated up to 2.2 percent per annum through 2034 by the adoption of cost-effective technologies.

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[14] ATAG, 2020: *Tracking Aviation Efficiency, How is the aviation sector performing in its drive to improve fuel efficiency, in line with its short-term goal?* Fact Sheet #3, January 2020. Available at https://aviationbenefits.org/downloads/fact-sheet-3-tracking-aviation-efficiency/ .

[15] IAE, 2020, Aviation, Tracking report, June 2020, Available at https://www.iea.org/reports/aviation#acknowledgements .

[16] U.S. Energy Information Administration (EIA), 2020: *Annual Energy Outlook 2020 with projections to 2050*, #AEO2020, Available at www.eia.gov/aeo (last accessed November 11, 2020).

[17] ICAO, 2019: *Independent Expert Integrated Technology Goals Assessment and Review for Engines and Aircraft*, Doc 10127. Montreal, 2019. 225 pp. Available at: https://www.icao.int/publications/catalogue/cat_2020_sup01_en.pdf (last accessed November 10, 2020). It is found on page 3 of the English Edition of the 2020 catalog’s Supplement No.1- December 2019/January 2020.

[18] ICAO, 2019: *Environmental Report 2019 – Aviation and Climate Change – Destination Green The Next Chapter*, 2019, which is located at https://www.icao.int/environmental-protection/Pages/envrep2019.aspx (last accessed November 10, 2020).

[19] ICCT, 2020, *Fuel Burn of New Commercial Jet Aircraft: 1960 to 2019*. September 20. Available at: https://theicct.org/publications/fuel-burn-new-comm-aircraft-1960-2019-sept2020 .

In the proposed rulemaking, ICF projected incremental fuel efficiency improvements or business as usual improvements for newly produced airplanes at 0.25 to 0.50 percent annually (out to 2040), depending on the airplanes size category. This is based on the smoothed forecast described above. ICF's research revealed that performance improvement packages (PIPs) or technology improvements for individual airplanes occur in step functions and not in continuous improvements per year. However, a reasonable projection of inserting these technologies over the forecast period yielded an annualized 0.25 to 0.50 percent improvement in fuel burn. Ultimately, based on the historical performance improvement described earlier by industry and the other sources, as well as the basket-of-2017-vintage TRL8 technologies available for insertion going forward, this continuous improvement depiction (or business as usual improvement methodology) was reasonable. Thus, we believe our conclusion of no incremental cost and no incremental emission reductions from the proposed standards is sound.

13.3. Technology Following Standards Compared to Technology Forcing Standards

Comments:

Organization: Airlines for America (A4A) and Air Line Pilots Association, International (ALPA)

As a result, there is no doubt that the ICAO CO_2 Aircraft Standards are technically sound.[13] In addition, there is no doubt that the standards are consistent with the Terms of Reference ("TOR") for CAEP, which provide that such standards must be technologically feasible, economically reasonable, environmentally beneficial, and balanced against interdependencies (aircraft noise and competing emission reductions of other pollutants, such as oxides of nitrogen and particulate matter).[14]

Critically, the CAEP TOR align well with the criteria EPA must follow pursuant to CAA Section 231 and ICAO's assessment of each element of the TOR is directly related to the decisions EPA must make when adopting aircraft engine emission standards. Section 231(b) requires any engine emissions standard to allow sufficient lead time "to permit the development and application of the requisite technology, giving appropriate consideration to the cost of compliance within such period." Due to the rigorous performance criteria required of aircraft dictated by safety imperatives and the need to match aircraft mission capability to demand, the process involved in designing, certifying, and building new aircraft is inherently lengthy. In addition, Section 231 expressly prohibits changes in engine emission standards that "would significantly increase noise and adversely affect safety." 231(a)(2)(B)(ii).[15] Also particularly relevant here is that, as EPA explains in its preamble, ICAO/CAEP evaluates "technological feasibility" using the Technological Readiness Level ("TRL") scale and deems technologies that have attained TRL8 (defined as the "actual system completed and 'flight qualified' through test and demonstration") to be "technologically feasible."[16] Use of TRL8 to evaluate "technological feasibility" thus ensures emissions standards reflect what aircraft technologies can safely deliver, rather than hypothetical "technology forcing" standards that could pose a potential threat to air safety.

EPA affirms the "long-established ICAO/CAEP terms of reference were taken into account when deciding the international CO_2 Airplane Emissions Standards, principal among these being technical feasibility."[17] Given the close relationship between the criteria it must follow under CAA Section 231 and the ICAO/CAEP TOR, it is clear that the comprehensive technical and economic data and analyses developed by CAEP to support its standards also is more than sufficient to support the adoption of those standards into U.S. law. [EPA-HQ-OAR-2018-0276-0161-A1, pp.4-7]

[13] As EPA notes, CAEP provided a summary of its analyses and findings, ICAO, 2016: Doc. 10069 – Report of the Tenth Meeting, Montreal, 1-12 February 2016, Committee on Aviation Environmental Protection, CAEP 10.
[14] The CAEP TOR are available at https://www.icao.int/environmental-protection/Pages/Caep.aspxz#ToR. In its Draft Airplane GHG Standards Technical Support Document (TSD), EPA-HQ-OAR-2018-0276-0024) EPA provides extensive information regarding ICAO/CAEP's analysis. Additional information and detail on ICAO/CAEP's analysis has been made publicly available by the European Aviation Safety Agency ("EASA") in its Notice of Proposed Amendment 2017-01, Appendix 3, ICAO ANNEX 16, VOL III AMENDMENTS, which we incorporate here by reference (available at: https://www.easa.europa.eu/sites/default/files/dfu/NPA%202017-01.pdf).
[15] Section 231(c) creates an additional mechanism to ensure aircraft engine emission standards are not inconsistent with the imperative to maintain air safety, providing that any requirements promulgated pursuant to Section 231 "shall not apply" if the Secretary of Transportation makes a finding that the regulation "would create a hazard to aircraft safety" and the President disapproves the requirement after public notice and comment.
[16] 85 Fed. Reg at 51585.
[17] 85 Fed. Reg at 51585.

Organization: California Air Resources Board (CARB)

The public health, environmental, economic, and social impacts of uncontrolled GHG emissions from aircraft necessitate real and significant control of these emissions. Instead, EPA proposes to simply codify an approach that, at the time of its adoption by the International Civil Aviation Organization (ICAO) four years ago, explicitly considered and incorporated only technologies that were "flight-ready" at that time.[7] The International Council on Clean Transportation (ICCT) estimates that the proposed rule lags existing manufacturer efforts by more than 10 years.[8] The incorporated technologies were limited even further by ICAO policies preventing consideration of existing and effective GHG reduction strategies such as weight reductions and sustainable aviation fuels.[9] The proposed standard is worse than business-as-usual.

In its proposal to merely ratify ICAO's limited and already-outdated standard, EPA has arbitrarily failed to consider a variety of demonstrated and in-development emissions-reducing technologies, measures, and policies, and refused to regulate emissions from in-service and smaller aircraft, which comprise major portions of the aviation sector. Clean Air Act section 231 requires EPA, having made an endangerment finding for aircraft GHG emissions, to appropriately control these emissions, including consideration of potential controls' technological feasibility.[10] EPA's failure to consider and incorporate the existing and in-development technologies and measures described below is "arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law."[11] EPA must strengthen the standards and incorporate these technologies, measures, and sources to fulfill its obligations and its mission to protect public health and the environment. [EPA-HQ-OAR-2018-0276-0169-A1, pp.2-3]

a. The standard must incorporate additional engine designs and aerodynamic improvements, including weight-reducing technologies.

Congress and federal agencies have recognized the need for emissions reducing technologies and supported their development and use. The result is that many technologies are actively advancing. EPA must account for and incorporate potential reductions from these technologies into its standards.

The FAA Reauthorization Act of 2018 requires FAA, in coordination with the National Aeronautics and Space Administration (NASA), to "conduct a review of current and planned research on the use of advanced aircraft technologies, innovative materials, alternative fuels, additive manufacturing, and novel aircraft designs, to increase aircraft fuel efficiency[,]" and to report its findings to Congress.[12] FAA and NASA programs are demonstrating the effectiveness and current and near-term viability of engine, aerodynamics, and weight-reducing technologies that EPA inexplicably failed to consider.

NASA programs, including the Advanced Air Vehicles Program and the Integrated Aviation System Research Program, research new vehicle technologies that are anticipated to significantly reduce emissions. NASA's Environmentally Responsible Aviation Project, designed to halve fuel burn for subsonic passenger and cargo transport aircraft by 2020, has developed technologies to reduce fuel burn and emissions, including tail enhancements and surface coatings to reduce weight and drag, and lighter-weight structures.[13] The 2015 U.S. Aviation GHG Emissions Reduction Plan submitted to ICAO notes, "Typically five to ten years after the conclusion of a NASA program, industry will build on NASA's research results and integrate the associated knowledge into commercial products."[14]

FAA's Continuous Lower Emissions, Energy, and Noise (CLEEN) program, launched in 2010, is a cost-sharing program in which participants match or exceed federal awards to accelerate the development and commercialization of new certifiable aircraft technologies and sustainable aviation fuels. Congress codified the program into statute in 2018.[15] During the CLEEN program's first phase, from 2010 to 2015, it provided 125 million dollars to help aircraft and components companies develop and demonstrate technologies to reduce aircraft fuel burn by 33 percent, with a target entry into service date of 2018.[16] In the second phase, from 2015 to 2020, FAA provided another 100 million dollars to develop technologies that would reduce aircraft fuel burn by 40 percent, with a target entry into service date of 2026.[17] Emissions-reducing technologies successfully developed through the program include composite airframe technologies; advanced wing technologies; and advanced fan systems, among many others.[18] Several of technologies developed through CLEEN are now commercially available.[19]

Analyses conducted by the Georgia Institute of Technology, Purdue University, Stanford University, and Massachusetts Institute of Technology (institutions designated as FAA Centers of Excellence) show that the technologies developed through CLEEN Phases I and II could achieve cumulative savings of 22 billion gallons of jet fuel between 2025 and 2050.[20] Sister agencies and Congress have helped to develop, demonstrate, and analyze these emissions-reducing technologies, but EPA has ignored them in considering and proposing emissions standards.

In particular, EPA baselessly refused to consider weight-reducing technologies, which are the focus of many federal and industry research efforts. The proposed rule's Technical Support Document (TSD) includes an analysis of engine and airframe technologies conducted by a third-party contractor, ICF Inc. (The TSD recognizes that many of these technologies have already entered service since ICF's analysis was first performed in 2015.[21]) The TSD provides an analysis of airframe and engine technologies applicable to fuel burn reductions, but explicitly omits critical weight reducing technologies that can increase fuel efficiency and thereby reduce GHG emissions. This exclusion eliminates about one-third of the technologies identified by ICF that could achieve emissions reductions.[22] EPA explains that it did not consider weight-reducing technologies because they are not credited by ICAO.[23] EPA concludes that "even though weight reducing technologies increase the airplane fuel efficiency, this improvement in efficiency frequently would not be reflected in operation[,]" because, "while weight reduction technologies can be used to improve airplane fuel efficiency, they may also be used to allow increases in payload, equipage, and fuel load."[24]

Yet adopting weight-reducing technologies does not inherently mean an increase in capacity to add weight elsewhere. A study conducted by Tecolote Research demonstrates this in an evaluation of composite material fractions by assuming that "the volume of the parts remains the same with the composites substituted for aluminum."[25] In this example, a reduction in weight does not change the volume. Any load that would be constrained by volume requirements would remain the same, reducing the operating weight of the aircraft and thus the emissions.

Technology under development by Boeing and funded by CLEEN Phase II, known as the Structurally Efficient Wing (SEW), provides large weight reductions through new manufacturing techniques and advanced composite material technology. It is estimated that this technology could avoid approximately 660 million tons of CO_2 emissions over a twenty-year period.[26] These are non-trivial reductions that EPA should incorporate and must consider. [EPA-HQ-OAR-2018-0276-0169-A1, pp.4-6]

There are multiple feasible technologies that would achieve these goals for EPA to consider. In the Revised 2016 Strategy for the State Implementation Plan, CARB discussed aircraft as a growing emissions source that needed to be addressed, and identified potential EPA actions to achieve those emissions reductions.[56] To date, EPA has failed to meet its obligation to effectively limit emissions from aircraft, making it more challenging for California and local air districts to meet federal air quality standards and reduce air pollution that harms public health.

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[7] 85 Fed. Reg. at 51,585 (ICAO used Technology Readiness Level 8, defined as "actual system completed and 'flight qualified' through test and demonstration.").

[8] Sola Zheng and Daniel Rutherford, ICCT, "Fuel burn of new commercial jet aircraft: 1960 to 2019" (Sept. 8, 2020), available at https://theicct.org/publications/fuel-burn-new-commaircraft- 1960-2019-sept2020.

[9] 85 Fed. Reg. at 51,564; while ICAO's GHG standard does not include sustainable aviation fuels, ICAO considers these fuels through Carbon Offsetting and Reduction for International Aviation (CORSIA), as discussed below. ICAO, Sustainable Aviation Fuels, https://www.icao.int/environmental-protection/pages/SAF.aspx.

[10] 42 U.S.C. § 7571; see National Association of Clean Air Agencies v. EPA, 489 F.3d 1221, 1230 (D.C. Cir. 2007) (explaining that section 231 "confer[s] broad discretion to the Administrator to weigh various factors in arriving at appropriate standards.").

[11] Clean Air Act § 307(d)(9), 42 U.S.C. § 7607(d)(9).

[12] FAA Reauthorization Act of 2018, Pub.L. 115-254, 115th Congress, 132 Stat. 3413, § 742.

[13] U.S. Aviation Greenhouse Gas Emissions Reduction Plan (June 2015), available at https://www.icao.int/environmental-protection/Lists/ActionPlan/Attachments/30/ UnitedStates_Action_Plan-2015.pdf.

[14] Id. at 13.

[15] FAA Reauthorization Act of 2018, Pub.L. 115-254, 115th Congress, 132 Stat. 3413, adding 49 U.S.C. § 47511.

[16] Chris Dorbian, FAA Office of Environment & Energy, CLEEN Program Overview (March 3, 2020), available at https://anesymposium.aqrc.ucdavis.edu/sites/g/files/dgvnsk3916/ files/inline-files/20200303%20UC%20Davis%20ANE%20Symposium%20-%20CLEEN%20Overview%20%28Dorbian%29.pdf. CLEEN Phase I Recipients include Boeing, General Electric, Honeywell, Pratt & Whitney, and Rolls-Royce. FAA, Continuous Lower Energy, Emissions, and Noise (CLEEN) Program, updated June 19, 2020, https://www.faa.gov/about/office_org/headquarters_offices/apl/research/aircraft_technology/ cleen/.

[17] Id. CLEEN Phase II Recipients include Aurora Flight Sciences, Boeing, Collins Aerospace, Delta Tech Ops/MDS Coating Technologies, General Electric, Honeywell, Pratt & Whitney, and Rolls-Royce. FAA, Continuous Lower Energy, Emissions, and Noise (CLEEN) Program, updated June 19, 2020, https://www.faa.gov/about/office_org/headquarters_offices/apl/ research/aircraft_technology/cleen/.

[18] FAA, CLEEN Phase I and II Projects, Feb. 27, 2020, available at https://www.faa.gov/about/ office_org/headquarters_offices/apl/research/aircraft_technology/cleen/media/CLEENI_CLEE NII_Projects.pdf.

[19] Ibid.

[20] ASCENT, Project 010 Aircraft Technology Modeling and Assessment (July 2018), available at https://ascent.aero/documents/2018/07/ascent-010-2015-annual-report.pdf/; PARTNER, Environmental Design Space Assessment of Continuous Lower Energy Emissions Noise (CLEEN) Technologies (March 2016), available at http://partner.mit.edu/sites/partner.mit.edu/ files/PARTNER-Project-36-final-report.pdf. The third phase of the CLEEN Program is currently under development. See FAA, Continuous Lower Energy, Emissions, and Noise (CLEEN) Program, updated June 19, 2020, https://www.faa.gov/about/office_org/ headquarters_offices/apl/research/aircraft_technology/cleen/.

[21] Proposal TSD at 32.

[22] Ibid.

[23] 85 Fed. Reg. at 51,564-65.

[24] Ibid.

[25] Tecolote Research, Final Report - Aviation Fuel Efficiency Technology (2015) Assessment, available at https://theicct.org/sites/default/files/publications/Aviation%20Fuel%20Efficiency%20Technology%20Assessment%20(AFETA)%202015%20Final%20Report%2018J an2016.pdf, at 82.

[26] FAA, CLEEN Phase I and II Projects (Feb. 27, 2020), available at https://www.faa.gov/about/office_org/headquarters_offices/apl/research/aircraft_technology/cleen/media/CLEENI_CLEENII_Projects.pdf, at 2.
[56] CARB, Revised 2016 State Strategy for the State Implementation Plan (March 7, 2017), available at https://ww3.arb.ca.gov/planning/sip/2016sip/rev2016statesip.pdf.

Organization: California Attorney General's Office and the California Air Resources Board (CARB) et al.

2. EPA failed to consider technically feasible alternatives likely to result in meaningful emission reductions.

By limiting its consideration to Scenarios 1, 2, and 3, EPA ignored a host of technically feasible options with the potential to curb aircraft GHG emissions to an extent “compatible with their significance as pollution sources.” See 37 Fed. Reg. at 26,488. Far from a historic or “major” rule for GHG emissions,[139] the Proposed Rule is an empty exercise that substitutes feeble, already-obsolete standards for the critically needed regulation Congress intended.

First, EPA did not evaluate adopting new-type and in-production standards at stringency levels greater than Scenario 3, up to ICAO SL 10. EPA has not offered a reasoned explanation for why even in-production standards cannot be set at SL 10, given that aircraft currently in use are already achieving this stringency level.[140, 141] At CAEP meetings, not only did the U.S. argue for more stringent ICAO standards, it urged CAEP to set standards that would actually reduce GHG emissions beyond business as usual. 80 Fed. Reg. at 37,791. EPA has offered no explanation for abandoning this principle in the current rulemaking. Cf. Fox Television Studios, 556 U.S. at 515-16.

Second, EPA did not evaluate standards above ICAO’s highest stringency option, SL 10. EPA’s own analysis shows that several aircraft already in production exceed this level. Draft TSD, at 125-126 (Figures 6-1, 6-2). For the new-type standard, EPA’s industry data show an even more aggressive standard is feasible. Although, according to EPA, these new designs occur only every 8 to 10 years, “[n]ew type designs (and some redesigns) typically yield large fuel burn reductions—10 percent to 20 percent over the prior generation they replace.” 85 Fed. Reg. at 51,566.[142] Other studies have shown cost-effective technologies could reduce emissions from new aircraft by 2.2 percent annually through 2034.[143] EPA has offered no explanation for why it did not consider, e.g., a new-type standard that is 10 to 20 percent more stringent than SL 10, with 8 to 10 years of lead time.

It is particularly irrational—and contrary to section 231—to cap considered stringency options at ICAO’s SL 10, because ICAO explicitly limited its deliberations to technology proven four years ago: “ICAO decided on the international Airplane CO_2 Emission Standards, which are equivalent to the proposed GHG standards, based on proven technology by 2016/2017 that was expected to be available over a sufficient range of in-production and on-order airplanes by approximately 2020.” 85 Fed. Reg. at 51,586.[144] However, section 231 clearly steers EPA to set its standards according to technology expected to be developed and proven in the future, provided EPA allows manufacturers sufficient lead time. 42 U.S.C. § 7571(b). By limiting its own consideration to ICAO’s narrower scope of technical feasibility, EPA has failed to exercise its discretion rationally and in accordance with the statute.

Third, EPA did not evaluate forms of emission control beyond the ICAO standard. EPA admits it did not consider any weight-reducing technologies, which constitute one-third of the 70+ technologies its contractor ICF examined. Draft TSD, at 32. EPA states it did not consider these technologies because operators can offset weight reductions with increased cargo or fuel load; however, EPA never explains why it cannot propose standards that rely on reducing weight without allowing for such offsets. 85 Fed. Reg. at 51,586 & n.150.[145] And EPA apparently did not consider whether increasing cargo carried on a flight may improve fleetwide emissions reduction for a given transport demand. Although the ICAO metric itself does not reward weight reduction, EPA never explains why it cannot concurrently adopt an emission standard that does encourage weight reduction; certainly, if the whole fleet can be made less heavy, fuel efficiency improves and contributes to greater emissions reduction.

Indeed, EPA wrongly proceeds as if GHG emissions reduction and fuel efficiency are equivalent, see 85 Fed. Reg. at 51,562, and has failed to evaluate emission-reduction strategies beyond reducing fuel burn. EPA did not consider alternative fuels, which aircraft manufacturers are already developing. See supra pp. 19-20.[146] Even without widespread deployment, zeroemission aircraft could support a considerable reduction of average fleetwide emissions, similar to how electric cars reduce automakers' fleetwide emissions. Again, EPA has offered no explanation for failing to even examine these demonstrated and effective methods of controlling emission reduction beyond the ICAO standard. [EPA-HQ-OAR-2018-0276-0176-A1, pp.29-31]

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[139] See Press Release: EPA Proposes First Greenhouse Gas Emissions Standards for Aircraft, EPA (Jul. 22, 2020), https://www.epa.gov/newsreleases/epa-proposes-first-greenhouse-gas-emissions-standards-aircraft.

[140] As ICCT finds, "[s]ome new types that entered into service in recent years pass the [ICAO inproduction] standard by significant margins, notably the Airbus A330-900neo at -15%, the Embraer E195-E2 at -18%, and the Bombardier CS100 at 25%." Zheng & Rutherford, supra note 137, at 15. Compared to the ICAO in-production standard (SL 3, for maximum takeoff mass of 60,000 kg), these margins translate, respectively, to SL 9, SL 10, and a theoretical "SL 12" (8 percent more stringent than SL 10). See Draft TSD at 122 (Table 6-2).

[141] To the extent that Scenario 3's cost-benefit analysis is used to support EPA's decision not to explore further stringency options, that analysis is so flawed that any reliance on it would be irrational. As EPA admits, this cost-benefit analysis is based on outdated information: the Airbus A380's early exit means Scenario 3 results in no costs and no benefits. Draft TSD, at 133. In addition, EPA's analysis of benefits from emissions reduction uses a faulty, artificially constrained model of the social cost of carbon. See Draft TSD, at 138-143, 147-154. In comments on EPA's Affordable Clean Energy rule, CARB and other parties extensively detailed the defects of this "interim domestic" social cost of carbon—including its inappropriately high 3- and 7-percent discount rates, the restriction to domestic climate change impacts, and its undervaluation of lower-probability but severe impacts. See CARB, Comment at pp. 31-33, EPAHQ- OAR-2017-0355-19929 (Apr. 26, 2018); Envtl. Defense Fund et al., Joint Comments, EPA-HQOAR- 2017-0355-24812 (Oct. 31, 2018); Abrams Environmental Law Clinic, Comment at pp. 3-10, EPAHQ- OAR-2017-0355-23647 (Oct. 30, 2018). The Commenting States hereby incorporate by reference these comments on EPA's interim domestic social cost of carbon into this comment, along with the amicus curiae brief of Prof. Michael Greenstone, co-leader of the Interagency Working Group that developed the original (and scientifically valid) social cost of carbon methodology, in the American Lung Assoc. v. EPA appeal to the D.C. Circuit Court of Appeals, No. 19-1140, Doc. #1839719 (Apr. 24, 2020).

[142] See also Draft TSD, at 14 ("with the fast pace of advancing aviation technology the status of CO_2 technology improvements has changed in this short time frame" from 2015 to 2018).

[143] Kharina, A. et al., "Cost Assessment of Near and Mid-Term Technologies to Improve New Aircraft Fuel Efficiency," at 28 (Sept. 27, 2016), https://theicct.org/publications/cost-assessment-near-and-midterm- technologies-improve-new-aircraft-fuel-efficiency. This would translate to improved emissions reduction relative to 2015 aircraft of 25 percent in 2024 and 40 percent in 2034. Id. at 28, 31, 35.

[144] Indeed, because ICAO measured feasibility using a short- and mid-term methodology based on a 2015-2029 timeframe, even technologies set to be delivered starting in 2016 were not considered feasible under the CAEP definition. The proposal rule was released in August 2020, already 5 years into the 15- year period. (It is additionally unclear what years are defined as the short-term period and which as the mid-term period.) Given that additional technologies may have been developed during this time, the short-term and mid-term methodology is already outdated and does not adequately assess available technologies and projected improvements.

[145] Adopting weight-reducing technologies does not inherently mean an increase in capacity to add weight elsewhere. See Tecolote Research, Final Report: Aviation Fuel Efficiency Technology Assessment, at 82 (Dec. 26, 2015) (assuming, in an evaluation of composite material fractions, that "the volume of the parts remains the same with the composites substituted for aluminum"), https://theicct.org/sites/default/files/publications/Aviation%20Fuel%20Efficiency%20Technology%20Assessment%20(AFETA)%202015%20Final%20Report%2018Jan2016.pdf. In this example, there would not necessarily be a difference in volume. Any load that would be constrained by volume requirements would remain the same, while the operating weight of the aircraft would still be reduced.

[146] In September 2020, Airbus unveiled designs for a hydrogen-fueled, zero-emission aircraft, but notes that the success of such alternative-fuel aircraft depends on government regulators incenting the aviation sector to retire older aircraft and install the necessary infrastructure. Energywire, "Airbus unveils hydrogen designs for zero-emission flight" (Sept. 22, 2020), https://www.eenews.net/energywire/stories/1063714307. The present rulemaking is precisely one such opportunity to steer the industry toward cleaner fuels.

Organization: Environmental Defense Fund

III. EPA has authority to implement tighter greenhouse gas emissions standards that both foster new technologies and provide flexibility.

As EPA asserts in the current proposed rule, EPA is authorized to consider a wide range of methods for achieving reductions in aircraft engine emissions.[27] Section 231 of CAA does not specify how standards promulgated by EPA must be formulated, nor does it specify that standards must apply only to the operation direct capabilities of engine technology.[28] Moreover, the lack of statutory specifics has in fact been interpreted to grant EPA significant discretion in how it chooses to promulgate standards.[29] Consequently, EPA is empowered to consider a variety of possible methods that may reduce "the emission of any air pollutant" which "in [the Administrator's] judgment causes, or contributes to, air pollution which may reasonably be anticipated to endanger public health or welfare,"[30] even though the reductions may occur outside of the immediate class or classes of engines which emit those pollutants. [EPA-HQ-OAR-2018-0276-0158-A1, p.6]

Section 231 requires EPA to promulgate standards that are applicable to aircraft engine emissions of air pollutants determined to cause or contribute to "air pollution which may reasonably be anticipated to endanger public health or welfare," such that the standards result in the reduction or elimination of those pollutants. However, EPA's proposed standard does not do so. In fact, it does not achieve any reductions in the pollutants. EPA must consider and adopt options which would actually reduce the danger to public health; its failure to do so is arbitrary and capricious. As explained in EPA's "Draft Airplane Greenhouse Gas Standards Technical Support Document (TSD)," EPA considered only three Scenarios. As EPA admits in that document, "under both scenarios 1 and 2, there would be no cost and no benefit (no emission reduction) for the proposed GHG standards" and Scenario 3 would have only a minuscule impact on U.S. domestic emissions because it would necessitate improvements in only one aircraft, and none of the U.S. have that aircraft in their fleets.[31] As stated in Nat'l Ass'n of Clean Air Agencies v. EPA, "Congress has delegated expansive authority to EPA to enact appropriate regulations applicable to the emission of air pollutants from aircraft engines."[32] [EPA-HQ-OAR-2018-0276-0158-A1, p.6-7]

The statute does not specify that EPA must set these standards only by addressing emissions exclusively at the source. Rather, Section 231 affords EPA the latitude to consider approaches to reducing these pollutants that stimulate technology advancements for individual aircraft engines, spur innovation in airframe design, and provide flexibility to consider emission reductions that may be associated with particular aircraft-engine combinations but which occur outside the aircraft-engine envelope. [EPA-HQ-OAR-2018-0276-0158-A1, p.7]

"[section] 231 requires rules promulgated thereunder to tighten emission standards," but does not necessarily require such standards to be technology-forcing.[33] Provided standards promulgated by EPA achieve the goal of addressing the endangerment, and that the EPA Administrator consult with the Administrator of the Federal Aviation Administration and avoid standards that would "significantly increase noise or adversely affect safety,"[34] EPA has broad latitude to craft a standard that will actually significantly protect public health from the climate change impacts of aviation, spur technology development for airplane engines and airframes, and provide flexibility, enabling industry to meet tighter emissions standards than are achievable with existing and reasonably foreseeable technology.35 [EPA-HQ-OAR-2018-0276-0158-A1, p.7]

Specifically, EPA could, within its statutory authority:

• set stringent emissions limits for engine/aircraft combinations that encourage and recognize the emission reduction effects of more aerodynamic aircraft designs, lightweight materials, and other innovative engineering;36 [EPA-HQ-OAR-2018-0276-0158-A1, p.7-8]

• set stringent emissions limits for aircraft engines that recognize the emission reductions actually achieved [EPA-HQ-OAR-2018-0276-0158-A1, p.8]

Such approaches would spur American innovation and could create jobs here in the United States producing the engines, aircraft, lightweighted materials, flight systems, emission reductions and fuels of the future. These approaches could foster co-benefits by encouraging technologies, flight patterns, and the uptake of SAFs that reduce local air pollution around airports, and thereby benefit the health of local communities and disadvantaged groups. EPA and FAA have in fact previously asserted the authority to consider "new air traffic systems and flight management techniques that can result in environmental benefits," when developing and implementing standards.[41] EPA can build on this authority in developing significantly more ambitious standards for aviation GHG emissions, and can work cooperatively with FAA to ensure these methods are enforceable by integrating the obligations directly into each aircraft's airworthiness certificate. [EPA-HQ-OAR-2018-0276-0158-A1, p.8-9]

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[27] 85 Fed. Reg. 51562.
[28] See id; 42 U.S.C. § 7571.
[29] Nat'l Ass'n of Clean Air Agencies, 489 F.3d at 1230.
[30] 42 U.S.C. § 7571(a)(2)(A).
[31] Draft Airplane Greenhouse Gas Standards Technical Support Document (TSD) (EPA-420-D-20-004, July 2020), at pages 105-106 (emphasis added). Text available at https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100ZN37.pdf (accessed October 16, 2020).
[32] 489 F.3d 1221, 1230 (D.C. Cir. 2007).
[33] Id.
[34] 42 U.S.C. § 7571(a)(2)(B)(ii).
[35] See id.
[36] See 49 U.S.C. §§ 44701(a)(1)-(2) ("The Administrator of [FAA] shall promote safe flight of civil aircraft in air commerce by prescribing minimum standards for the design, material, construction, quality of work, and performance of aircraft, aircraft engines, and propellers," and "regulations and minimum standards [for ensuring compliance]."). In consulting with FAA on aircraft engine emission standards, EPA may consider the reduction effects of particular designs and engineering techniques that FAA would then mandate to ensure compliance with EPA's standards.
[37] See 49 U.S.C. §§ 40103(b) ("The Administrator of [FAA] shall develop plans and policy for the use of the navigable airspace and assign by regulation or order the use of the airspace necessary to ensure the safety of aircraft and the efficient use of airspace."). In consulting with FAA on aircraft engine emission standards, EPA may consider the reduction effects of particular flight techniques and flight paths that FAA would then mandate to ensure compliance with EPA's standards.
38 See ICAO Doc 10126, CAEP/11 (2019), at 9A-8 (Table 1 – Sustainability Themes, Principles, Criteria and Guidance recommended by CAEP during its 2017 Steering Group Meeting). See also 49 U.S.C. §§ 44714(1)-(2) ("The Administrator of [FAA] shall prescribe standards for the composition or chemical or physical properties of an aircraft fuel or fuel additive to control or eliminate aircraft emissions the Administrator of [EPA] decides under section 231 of the Clean Air Act endanger the public health or welfare; and regulations providing for carrying out and enforcing those standards."). In consulting with FAA on aircraft engine emission standards, EPA may consider the reduction effects of particular jet fuels that FAA would then require aircraft operators to utilize to ensure compliance with EPA's standards.
[39] See ICAO "Life Cycle Emissions of Sustainable Aviation Fuels," text available at https://www.icao.int/environmental-protection/pages/SAF_LifeCycle.aspx (accessed October 15, 2020).
[40] See ICAO, "CORSIA Eligible Emissions Units", https://www.icao.int/environmental-protection/CORSIA/Pages/CORSIA-Emissions-Units.aspx (accessed October 15, 2020).
[41] FAA and EPA, ''Agreement Between Federal Aviation Administration and Environmental Protection Agency Regarding Environmental Matters Relation to Aviation,'' signed on March 24, 1998 by FAA's Acting Assistant

Administrator for Policy, Planning, and International Aviation, Louise Maillet, and EPA's Acting Assistant Administrator for Air and Radiation, Richard Wilson. A copy of this document can be found in EPA Docket OAR–2002– 0030.

Organization: International Council on Clean Transportation (ICCT)

ICCT agrees with EPA on the following aspects of the proposed rule:

1. That ICAO's recommended standard is designed to be technology-following and that it, as proposed, will not lead to additional GHG emissions reduction from aircraft and aircraft engines. That's because, although the rule doesn't take full effect until 2028, CAEP defined technological feasibility to exclude aircraft and engine technologies that were set to be delivered starting in 2016. Thus, it's expected that all new airplanes will pass the standard by 2028 because existing non-compliant types will cease production before then. [EPA-HQ-OAR-2018-0276-0168-A1, p.2]

Organization: Mercy Investment Services

[The following comments were submitted as testimony at the virtual public hearing on September 17, 2020.]

These investments are critical to ensuring that the U.S. aviation industry maintains a leading position in an increasingly competitive and carbon-constrained world. The U.S. is already falling behind in reducing aviation emissions. The European Union has instituted an emissions-trading system and other countries, such as Norway, are instituting targets for electrifying short-haul flights and instituting biofuels mandates. The proposed rule would provide no incentive to invest in critical fuel efficiency technologies. In fact, according to the International Center on Clean Transportation, carriers accounting for 82 percent of 2017 aviation demand in the U.S. would already meet the CO_2 standard by 2028 without further improvement to their fleets.

Organization: National Association of Manufacturers

Manufacturers Protect the Environment Through Investment and Innovation

As creators and users of ground-breaking technologies that are vital to reducing emissions, manufacturers invest billions of dollars annually to improve air quality and have achieved remarkable results in this field. By utilizing a wide range of traditional and innovative measures, manufacturers have helped to usher in a cleaner and more sustainable environment.

The NAM has long supported policies that encourage emissions reductions and manufacturers in America continue to lead on the global stage—driving our international counterparts to do the same. Across industrial sectors, manufacturers in America are leading the charge not only to address traditional air pollution, but also to reduce greenhouse gas emissions. Combating the impacts of climate change is a top environmental policy issue for manufacturers and the global community.

Over the past decade, manufacturers in the U.S. have reduced the carbon footprint of their products by 21 percent while increasing our value to the economy by 18 percent. Overall, the U.S. manufacturing sector has one of the world's lowest carbon intensities per dollar of Gross Domestic Product, a fraction of the carbon intensity of other major manufacturing economies like China and India. Manufacturers are significantly more carbon efficient than our top global competitors, and the U.S. has reduced its total GHG emissions more than any other nation.

Manufacturers' significant investments to reduce environmental impacts have yielded impressive results. "Between 1970 and 2019, the combined emissions of criteria and precursor pollutants dropped by 77 percent".[1] From 1990 to 2019, national average concentrations of air pollutants declined "25 percent for ground-level ozone (8-hour), 43 percent (from 2000) for fine Particulate Matter (annual), 46 percent for coarse Particulate Matter (24-hour), 90 percent for sulfur dioxide (1-hour), 59 percent for nitrogen dioxide (annual), 85 percent (from 2010) for lead (3-month), and 78 percent for carbon monoxide (8-hour)”.[2]

By driving down emissions through environmental stewardship, manufacturers in America make modern life sustainable while building a more inclusive future. [EPA-HQ-OAR-2018-0276-0149-A1, p.2]

EPA’s proposal would establish – for the first time – a carbon dioxide emissions standard for the aviation industry that formalizes technology improvements into the airplane certification process that, until now, have been purely voluntary.[4] Consequently, implementing these standards would guarantee that older, less efficient airplanes are replaced by new, more efficient models. This will ensure that manufacturers continue to invest in new technologies that enable aviation to grow sustainably and responsibly. [EPA-HQ-OAR-2018-0276-0149-A1, p.3]

[The following comments were submitted as testimony at the virtual public hearing on September 17, 2020.]

Today’s aircraft are well over 70 percent more efficient than the first jets. And implementing these standards would ensure that older, less efficient airplanes are replaced by new, more efficient models. Continued investment by manufacturers in new technologies will enable aviation to continue to grow sustainably and responsibly.

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1 EPA Air Trends, available at https://gispub.epa.gov/air/trendsreport/2020/#home.
2 Ibid.
4 Ibid.

Organization: Salim, Nadia

[The following comments were submitted as testimony at the virtual public hearing on September 17, 2020.]

I agree with Ms. Jones and others speaking here today that environmental protection and economic development are not at odds. And I would encourage these manufacturers to invest in their workers and technological development to encourage advancements to prioritize the health and wellbeing of their workforce as well as all of our citizens and shared environment over short-term profits. The development of better and greener technology use can only mean more and better opportunities for everyone.

Organization: U.S. Chamber of Commerce

[The following comments were submitted as testimony at the virtual public hearing on September 17, 2020.]

Today’s aircraft are well over 70 percent to 80 percent more efficient than the first jets. Continued investment by manufacturers in new technologies will further improve efficiency and reduce emissions. The ICAO standards are an important part of the industry’s strategy to cut net global aviation carbon dioxide emissions to half of what they were in 2015 by 2050. These ambitious emission standards would formalize technology improvements into the airplane certification process that until now have been purely voluntary.

Organization: Washington State Department of Ecology (Ecology)

EPA should pursue a technology-forcing, rather than a technology-following, rule

The aircraft emissions standards EPA sets today should accelerate the introduction, adoption, and installation of clean technologies. EPA standards must ensure GHG reductions over the long¬term by incentivizing manufacturers to create cleaner, more efficient options.[15] EPA has developed many successful examples of technology-forcing regulations that demonstrate significant environmental, economic, and social benefits. The ICAO standards, largely written by aircraft manufacturers, do the opposite. They lag behind current technology and trends in the industry. EPA has a responsibility to the law and the American people to propose standards that truly benefit public health and the environment. [EPA-HQ-OAR-2018-0276-0140-A1, p.4]

According to the U.S. Department of Transportation, fuel costs are one of the largest and most variable airline expenses, representing between 15 and 20 percent of operating expenses.[16] Technology-forcing standards would play an important role by improving aircraft fuel economy and helping our domestic industry maintain its role at the forefront of innovation and international competitiveness. EPA must seize this opportunity to reinforce our world leadership in aircraft technology and sustainability, rather than succumbing to a lowest common denominator standard. [EPA-HQ-OAR-2018-0276-0140-A1, p.4]

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15 See 42 U.S.C. § 7571(b).
16 U.S. Department of Transportation. (2019). "What the Cost of Airline Fuel Means to You." https://www.transportation.gov/administrations/assistant-secretary-research-and-technology/what-cost-airline-fuel-means-you

Response:

See Section IV.I.1 of the Preamble for the EPA's response on the stringency of the standards. Also, see sections VI.A, VI.B., and VI.C of the Preamble and Section 2 of the TSD for details on technologies assessed for this rulemaking (and/or for a detailed discussion on technological feasibility in setting the airplane GHG standards).

In regard to comments on weight-reducing technologies and ICAO's fuel efficiency-based metric not directly rewarding these technologies, see Section 4 of this Response to Comments document.

For the response to comments on the stringency levels of the alternatives that the EPA analyzed for this rulemaking, see Section 14.1 of this Response to Comments.

In addition, commenters suggested that the EPA should assess weight-reducing technologies and several additional technologies -- beyond those technologies that the EPA included in the EPA analysis for this rulemaking -- when considering the stringency of the airplane GHG standards. Whether or not it is appropriate for the EPA to consider such technologies for this rulemaking, the EPA has not done so for this final rulemaking (depending on the technology). The EPA did not develop a record (depending on the technology) that considers these additional technologies; therefore, the public has not been provided an opportunity to evaluate and comment upon these technologies. To effectively assess these technologies and their effect on the stringency of the standards, the EPA would need more time to gather and analyze information on them, and the EPA currently does not have the time. The EPA is now late in issuing its GHG standards applicable to new type designs, as the January 1, 2020, applicability date under the international CO2 standards has already passed, and the ICAO applicability date of January 1, 2023 for modified airplane types (changes for non-GHG Certificated Airplane Types) is fast approaching. U.S. airplane manufacturers are urging us to promptly promulgate this final rulemaking to adopt ICAO's standards, which were adopted back in 2017, because decisions are now being made by air carriers on airplane deliveries through the end of this decade.[20] Also, the EPA understands that U.S. airplane manufacturers need time to certify their airplanes, after the subsequent FAA rulemaking to enforce the

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[20] AIA, 2020: *Aerospace Industries Association comments on Control of Air Pollution from Airplanes and Airplane Engines: Greenhouse Gas Emission Standards and Test Procedures, Docket: EPA–HQ–OAR–2018–0276*, October 19, 2020.

standards, to ensure the airplanes comply with the in-production standards by 2028. Since we have not yet provided that opportunity for public comment on the additional technologies, and attempting to do so now would in the EPA's view unacceptably slow down this rulemaking, in the interests of expediency and of bringing U.S. domestic law into conformity with our obligations under the Chicago Convention, we have decided that the most appropriate course for now, under CAA section 231, is to simply adopt airplane GHG standards that are harmonized with the standards adopted by ICAO in 2017 (in terms of stringency level, timing, scope, etc.).

In regard to comments on technology following standards (as compared to technology forcing standards), in the past the EPA's actions to regulate emissions from aircraft engines came directly from the authority in section 231 of the CAA, and we have aligned the U.S. emissions requirements with those promulgated by ICAO. All of these previous ICAO emission standards, and the EPA's standards reflecting them, have generally been considered anti-backsliding standards (most aircraft engines meet the standards), which are technology following. Under this longstanding EPA and FAA rulemaking approach, international emission standards have been adopted by ICAO, with significant involvement from the FAA and the EPA, and subsequently the EPA has undertaken rulemakings under CAA section 231 to establish domestic standards that are the same as or at least as stringent as ICAO's standards. As described in the introductory paragraphs of Section IV of the Preamble, the more stringent alternatives the EPA analyzed for this rulemaking would have further limited additional costs and some additional GHG emission reductions compared to the final standards, but the additional emission reductions are relatively small from the alternatives and do not justify deviating from the international standards and disrupting international harmonization. ICAO intentionally established its airplane CO_2 standards at a level which is technology following to adhere to its definition of technical feasibility that is meant to consider the emissions performance of in-production and in-development airplanes, including types that would first enter into service by about 2020. Thus, the additional emission reductions associated with the more stringent alternatives are relatively small because all but one of the affected airplanes either meet the stringency levels or are expected to go out of production by the effective dates. In addition, requiring U.S. manufacturers to certify to a different standard than has been adopted internationally (even one more stringent) could have disruptive effects on manufacturers' ability to market planes for international operation. Consequently, the EPA did not choose to finalize either of these alternatives.

The EPA is adopting technology following standards that match ICAO's standards, to catch up with the action that ICAO undertook back in 2017 to adopt its airplane CO_2 standards. As described in detail in Section IV.I.1 of the Preamble for the EPA's response on the stringency of the standards, the EPA's final standards are consistent with section 231 of the Clean Air Act that does not require technology forcing standards. Also, in the interests of expediency, as described above, and of bringing U.S. domestic law into conformity with our obligations under the Chicago Convention, we have decided that the most appropriate course for now, under CAA section 231, is to simply adopt airplane GHG standards that are harmonized with the standards adopted by ICAO in 2017.

13.4. Costs

Comments:

Organization: Boeing Company (Boeing)

EPA's proposed rule also addresses necessary procedural requirements. For compliance with Executive Order (EO) 12866, EPA need not attribute any costs to compliance with the ICAO standard and this proposed rule (i.e., since U.S. commercial aerospace manufacturers must comply with the ICAO standard adopted internationally, whether or not EPA adopts a domestic standard, in order to sell their products in or serve foreign markets).[215] In addition, the proposed rule complies with EO 13771 because, given the requirement to comply with the ICAO standard whether or not a domestic standard is promulgated, and the cost savings for U.S. domestic manufacturers that will be able to certify their airplanes to the ICAO standard with the FAA rather than foreign certifying organizations, the total costs of the proposed regulation are less than zero (i.e., the proposed regulation would result in a savings for aircraft manufacturers compared to the status quo) . For the same reasons, this rule should also qualify as a deregulatory action under Executive Order 13771 ("Reducing Regulation and Controlling Regulatory Costs"). [EPA-HQ-OAR-2018-0276-0181-A2, pp.47-48]

[215] See 77 Fed. Reg. 36,342 (June 18, 2012) (Section 231 rulemaking implementing ICAO NOx standard) ("[T]here is no significant further direct cost to the manufacturers created by EPA's adopting the [ICAO] requirements into U.S. regulations.").

Organization: California Air Resources Board (CARB)

III. EPA must consider and evaluate these technologies objectively.

As detailed in the Multistate Comment, EPA both proposed an explicitly "no cost-no benefit" standard and utterly abdicated its responsibility to consider regulatory options that would actually reduce emissions. [EPA-HQ-OAR-2018-0276-0169 p. 18]

Organization: Anonymous Public Comment 22

EPA hides the ball on potential certification costs or benefits, and fails to fully assess alternatives, by obfuscating the role of FAA rules for any alleged benefits (See Comment A4 and A43: https://downloads.regulations.gov/EPA-HQ-OAR-2018-0276-0036/attachment_2.pdf). EPA states that international certification stems from FAA compliance, ratherthan Clean Air Act rules (See Comment A52R51, A48R47: https://downloads.regulations.gov/EPA-HQ-OAR-2018-0276-0036/attachment_2.pdf). [EPA-HQ-OAR-2018-0276-0171 p. 1]

EPA's accompanying technical support document and analysis suffers from a number of defects, many of which were exposed by interagency concerns:

Contrary to OMB Circular A-4, EPA fails to conduct a threshold or break-even analysis for its unquantified benefits related to international competitiveness. [EPA-HQ-OAR-2018-0276-0171 p. 1]

Response:

The EPA agrees with the statements of support from Boeing that the EPA does not need to attribute any costs with this proposed GHG standards, and the total costs of the proposed regulation are potentially less than zero. As stated in the sections VI.D.2 of the Preamble, this rulemaking will potentially provide for a cost savings to U.S. manufacturers since it will enable them to domestically certify their airplane (via subsequent FAA rulemaking) instead of having to certify with foreign certification authorities (which will occur without this EPA rulemaking). If the final GHG standards, which match the ICAO standards, are not adopted in the U.S., the U.S. civil airplane manufacturers will have to certify to the ICAO standards at higher costs because they will have to move their entire certification program(s) to a non-U.S. certification authority.[21] Also, following this final rulemaking for the GHG standards, the FAA will issue a rulemaking to enforce compliance to these standards, and any potential certification costs for the GHG standards will be estimated by FAA and attributed to the FAA rulemaking. Thus, there are no new certification costs for the EPA rulemaking.

In addition, as described in Section VI.E of the Preamble, ICAO intentionally established its standards, which match the final standards, at a level which is technology following to adhere to its definition of technical feasibility that is meant to consider the emissions performance of in-production and in-development airplanes, including types that would first enter into service by about 2020. Independent of the ICAO standards, nearly all airplanes produced by U.S. manufacturers will meet the ICAO in-production standards in 2028 due to business-as-usual market forces on continually improving fuel efficiency. The cumulative fuel efficiency improvement of the global airplane fleet was 54 percent between 1990 and 2019, and over 21 percent from 2009 to 2019, which was an average annual rate of 2 percent.[22] Business-as-usual improvements are expected to continue in the future. Anticipation of future ICAO standards will be another factor for manufacturers to consider in continually improving the fuel efficiency of their airplanes. Thus, all airplanes either meet the stringency levels, are expected to go out of production by the effective dates, or will seek exemptions from the GHG standard. Therefore, there will be no costs and no additional benefits from complying with these final standards – beyond the benefits from maintaining consistency or harmonizing with the international standards and preventing backsliding by ensuring that all new type design and in-production airplanes are at least as fuel efficient as today's airplanes.

Furthermore, see the response in Section 14.2 of this Response to Comments document for further details on the EPA's rationale for no costs or emission reductions from this rulemaking.

13.4.1. Reporting Requirement Costs

Comments:

Organization: Aerospace Industries Association (AIA)

Burden associated with proposed reporting requirements

Based on AIA members' experience with existing reporting requirements for engine emissions, the EPA's burden estimate of 6 hours per year for each aircraft manufacturer to provide this data is a significant underestimate. AIA believes a more appropriate figure would be 30 hours per year for each manufacturer to provide annual updates, while the initial burden to collect data for first-time reporting could be closer to 80 hours. These estimates reflect the total time expended by multiple personnel, and includes time required to consult various data sources, crosscheck against other records, and seek the necessary approval to submit the data. [EPA-HQ-OAR-2018-0276-0087-A1, p.6]

Organization: Airbus S.A.S. (Airbus)

The aviation sector is currently going through an unprecedented crisis, and resource management is a challenge. EPA made an estimation in section VII.D.4 that the cost associated with this reporting requirement would represent an "estimated annual burden and cost of about 6 hours and $543 per manufacturer" because it would add "only 2 basic categories to those already requested by the CO2DB." This cost is indeed largely underestimated, and it is important that the proposed reporting requirements demonstrate actual benefits for environmental protection, to ensure optimum use of resources from the aviation sector. [EPA-HQ-OAR-2018-0276-0077-A1, p.3]

Organization: Gulfstream Aerospace Corporation

Gulfstream believes the Information Collection Request (ICR) reporting requirement as detailed in the NPRM will be more onerous than predicted in the EPA cost estimate. On an annual basis multiple personnel will be required to consult various data sources, crosscheck against other records, and seek necessary approvals to submit the data. Initial setup of a compliance structure will require additional effort the first year. [EPA-HQ-OAR-2018-0276-0078-A1, p.2]

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[22] ATAG, 2020: *Tracking Aviation Efficiency, How is the aviation sector performing in its drive to improve fuel efficiency, in line with its short-term goal?* Fact Sheet #3, January 2020. Available at https://aviationbenefits.org/downloads/fact-sheet-3-tracking-aviation-efficiency/ .

Organization: International Co-ordinating Council of Aerospace Industries Associations (ICCAIA)

A quick question that I don't know if you are allowed to answer but as I represent all of the manufacturers I am sure you can understand why I am asking… The NPRM states that the EPA believes that there are 10 manufacturers that would be impacted by the CO_2 rule. My question is an easy one – are you able to tell me the ten you have identified? As you can imagine I would 1) like to understand which of my constituents you believe are subject to the rule and 2) would like to see if anyone has been excluded that I would have expected to see on the list. [EPA-HQ-OAR-2018-0276-0083-A1, p.3]

The list looks solid for western manufacturers but where I am not sure is regarding some products from the East, namely the Irkut MC-21 and the COMAC 919. [EPA-HQ-OAR-2018-0276-0083-A1, p.1]

Whilst the COMAC is a totally unknown quantity as they are not a member of ICCAIA, Irkut is a different matter. My understanding is that they do intend to seek FAA certification for the MC-21; does that mean that they should be on your list? [EPA-HQ-OAR-2018-0276-0083-A1, p.1]

Response:

As discussed on Section 9, the EPA is not adopting the proposed reporting requirements in the final rule. Thus, comments on the burden associated with the proposed reporting requirement are no longer relevant.

14. Alternatives (two alternative scenarios)

Comments:

Organization: Anonymous Public Comment 22

EPA's accompanying technical support document and analysis suffers from a number of defects, many of which were exposed by interagency concerns:

EPA fails to analyze less stringent regulatory scenarios, including those analyzed by ICAO, despite concerns from interagency commenters (See Comment A97R96: https://downloads.regulations.gov/EPA-HQ-OAR-2018-0276-0036/attachment_2.pdf). [EPA-HQ-OAR-2018-0276-0171 p. 1]

Organization: General Electric Company (GE)

Moreover, when preparing this proposal, EPA carefully analyzed the impacts of two more stringent alternatives. These analyses show that the alternatives would lead to minimal reduction in GHG emissions, while imposing significant costs associated with deviating from the ICAO standards. Consequently, EPA appropriately decided against proposing either of these alternatives. [EPA-HQ-OAR-2018-0276-0157-A1, p.8]

Response:

See Section IV.I.1 of the Preamble for the EPA's response on the stringency the standards, which also pertains to the stringency of the two alternatives the EPA analyzed. For further details on the EPA response to comments on the stringency levels of the two alternatives, see the EPA response in Section 14.1 of this Response to Comments document.

14.1. Emission Effects

Comments:

Organization: California Attorney General's Office and the California Air Resources Board (CARB) et al.

EPA examined two alternatives besides the Proposed Rule, but these also result in no GHG reductions over the baseline case. EPA never considered other programs of regulation that, under its own analysis, are technically feasible, including more stringent versions of ICAO's GHG standard and other emission reduction strategies, like alternative fuels or ground operations changes. Declining to consider any option that reduces emissions using feasible technologies is unlawful and arbitrary. Neither does EPA's "harmonization" interest under the Chicago Convention excuse EPA from carrying out its mandate under the Clean Air Act.

1. EPA only examined options that result in no emission reductions over business as usual.

As EPA's analysis confirms, the proposed aircraft emission standards do not reduce any GHG emissions from aircraft. 85 Fed. Reg. at 51,558, 51,583. Importantly, this fact is not due to aircraft manufacturers' incentive to comply with ICAO standards independent of EPA standards; rather, it is because the ICAO standards themselves were set to such a low stringency level that all aircraft currently in development or in production would already comply, even in the absence of any ICAO standards. See id. at 51,570; Draft TSD, at 38-39.

As EPA's technical study explains, the business-as-usual case—i.e., what the aviation sector would do with no ICAO or EPA regulation—already includes a continued level of emission-reduction as technology improves and aging aircraft are retired for newer, more advanced models. Draft TSD, at 104-106. These business-as-usual improvements merely slow down the massive increase in aviation sector emissions projected through 2040; they do not "bend the curve" down toward carbon-neutrality, which is necessary to stave off the worst effects of climate change. Draft TSD, at 105 (Figure 5-9); see supra at note 134.

In developing the ICAO standards, CAEP considered ten "stringency levels," with 1 being the least stringent and 10 the most stringent considered.[135] The standards ICAO adopted correspond to the stringency levels in the following chart, with "SL 8.5" falling between SL 8 and 9:

[See table on p. 28 of docket number EPA-HQ-OAR-2018-0276-0176-A1.]

Draft TSD at 122-24.[136] EPA projects that, globally, all aircraft models already meet these levels; will meet these levels with business-as-usual improvements by the effective date; or will go out of production before the effective date. 85 Fed. Reg. 51,583. To call this "technology-following" is an understatement: it is not simply that ICAO adopted proven technology, but that it set the standard to be so lax that even the worst performing aircraft fleets would meet it. Draft TSD, at 38-39; see 85 Fed. Reg. at 51,570. The International Council on Clean Transportation (ICCT) finds this standard "lags the existing efforts of manufacturers by more than 10 years"; indeed, 89 percent of aircraft deliveries in 2019 already pass the ICAO standard for 2028.[137]

Unsurprisingly, this "back of the pack" standard results in no reductions of GHGs relative to the baseline. Indeed, even though ICAO's models predicted a modest reduction of 250 megatonnes (Mt) of emissions globally (45.5 Mt in U.S.), EPA's review shows these reductions are illusory: ICAO credited to its standards what would occur anyway due to market drivers, fleet turnover, and other business-as-usual factors. 85 Fed. Reg. at 51,583-84; Draft TSD, at 116, 118. In addition to the proposed standards (Scenario 1), EPA states it has considered two alternatives: Scenario 2 would adopt the same stringency level as Scenario 1, but move up the effective dates of compliance; and Scenario 3 would adopt a slightly more stringent standard and advance compliance dates. Draft TSD, at 128. The Scenario 3 standard would correspond to the ICAO stringency levels as follows:

[See table on p. 28 of docket number EPA-HQ-OAR-2018-0276-0176-A1.]

Id. at 128-130. Like Scenario 1, Scenario 2 would result in no GHG reductions over business as usual. Id. at 132. Under Scenario 3, while EPA modeled negligible reductions based on old data, it admits that the most current information likewise projects no reductions at all over baseline. Id. at 133, 136.[138]

EPA did not evaluate other emission standards beyond Scenarios 1, 2, and 3. [EPA-HQ-OAR-2018-0276-0176-A1, pp.27-29]

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[135] The Draft TSD uses "SO" to refer to the stringency options considered during CAEP deliberations and "SL" to refer to the stringency levels set out in the CAEP/10 standards. These levels are equivalent, and this comment uses "SL."

[136] The stringency level is a function that ties the GHG emission limit to airplane weight (maximum takeoff mass). For aircraft with weight between 60,000 – 70,000 kg, the function is a "horizontal" transition between the stringency levels for weights below 60,000 kg and above 70,000 kg.

[137] Zheng, S. & Rutherford, D., "Fuel Burn of New Commercial Jet Aircraft: 1960 to 2019," at iv, 8 (Sept. 2020), https://theicct.org/sites/default/files/publications/Aircraft-fuel-burn-trends-sept2020.pdf.

[138] Scenario 3's marginal increase in stringency compared to Scenario 1 would affect only one noncompliant aircraft model: the Airbus 380, which no U.S. airline uses and which will go out of production in 2025. The impact on the Airbus 380 results in negligible domestic emission reductions. Draft TSD, at 106-107.). EPA's modeling was conducted prior to Airbus's announcement of a reduced order for the A380. EPA states that, taking into account the reduced order, there would be no reduction at all. Id. at 133.

Organization: Davis, Lauren and Nguyen, Johnnie Q.

The rule only states that two alternatives were considered, but ultimately "rejected [the] two more stringent standards, after concluding that one would provide only "relatively small" additional emission reductions, or no additional reductions at all—not enough to justify "disrupting international harmonization," or to risk disrupting manufacturing." (P.R. at 51654). For those living closest to airports, and society generally, it would seem the EPA has cast aside their health as just a negative externality to ensure the airplane industry is not disrupted. [EPA-HQ-OAR-2018-0276-0145-A1, p.6]

Organization: Life:Powered, an initiative of the Texas Public Policy Foundation

The EPA has also failed to prove that the rule will meet the Section 231 requirements that it "shall not change the aircraft engine emission standards if such change would significantly increase noise and adversely affect safety." There is no evidence that the EPA assessed the noise, safety, and local air quality consequences of the ICAO standards. This is especially problematic, as the International Energy Agency, Government Accountability Office, and numerous recent academic papers have noted the likelihood that more stringent greenhouse gas or fuel efficiency requirements will elicit trade-offs with noise, safety, or local air pollution effects. [EPA-HQ-OAR-2018-0276-0172-A1, pp.2-3]

Response:

The range of stringency options for the international airplane fuel efficiency standards, which match the proposed GHG standards, was developed through a deliberate process by technical experts in ICAO's Committee on Aviation Environmental Protection (CAEP). As described in Section VI.B in the Preamble, the long-established ICAO/CAEP terms of reference were taken into account when deciding the international Airplane CO_2 Emission Standards, principal among these being technical feasibility. For the ICAO CO_2 certification standard setting, technical feasibility refers to any technology expected to be demonstrated to be safe and airworthy proven to Technology Readiness Level[23] (TRL) 8 by 2016 or shortly thereafter (per CAEP member guidance; approximately 2017), and expected to be available for application in the short term (approximately 2020) over a sufficient range of newly certificated airplanes.[24] This means that the analysis that informed the international standard considered the emissions performance of in-production and on-order or in-development[25] airplanes, including types that first enter into service by about 2020.

As described in Section 6.1.1 of the technical support document (TSD), CAEP analyzed 10 different stringency options (SOs) for standards of both in-production and new type design airplanes, comparing airplanes with a similar level of technology on the same stringency level. These stringency options were generically referred to numerically from “1” as the least stringent to “10” as the most stringent. The range of stringency options fell into three categories as follows: (1) CO_2 stringency options that could impact only the oldest, least efficient airplanes in-production around the world, (2) middle range CO_2 stringency options that could impact many airplanes currently in-production and comprising much of the current operational fleet, and (3) CO_2 stringency options that could impact airplanes that have either just entered production or are in final design phase but would be in-production by the time the international Airplane CO_2 Emission Standards become effective. Also, CAEP assessed several implementation dates, including, 2020, 2023, 2025, and 2028.

The EPA's analysis of the proposed standards and alternatives covered the wide range of stringency options that CAEP considered, in terms of implementation date and stringency level, within this technical feasibility space. The EPA's proposed standards and the alternatives are on the more stringent end of this wide range of stringency options. The comment that "EPA only examined options that result in no emission reductions over business as usual" is not accurate. Although the EPA's analysis showed that the alternatives resulted in no or limited emission reductions and do not justify differentiating from the international standards and disrupting international harmonization, the results of the EPA's analysis were the outcome instead of the precondition of the analysis. In addition, see Section IV.I.1 of the Preamble that describes the broad discretion the EPA has under section 231 of the CAA in setting standards or the stringency of standards. Also, this broad discretion pertains to the alternatives the EPA assessed in analyzing this stringency of standards.

Regarding this rule's impact on people living closest to airports, the same conclusion holds true when comparing the primary scenario (or the proposed standards) versus the alternatives.

14.2. Costs

<u>Comments:</u>

Organization: Boeing Company (Boeing)

1. Boeing Faces Significant Financial Hardship

[23] TRL is a measure of Technology Readiness Level. CAEP has defined TRL8 as the “actual system completed and ‘flight qualified’ through test and demonstration.” TRL is a scale from 1 to 9, TRL1 is the conceptual principle, and TRL9 is the “actual system ‘flight proven’ on operational flight.” The TRL scale was originally developed by NASA. ICF International, CO2 Analysis of CO2-Reducing Technologies for Aircraft, Final Report, EPA Contract Number EP-C-12-011, see page 40, March 17, 2015.

[24] ICAO, 2016: Report of the Tenth Meeting, Montreal, 1-12 February 2016, Committee on Aviation Environmental Protection, Document 10069, CAEP10, 432pp, is found on page 27 of the English Edition of the ICAO Products & Services 2020 Catalog and is copyright protected: Order No. 10069. For purchase available at: https://www.icao.int/publications/Pages/catalogue.aspx (last accessed March 16, 2020). The statement on technological feasibility is located in Appendix C (page 5C-15, paragraph 6.2.1) of this report.

[25] Airplanes that are currently in-development, but were anticipated to be in production by about 2020.

There is little question that the airline industry continues to face severe economic headwinds even as parts of the U.S. economy begin to recover from COVID-related losses. Some estimates suggest that global air passenger volume will drop by 60 to 70% in 2020 compared to 2019 volumes.[204] This decline has been described as "the most severe crisis that the airline industry has ever faced."[205] By comparison, the decline in air traffic following the events of September 11, 2001, was about 12% in the six months following the attacks, or about one-fifth the level of air traffic decline forecast due to COVID-19.[206] Air travel is also not projected to fully recover in the near-term, with significant reductions projected through at least 2023 (when travel is still projected to be down between 5 and 10% when compared with 2019 levels) according to one estimate,[207] and not return to pre-COVID levels until 2024 in the most recent forecasts.[208] Due to the impacts of the COVID-19 pandemic, Boeing's 2020 Market Outlook projects a 10-year demand for commercial aircraft that reflects an 11% reduction compared to that projected in 2019.[209] [EPA-HQ-OAR-2018-0276-0181-A2, p.44]

Boeing has been severely challenged by these market conditions, and EPA and FAA may, and indeed must, take these conditions into account when determining when to phase-in the ICAO standard for the 767F, lest its action be deemed arbitrary and capricious for failure to take into account the overly burdensome costs to Boeing and others of attempting to comply by 2028. The ICAO standard—adopted in March 2017—was developed based on the assumption that historic growth patterns in airline traffic and normal schedules for equipment replacement would continue. Since early 2020, however, these patterns have been severely disrupted by COVID-19, with effects to be felt throughout the coming years, as described in Section I.D. [EPA-HQ-OAR-2018-0276-0181-A2,pp.44-45]

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[204] From Bad to Worse: Global Air Traffic to Drop 60 to 70% in 2020, S&P Global Ratings (Aug. 12, 2020), available at https://www.spglobal.com/ratings/en/research/articles/200812-from-bad-to-worse-global-air-traffic-to-drop-60-70-in-2020-1161-389.
[205] Id.
[206] Id.
[207] Id.
[208] See IATA Press Release No. 63, Recovery Delayed As International Travel Remains Locked Down (July 28, 2020), available at https://www.iata.org/en/pressroom/pr/2020-07-28-02/.
[209] See Boeing News Release, Boeing Forecasts Challenging Near-Term Aerospace Market with Resilience in Long Term (Oct. 6, 2020), available at https://boeing.mediaroom.com/2020-10-06-Boeing-Forecasts-Challenging-Near-Term-Aerospace-Market-with-Resilience-in-Long-Term; see also Boeing's Commercial Market Outlook 2020-2039, available at https://www.boeing.com/resources/boeingdotcom/market/assets/downloads/2020_CMO_PDF_Download.pdf; Boeing's Commercial Outlook 2019-2039 (2019), available at https://www.boeing.com/resources/boeingdotcom/commercial/market/commercial-market-outlook/assets/downloads/cmo-2019-report-final.pdf.

Organization: Center for Biological Diversity, Earthjustice, on behalf of the Sierra Club and Friends of the Earth, and the Natural Resources Defense Council (NRDC)

EPA failed to analyze the costs and benefits of a meaningful range of possible emission standards. Though EPA acknowledges that it was obligated to propose standards as a result of its 2016 findings that the CO_2 and other gases emitted by aircraft "endanger the public health and welfare of current and future generations,"[134] the Proposal is, remarkably, devoid of any analysis of alternatives that would result in any greenhouse gas emissions reductions, let alone the significant reductions necessary to address the endangerment findings.

The Proposal itself contains only a passing reference to alternatives, stating that just one of the two alternatives EPA considered reduced emissions, "but the additional emission reductions are relatively small from this alternative and do not justify differentiating from the international standards and disrupting international harmonization."[135] As discussed below, a close look at the Technical Support

Document reveals that the EPA has misstated the emissions reduction potential of the more-stringent alternative it considered and rejected, and its reasons for doing so are arbitrary and capricious. Neither alternative considered reduces greenhouse gas emissions.

In the Technical Support Document, two alternative scenarios were presented. Both were derived from the ten stringency options considered half a decade ago during the international negotiations to set the ICAO standards. EPA selected two scenarios (Scenarios 2 and 3 in the table below) and compared them to the Proposal (Scenario 1) "to consider whether moving the implementation date(s) forward (for in-production airplanes) and tightening the stringency (for both in-production and new type designs) would make a meaningful difference."[136]

Table 1-Proposal and Alternative Scenarios[137]

[Table 1 can be found on p.20 of docket number EPA-HQ-OAR-2018-0276-0150-A1.]

EPA looked at the existing airplane fleet and its projected evolution to determine which models would be impacted under Scenario 2 and 3 relative to the Proposal. Although the discussion of the alternative scenarios is opaque, outdated, and misleading, EPA ultimately admits that neither the Proposal nor either of the alternatives examined would reduce greenhouse gas emissions or increase costs for manufacturers.

Scenario 2 includes the "earliest implementation date that is practical" among the ten scenarios considered at the ICAO negotiations.[138] The Technical Support Document first states that all airplane models except one are "expected to be in production and compliant with" the accelerated 2023 in-production delivery date in Scenario 2.[139] EPA then notes that the outlier model—a Boeing 767-3ERF freighter airplane—is expected to be out of production by the earlier 2023 in-production airplane implementation date.[140] (Moreover, due to the delay of the in-production deadline to 2028 for dedicated freighters, as displayed in Table 1, and the plane's eligibility for an exemption for "airplanes at the end of their production life," the plane could escape the 2023 deadline in any case).[141] Scenario 2 itself therefore does nothing to affect the status quo, and EPA admits that it does "not . . . result in additional GHG reductions or costs relative to the proposed standards or Scenario 1."[142]

Scenario 3 "represents the most stringent option analyzed" during the international negotiations.[143] It accelerates the implementation date for in-production airplanes and increases the stringency of the standards for new type and in-production airplanes—it is the position the United States advocated for during ICAO negotiations.[144] Despite its support for Scenario 3 in 2015, EPA now claims that "there are limited [GHG] reductions and costs from Scenario 3."[145] However, EPA admits that any reductions are the result of the scenario's "impacts on a single airplane model, the Airbus A380."[146] EPA projected the emissions reductions associated with Scenario 3 to be "limited" because few A380s were expected to be built after the early implementation date for in-production airplanes of 2023.[147] In fact, EPA admits that even that conclusion about the limited emissions reductions associated with these aircraft was wrong because EPA ran its analysis before Airbus made a critical announcement about the plane in question: Airbus now plans to end production of A380s ahead of the early 2023 implementation date (and is eligible for an exemption even if it does continue production).[148] Considering the end of A380s production, Scenario 3 itself ultimately results in "no costs and no emission reductions."[149] Notably, the more accelerated and stringent standards would cost industry nothing, but EPA still refused to adopt them for reasons of "global consistency" and to ensure U.S. manufacturers are not "at a competitive disadvantage."[150]

There are several ways that EPA's selection of the Proposal instead of other alternatives is arbitrary and capricious. First, EPA's justification for eliminating alternative scenarios 2 and 3, which offer earlier implementation dates, is unsupported by the evidence before the agency. The reasons provided in the Technical Support Document for rejecting these scenarios are unsound. "Global consistency" is not required for the U.S. to meet its international treaty obligations (see Section IV.D., supra), and

U.S. manufacturers cannot be at a "competitive disadvantage" if an earlier implementation date and more stringent standards would not cost them anything. EPA's statements in the Proposal are also unsupported. EPA states that Scenario 3 results in "some additional GHG emission reductions compared to the proposed standards,"[151] but this is flatly contradicted by the conclusion in the Technical Support document that Scenario 3 results in "no costs and no emission reductions." Elsewhere, EPA states that it must give manufacturers "knowledge of the level of future standards at least 8 years in advance of any new type design entering service."[152] While lead time may be a relevant consideration for standards that actually reduce emissions by requiring changes in type design, it is not relevant, let alone necessary, for a Proposal that EPA acknowledges manufacturers would already meet should it be implemented earlier. At a minimum, EPA should have explained its reasoning for not adopting Scenarios 2 and 3. In 2015 and 2016, EPA spent months developing unique data and analysis to inform its position to support Scenario 3 at the ICAO negotiations.[153] "[F]or the first time in the 30+ year history" of the negotiations, EPA provided objective information that came from a nonindustry source.[154] EPA now arbitrarily eschews that option based on an "explanation . . . that runs counter to the evidence before" it.[155]

Second and more importantly, EPA's failure to consider any alternatives that actually fulfill the emissions-reduction purpose of the Proposal puts on full display EPA's refusal to consider the most important aspect of the problem before the agency: the need to protect public health and welfare from the overwhelming damage done by greenhouse gas-induced climate change. Instead, EPA, relying on its commitment to a fabricated "international harmonization" polestar, arbitrarily and without explanation limits its alternative considerations to only those considered by ICAO and, even among those, considers just a select three. That decision unlawfully precludes consideration of alternatives consonant with the forward-looking, preventative approach demanded by section 231 and the Clean Air Act. There are many obvious alternative standards to those considered at ICAO, including those cited in Section V, infra.[156] EPA has previously proposed some alternative options for regulation in its endangerment findings and advanced notice of proposed rulemaking, though those are now more than five years out of date. Today, EPA must rely on the best science and what is currently possible and necessary to address the climate emergency, addressing five additional years of information since the ICAO negotiations.

Finally, even if EPA had properly considered an adequate array of alternatives, the way it conducted its alternative analysis itself was flawed. In analyzing alternatives, agencies must refrain from "put[ting] a thumb on the scale by undervaluing the benefits and overvaluing the costs of more stringent standards."[157] But that is exactly what EPA did. As the Institute for Policy Integrity explains in its concurrently submitted comment letter, EPA improperly focused only on domestic climate damages and applied an inappropriate seven percent discount rate to those damages. The undersigned incorporate these criticisms by reference. EPA's use of the social domestic cost of carbon tool to determine that the benefits of Scenario 3 were outweighed by its costs is particularly egregious.[158] The Trump administration replaced long-standing social cost of greenhouse gas emission tools with "interim" tools to artificially drive down the benefits of environmental rules. A district court recently found that use of the interim social cost of methane tool was arbitrary and capricious: "an agency simply cannot construct a model that confirms a preordained outcome while ignoring a model that reflects the best science available."[159] In particular, the court determined that the interim tool was unlawful because it replaces peer-reviewed models that use the best available data;[160] ignores the impacts of climate change on millions of Americans living abroad and on U.S. interests due to worldwide climate disruption;[161] underestimates the U.S.' share of global damages from emissions;[162] and overstates the significance of the regulatory rules and orders cited to justify the new rule, as those rules and orders do not require exclusion of global impacts.[163] The same principles and logic that the district court found so flawed when it examined the interim tool to assess the domestic cost of methane underpin the interim tool to assess the domestic cost of carbon. Reliance on that tool is arbitrary and capricious.

EPA must also account for the staggering costs associated with further delay in reducing greenhouse gas emissions. The cost of delaying the necessary cuts to the nation's greenhouse gas emissions is extremely steep and irreversible, rising exponentially as delay continues.[164] Based even on highly conservative assumptions (which omit, for example, the effects of crucial tipping points such as methane releases from melting permafrost), the cost of delay alone was found in the Obama administration's now-outdated Cost of Delay Report to be at least $150 billion for every year of delayed action if the delay results in overshooting the increase of temperatures over pre-industrial levels by just one degree Celsius, and sharply higher annually for every degree of warming thereafter.[165] Every year of unnecessary delay in reducing greenhouse gas emissions from aircraft in the face of steeply rising, persistent, and irreversible costs, including the acknowledged possibility that mitigation will be too late altogether, is unreasonable and unjustifiable. [EPA-HQ-OAR-2018-0276-0150-A1, pp.19-23]

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[134] 85 Fed. Reg. at 51,557.
[135] Id. at 51,564.
[136] Technical Support Document at 126.
[137] Id. at 128 (adopted from Table 6-4).
[138] Id. at 126.
[139] Id. at 132.
[140] Id. at 133.
[141] Id. at 132-33.
[142] Id. at 132.
[143] Id. at 126.
[144] Id. at 129-30.
[145] Id. at 133.
[146] Id.
[147] Id. at 136.
[148] Id. at 133 ("The early exit of A380 would result in no costs and no emission reductions from Scenario 3. However, this EPA analysis of Scenario 3 was conducted prior to Airbus's announcement, so the analysis did not consider the effect of the A380 ending production in 2021. Thus, this analysis results in limited costs and emission reductions for Scenario 3"), 137 ("the A380 could apply to utilize the proposed exemption provisions (described in section V.E of the preamble), which are intended for airplanes at the end of their production life. If Airbus chose to apply for an exemption and it was granted, the A380 would not need to respond to Scenario 3, and thus, there would be no resultant emission reductions or costs for Scenario 3.").
[149] Id. at 133.
[150] Id. at 146.
[151] 85 Fed. Reg. at 51,564.
[152] 85 Fed. Reg. at 51,567.
[153] Charmley email 2/16/2016.
[154] Id.
[155] State Farm, 463 U.S. at 43.
[156] See Int'l Ladies' Garment Workers' Union v. Donovan, 722 F.2d 795, 816 n.41, 817-18 (D.C. Cir. 1983) (agencies must consider "obvious" alternatives and provide an adequate explanation when alternatives are rejected: "the agency's consideration of some alternatives does not free it from considering other obvious alternatives. A contrary holding would provide agencies an easy means to circumvent this aspect of reasoned decision making, since they could, according to the Government, avoid considering obvious and potentially viable alternatives simply by showing that they considered any alternatives at all.").
[157] Ctr. for Biological Diversity v. Nat'l Highway Traffic Safety Admin., 538 F.3d 1172, 1198 (9th Cir. 2008).
[158] Technical Support Document at 144-146. As explained above, Scenario 3 does not actually reduce emissions nor impose any costs because the type of plane affected by this scenario is going out of production ahead of the compliance deadline.
[159] California v. Bernhardt, No. 4:18-cv-05712-YGR, 2020 U.S. Dist. LEXIS 128961, at *84 (N.D. Cal. July 15, 2020).
[160] Id. at *77-*78.

161 Id. at *81.
162 Id.
163 Id. at *78-*79.
164 The White House, Cost of Delaying Action to Stem Climate Change (Jul. 29, 2014) at 2, available at https://obamawhitehouse.archives.gov/sites/default/files/docs/the_cost_of_delaying_action_to_stem_climate_change.pdf.
165 Id.

Response:

In regard to the response on the stringency levels of the alternatives analyzed, see Section 14.1 of the Response to Comments document. For the criteria the EPA must consider in setting the stringency of standards, which also pertains to the evaluation of the stringency in alternatives, see Section IV.I.1 of the Preamble.

In regard to Boeing comments on COVID-19 effects and delayed implementation date for the 767F, see Section 6.2.1.2 of the Response to Comments document.

For the EPA's response to comments on monetized benefits (i.e., social cost of greenhouse gases), see Section 14.3 of the Response to Comments Document.

14.3. Monetized Benefits

Comments:

Organization: California Air Resources Board (CARB)

If and when EPA fulfills its obligation to consider regulatory options that produce both costs and benefits, it must evaluate these options using objective and appropriate tools and metrics. This excludes use of the arbitrary "interim" domestic social cost of carbon values that EPA applied to this proposal,79 like many other proposals and rules over the last three anda- half years.80 It also necessitates the application of discount rates that are appropriate to the intergenerational nature of climate impacts.

Beginning in 2009, the President's Council of Economic Advisors and the U.S. Office of Management and Budget (OMB) convened the Interagency Working Group (IWG) on the Social Cost of GHGs (SC-GHGs) to develop a methodology for estimating the social cost of carbon and other GHGs. The IWG, comprised of scientific and economic experts, recommended the use of SC-GHG values based on models developed over decades of global peer-reviewed research.81 These models and methodologies have been modified and updated since first being utilized, and represent the best available science in the field.

EPA's interim domestic SC-GHGs are a fraction of the IWG values – which well may be EPA's intent. But given the interconnectedness of the global economy and security, climatic damages outside U.S. borders have both direct and indirect domestic impacts.82 These include impacts to U.S. citizens (including U.S. military service members) who live abroad and/or have significant investments abroad; potential impacts to trade flows and global commodity markets that affect the U.S. economy; impacts to U.S. military sites abroad; and other risks to national security with significant potential costs.83 As a federal court recently affirmed, a purported estimate of the domestic social costs of GHGs that omits these impacts on the U.S. violates the APA by "failing to consider ... important aspect[s] of the problem" and "run[ning] counter to the evidence before the agency."84

Although Executive Order 13783 withdrew the IWG reports as no longer representative of federal governmental policy in March 2017,85 "[T]he President did not alter by fiat what constitutes the best available science. The Executive Order in and of itself has no legal impact on the consensus that IWG's estimates constitute the best available science about monetizing the impacts of greenhouse gas emissions."86 As a federal court recently admonished, "An agency simply cannot construct a model that confirms a preordained outcome while ignoring a model that reflects the best science available."87

Moreover, a variety of experts, including the National Academies of Sciences, have concluded that no appropriate domestic-only social cost of GHGs estimate exists.88 A recent U.S. Government Accountability Office report affirms that EPA's domestic SC-GHGs does not account for the best available science, in violation of Executive Orders 12688 and 13783, and OMB Circular A-4, which EPA identifies as justification for its interim domestic values.89 Because updated IWG reports continue to be the best available science, and no appropriate, peer-reviewed domestic-only social cost of GHGs exists, use of domestic-only social cost of GHG values is arbitrary and capricious.90

Furthermore, the TSD incorporates only discount rates of 3 and 7 percent, which it asserts, incorrectly, complies with OMB Circular A-4.91 Circular A-4 suggests that utilizing discount rates of 3 and 7 percent is likely appropriate, at minimum and in general. However, regarding costs and benefits that arise across generations—the type of intergenerational discounting at play in analysis and consideration of climate impacts—Circular A-4 suggests that discount rates ranging from 1 to 3 percent are more appropriate.92 Other experts also reject a 7 percent approach, with IWG recommending discount rates of 2.5, 3, and 5 percent,93 and surveyed experts almost unanimously recommending a long-term social discount rate between 1 and 3 percent.94 Like the interim domestic SC-GHGs, EPA's inappropriate discount rates undermine the agency's valuation of GHG reductions. [EPA-HQ-OAR-2018-0276-0169-A1, pp.18-20]

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[79] Proposal TSD at 137 et seq.

[80] See, e.g., CARB comments on Notices of Proposed rulemaking: "Safer Affordable Fuel- Efficient Vehicles Rule for Model Years 2021-2026 Passenger Cars and Light Trucks," 83 Fed. Reg. 53,204 (Oct. 22, 2018), Docket ID No. EPA-HQ-OAR-2018-0283, submitted Oct. 26, 2018; "Affordable Clean Energy Rule," 83 Fed. Reg. 44,746 (Aug. 31, 2018), Docket ID No. EPA-HQ-OAR-2017-0355, submitted Oct. 31, 2018; "Oil and Natural Gas Sector: Emission Standards for New, Reconstructed, and Modified Sources Review," 84 Fed. Reg. 50,244 (Sept. 24, 2019), Docket ID No. EPA-HQ-OAR-2017-0757, submitted Nov. 25, 2019; "Increasing Consistency and Transparency in Considering Costs and Benefits in the Clean Air Act Rulemaking Process," 85 Fed. Reg. 35,612 (June 11, 2020), EPA–HQ–OAR–2020–00044, submitted August 3, 2020.

[81] See IWG, "Addendum to Technical Support Document on Social Cost of Carbon for Regulatory Impact Analysis under Executive Order 12866: Application of the Methodology to Estimate the Social Cost of Methane and the Social Cost of Nitrous Oxide" (Aug. 2016), available at https://www.epa.gov/sites/production/files/2016-12/documents/addendum_to_scghg_ tsd_august_2016.pdf.

[82] National Academies of Science, Engineering, and Medicine, Valuing Climate Damages: Updating Estimation of the Social Cost of Carbon Dioxide (2017), available at http://www.nap.edu/24651, conclusion 2-4 ("It is important to consider what constitutes a domestic impact in the case of a global pollutant that could have international implications that impact the United States. More thoroughly estimating a domestic [social cost of carbon dioxide] would therefore need to consider the potential implications of climate impacts on, and actions by, other countries, which also have impacts on the United States.").

[83] Public Law 115-91, Defense Authorization Act of 2018, December 12, 2017, 131 Stat. 1283, § 335.

[84] California v. Bernhardt, No. 18-5712, ––– F.Supp.3d ––––, 2020 WL 4001480 (N.D. Cal. July 15, 2020) at *27, appeal pending, No. 20-16794 (filed Sept. 16, 2020), citing Motor Vehicle Mfrs. Ass'n of U.S., Inc. v. State Farm Mut. Auto. Ins. Co., 463 U.S. 29, 43 (1983).

[85] E.O. 13783, March 28, 2017, § 5(b).

[86] California v. Bernhardt at *25, citing State Farm, 463 U.S. at 43.

[87] Id. at *28, citing Center for Biological Diversity v. NHTSA, 538 F.3d 1172, 1198-1201 (9th Cir. 2008) (agency "cannot put a thumb on the scale by undervaluing the benefits and overvaluing the costs of more stringent standards" by failing to "monetize or quantify the value of carbon emissions reduction"); Zero Zone, Inc. v. United States Dep't of Energy, 832 F.3d 654, 677-79 (7th Cir. 2016) (agency reasonably relied on IWG's estimates to calculate global benefits of greenhouse gas reductions from energy efficiency rules).

[88] National Academies of Science, Engineering, and Medicine, Valuing Climate Damages: Updating Estimation of the Social Cost of Carbon Dioxide, 2017, at 12, available at http://www.nap.edu/24651; California v. Bernhardt at *27 (noting that "focusing solely on domestic effects has been soundly rejected by economists as improper and unsupported by science.").
[89] U.S. Government Accountability Office, "Social Cost of Carbon: Identifying a Federal Entity to Address the National Academies' Recommendations Could Strengthen Regulatory Analysis," GAO-20-254 (June 2020), at 29 ("The rulemakings we reviewed used the current federal estimates, which were based on EPA's interim estimates; therefore, the federal government may not be well positioned to ensure agencies' future regulatory analyses are using the best available science until the agencies finalize federal estimates that consider the National Academies' implemented recommendations.").
[90] California v. Bernhardt at *28.
[91] Proposal TSD at 140. The TSD appends an alternate cost-benefit analysis using a different SC-GHGs that purports to incorporate global effects, inadequately, with a 2.5 percent discount rate. Proposal TSD at 147-154.
[92] OMB Circular A-4 (Sept. 2003).
[93] IWG, "Addendum to Technical Support Document on Social Cost of Carbon for Regulatory Impact Analysis under Executive Order 12866: Application of the Methodology to Estimate the Social Cost of Methane and the Social Cost of Nitrous Oxide" (Aug. 2016), available at https://www.epa.gov/sites/production/files/2016-12/documents/addendum_to_scghg__tsd_august_2016.pdf.
[94] In a recent peer-reviewed report, researchers surveyed 197 experts on the long-term social discount rates. While there was much variation, the median preferred social discount rate is 2 percent, and 92 percent of experts surveyed prefer a social discount rate between 1 and 3 percent. Moritz Drupp et al., "Discounting Disentangled," American Economic Journal: Economic Policy, 10 (4): 109-34 (2018), available at https://www.aeaweb.org/articles?id=10.1257/pol.20160240&&from=f.

Organization: Environmental Defense Fund, Institute for Policy Integrity at New York University School of Law, Montana Environmental Information Center, Natural Resources Defense Council, Sierra Club, Union of Concerned Scientists

Although EPA does not explore any scenarios that would provide significant reductions in greenhouse gas emissions, one of the scenarios EPA analyzes in the Technical Support Document ("TSD") for the Proposed Rule,4 Scenario 3, appears to have modest emissions reduction effects.[5] However, EPA downplays the climate benefits from Scenario 3 by using the flawed 'interim' social cost of greenhouse gases estimates. If EPA had used the Interagency Working Group on the Social Cost of Carbon's ("IWG" and "SCC") 2016 central social cost estimates, it would conclude that Scenario 3's carbon dioxide benefits would be roughly nine times greater than reported in the TSD.[6] As EPA continues to evaluate standards for airplane emissions—including both Scenario 3 as well as more ambitious proposals that would lead to real and substantial reductions of greenhouse gas emissions from the high-polluting aviation sector—it should apply the IWG's estimates of the social cost of greenhouse gases, which have been widely recognized for accounting for the full damages from greenhouse gas emissions using the best available science. Notably, the IWG's central estimates are considered by many economic and legal experts to reflect a conservative estimate of the true costs of greenhouse gas emissions and should be treated as a lower-bound estimate.[7] [EPA-HQ-OAR-2018-0276-0183-A1, pp. 1-2]

Indeed, the TSD contains a number of flaws with respect to monetizing greenhouse gas emissions, and so disregards tens of millions of dollars in climate benefits just from the modest Scenario 3 alternative. First, EPA focuses only on domestic climate damages in its primary analysis, relegating global climate damages to an appendix.[8] Second, EPA inappropriately applies the 7% discount rate to climate damages.[9] By making these choices, EPA reduces the SCC to as little as $1, thereby negating up to 97% of the benefits of carbon and nitrous oxide reduction as compared to the IWG's central estimates.[10] [EPA-HQ-OAR-2018-0276-0183-A1, p. 2]

These comments detail EPA's many flaws in relying on this problematic estimate of the social costs of carbon and nitrous oxide that arbitrarily ignore the real costs of greenhouse gas emissions:

• EPA arbitrarily attempts to limit its valuation of the social cost of carbon to purportedly domestic-only effects. Not only is a global perspective both required under principles of rational decisionmaking and consistent with the standards of Circular A-4, but the methodology and models that EPA uses both cannot calculate an accurate domestic-only value and also ignore important ways in which the global impacts of climate change harm the United States. Furthermore, EPA inconsistently counts alleged costs or cost savings that will ultimately accrue to foreign owners and foreign customers of U.S. firms, even as it excludes climate impacts that will fall on U.S. citizens due to the global effects of climate change. [EPA-HQ-OAR-2018-0276-0183-A1, p. 2]

• EPA arbitrarily discounts future climate effects at a 7% discount rate in addition to a 3% rate. Applying a 7% discount rate to intergenerational effects is inconsistent with Circular A-4's requirements to distinguish social discount rates from rates based on private returns to capital; to make plausible assumptions; to adequately address uncertainty, especially over long time horizons; and to rely on the best available economic data and literature. [EPA-HQ-OAR-2018-0276-0183-A1, p.3]

• EPA arbitrarily fails to follow prescribed practices for dealing with uncertainty. Specifically, EPA fails to address uncertainty over catastrophic damages, tipping points, option value, and risk aversion (by, for example, giving appropriate weight to an estimate of the social cost of carbon at the 95th percentile). By failing to run such sensitivity analyses, EPA overlooks how different (and more plausible) assumptions would change its cost-benefit calculation. [EPA-HQ-OAR-2018-0276-0183-A1, p.3]

EPA hides behind the label of "interim values" to cherry-pick only those methodological revisions that advance its predetermined goal of lower social costs of greenhouse gases. Any update to the Interagency Working Group's 2016 estimates must be unbiased, fully engaging with all the most up-to-date literature and with all the recommendations issued by the National Academies of Sciences. [EPA-HQ-OAR-2018-0276-0183-A1, p.3]

I. Using the Global Estimate of the Social Cost of Greenhouse Gases Is Consistent with Standards of Rational Decisionmaking

EPA should use global estimates of the social costs of greenhouse gases to monetize the emission reduction benefits from Scenario 3 (as well as more stringent standards that EPA should also consider) for its primary analysis in TSD. Using the global estimate is not only consistent with standards of rational decisionmaking, and in line with existing federal guidance and case law, but is required by EPA's "obligation under section 231 of the Clean Air Act to adopt [greenhouse gas] standards," [11] for the benefit of "public health or welfare."[12] [EPA-HQ-OAR-2018-0276-0183-A1, p.3]

a. Standards of Rationality Requires Attention to and Consistent Treatment of Important Factors

The Administrative Procedure Act requires EPA to use the best available data and methodologies to account for the social cost of greenhouse gases. This mandate continues to remain in effect following the issuance of Executive Order 13,783. Indeed, agencies must continue to monetize the social cost of greenhouse gases using the best available science, as that order recognizes, and the IWG's 2016 estimates of the social cost of carbon reflect the best available data and methods. [EPA-HQ-OAR-2018-0276-0183-A1, p.3]

The Supreme Court defined the standard of rationality for agency actions under the Administrative Procedure Act as follows: [EPA-HQ-OAR-2018-0276-0183-A1, p.3]

Normally, an agency rule would be arbitrary and capricious if the agency has relied on factors which Congress has not intended it to consider, entirely failed to consider an important aspect of the problem, offered an explanation for its decision that runs counter to the evidence before the agency, or is so implausible that it could not be ascribed to a difference in view of the product of agency expertise.[13] [EPA-HQ-OAR-2018-0276-0183-A1, p.3]

Furthermore, the Court found that the standard requires agencies to "examine the relevant data and articulate . . . a rational connection between the facts found and the choice made."[14] [EPA-HQ-OAR-2018-0276-0183-A1, p.4]

Two federal courts of appeals have already applied arbitrary and capricious review to require the use of the social cost of greenhouse gases in agency decision-making.[15] In Center for Biological Diversity v. National Highway Traffic Safety Administration, the U.S. Court of Appeals for the U.S. Court of Appeals for the Ninth Circuit ruled that, because the agency had monetized other uncertain costs and benefits of its vehicle fuel efficiency standard, its "decision not to monetize the benefit of carbon emissions reduction was arbitrary and capricious."[16] Specifically, it was arbitrary to "assign[ ] no value to the most significant benefit of more stringent [vehicle fuel efficiency] standards: reduction in carbon emissions."[17] When an agency bases a rulemaking on cost-benefit analysis, it is arbitrary to "put a thumb on the scale by undervaluing the benefits and overvaluing the costs."[18] The court also approvingly cited a partial consensus among experts around an estimate of "$50 per ton of carbon (or $13.60 per ton CO_2),"[19] which, in the year 2006 when the rule was issued, would have been consistent with estimates of a global social cost of carbon.[20] [EPA-HQ-OAR-2018-0276-0183-A1, p.4]

In Zero Zone Inc. v. Department of Energy., the U.S. Court of Appeals for the Seventh Circuit approved of the Department of Energy's use of the IWG's SCC estimates, holding that that "the expected reduction in environmental costs needs to be taken into account" in order for the Department "[t]o determine whether an energy conservation measure is appropriate under a cost-benefit analysis."[21] Furthermore, the court specifically rejected petitioner's challenge to the Department's use of a global (rather than domestic) social cost of carbon, holding that Department had reasonably identified carbon pollution as "a global externality" and appropriately concluded that, because "national energy conservation has global effects, . . . those global effects are an appropriate consideration when looking at a national policy."[22] [EPA-HQ-OAR-2018-0276-0183-A1, p.4]

And finally, and perhaps most germane of all, a recent ruling from the U.S. District Court for the Northern District of California struck down as arbitrary the Bureau of Land Management's ("BLM") repeal of the Waste Prevention Rule in part because the agency had abandoned the peer-reviewed, global estimates of the social cost of greenhouse gases in favor of flawed "interim" estimates that looked only at effects within the U.S. borders. In discussing the legal standard not to ignore important aspects of the rulemaking, the court reminded agencies that they lack discretion to ignore data that points in the opposite direction from its conclusions, and that agencies need more detailed justifications when they reverse prior positions.[23] As the Court explained, BLM did not meet these standards for numerous reasons. [EPA-HQ-OAR-2018-0276-0183-A1, p.4]

For one, the court critiqued BLM for using a rushed methodology that was completed "without any public comment or peer review," noting that "a more comprehensive model [to measure domestic-only impacts] does not exist nor is there any indication that one was initiated."[24] The court further noted that "focusing solely on domestic effects has been soundly rejected by economists as improper and unsupported by science," explaining that the so-called "interim" model relied upon by BLM "ignores impacts on 8 million United States citizens living abroad, including thousands of United States military personnel; billions of dollars of physical assets owned by United States companies abroad; United States companies impacted by their trading partners and suppliers abroad; and global migration and geopolitical security."[25] And the court reminded BLM that executive orders, including Executive Orders 12,866 and 13,783, require consideration of "all" costs and benefits, based on the "best reasonably obtainable scientific, technical, economic, and other information," and concluded that "none of the regulatory rules or orders require exclusion of global impacts."[26] In fact, the court urged BLM to take better account of the fact that not only does BLM admit that the domestic-only estimates are "underestimates," but that the global estimates are also likely underestimated.[27] [EPA-HQ-OAR-2018-0276-0183-A1, p.5]

In short, agencies must monetize important greenhouse gas effects when their decisions are grounded in cost-benefit analysis.[28] An assessment of greenhouse gas impacts that looks only at impacts within the U.S. borders does not meet this standard. [EPA-HQ-OAR-2018-0276-0183-A1, p.5]

b. Federal Guidance Requires Consideration of Global Climate Damages [EPA-HQ-OAR-2018-0276-0183-A1, p.5]

Opponents of climate regulation, some of whom EPA cites in its TSD,[29] have long challenged the global number in court and other forums, and often attempted to use the Office of Management and Budget's Circular A-4 guidance on regulatory impact analysis as support[30]—as EPA does here.[31] Specifically, opponents have seized on Circular A-4's instructions to "focus" on effects to "citizens and residents of the United States," while any significant effects occurring "beyond the borders of the United States . . . should be reported separately."[32] [EPA-HQ-OAR-2018-0276-0183-A1, p.5]

Yet Circular A-4's reference to effects "beyond the borders" in fact confirms that it is appropriate for agencies to consider the global effects of U.S. greenhouse gas emissions. While Circular A-4 may suggest that most typical decisions should focus on U.S. effects, the Circular cautions agencies that special cases call for different emphases: [EPA-HQ-OAR-2018-0276-0183-A1, p.5]

[Y]ou cannot conduct a good regulatory analysis according to a formula. Conducting high-quality analysis requires competent professional judgment. Different regulations may call for different emphases in the analysis, depending on the nature and complexity of the regulatory issues and the sensitivity of the benefit and cost estimates to the key assumptions.[33] [EPA-HQ-OAR-2018-0276-0183-A1, pp.5-6]

In fact, Circular A-4 elsewhere assumes that agencies' analyses will not always be conducted from purely the perspective of the United States, as one of its instructions only applies "as long as the analysis is conducted from the United States perspective,"[34] suggesting that in some circumstances it is appropriate for the analysis to be global. For example, EPA and the Department of Transportation have adopted a global perspective on the analysis of potential monopsony benefits to U.S. consumers resulting from the reduced price of foreign oil imports following energy efficiency increases.[35] [EPA-HQ-OAR-2018-0276-0183-A1, p.6]

Perhaps more than any other issue, a consideration of climate change requires precisely such a "different emphasis" from the default domestic-only assumption. To avoid a global "tragedy of the commons" that could irreparably damage all countries, including the United States, every nation should ideally set policy according to the global social cost of greenhouse gases.[36] Climate and clean air are global common resources, meaning they are freely available to all countries, but any one country's use—i.e., pollution—imposes harms on the polluting country as well as the rest of the world. Because greenhouse gas pollution does not stay within geographic borders but rather mixes in the atmosphere and affects climate worldwide, each ton emitted by the United States not only creates domestic harms, but also imposes large externalities on the rest of the world. Conversely, each ton of greenhouse gases abated in another country benefits the United States along with the rest of the world. [EPA-HQ-OAR-2018-0276-0183-A1, p.6]

If all countries set their greenhouse emission levels based on only domestic costs and benefits, ignoring the large global externalities, the aggregate result would be substantially sub-optimal climate protections and significantly increased risks of severe harms to all nations, including the United States. Thus, basic economic principles demonstrate that the United States stands to benefit greatly if all countries apply global social cost of greenhouse gas values in their regulatory decisions and project reviews. Indeed, the United States stands to gain hundreds of billions or even trillions of dollars in direct benefits from efficient foreign action on climate change.[37] [EPA-HQ-OAR-2018-0276-0183-A1, p.6]

Moreover, in order to ensure that other nations continue to use global social cost of greenhouse gas values, it is important that the United States itself do so.[38] The United States is engaged in a repeated strategic dynamic with several significant players—including the United Kingdom, Germany, Sweden, and others—that have already adopted a global framework for valuing the social cost of greenhouse gases.[39] For example, Canada and Mexico have explicitly borrowed the U.S. estimates of a global social cost of carbon to set their own fuel efficiency standards.[40] For the United States to depart from this collaborative dynamic by reverting to a domestic-only estimate would undermine the country's long-term interests and could jeopardize emissions reductions underway in other countries, which are already benefiting the United States.[EPA-HQ-OAR-2018-0276-0183-A1, pp.6-7]

For these and other reasons, reliance on a domestic-only valuation is inappropriate. In the past, some agencies have, in addition to the global estimate, also disclosed a "highly speculative"[41] estimate of the domestic-only effects of climate change. Such an approach is consistent with Circular A-4's suggestion that agencies may disclose domestic effects separately from global effects. However, as we have discussed, reliance on a domestic-only methodology would be inconsistent with both the inherent nature of climate change and the standards of Circular A-4. Consequently, under Circular A-4, EPA should use in its primary analysis the global social costs of carbon and nitrous oxide. [EPA-HQ-OAR-2018-0276-0183-A1, p.7]

For more details on the justification for a global value of the social cost of greenhouse gases, including the applicable standards of rational decision making, please see Peter Howard & Jason Schwartz, Think Global: International Reciprocity as Justification for a Global Social Cost of Carbon, [42] Columbia J. Envtl. L. 203 (2017). Another strong defense of the global valuation as consistent with best economic practices appears in a letter published in The Review of Environmental Economics and Policy, co-authored by Nobel laureate Kenneth Arrow. As Arrow and his co-authors explained: "To solve the unprecedented global commons problem posed by climate change, all nations must internalize the global externalities of their emissions[.] . . . [O]therwise, collective abatement efforts will never achieve an efficient, stable climate outcome."42 [EPA-HQ-OAR-2018-0276-0183-A1, p.7; see EPA-HQ-OAR-2018-0276-0183-A18 for the Peter Howard and Jason Schwartz article.]

c. Benefits and Costs that "Accrue to Citizens and Residents of the United States" Extend Far Beyond U.S. Borders [EPA-HQ-OAR-2018-0276-0183-A1, p.7]

To follow Circular A-4's instruction to analyze all significant effects that "accrue to [U.S.] citizens," agencies must look beyond "the borders of the United States" to a much broader range of climate effects. For one, because of our world's interconnected financial, political, health, security, and environmental systems, climate impacts occurring initially beyond the geographic borders of the United States cause significant costs that accrue to U.S. citizens and residents. Second, because U.S. climate policy impacts the climate policies of other nations, deregulatory actions such as this proposal have an indirect effect on foreign emissions and thus cause climate-related domestic impacts that are not accounted for in EPA's methodology. And third, U.S. citizens have direct interests in climate-related impacts that will occur overseas, including those affecting citizens living abroad or harming international habitats or species that U.S. citizens value. EPA makes no effort to address this reality, rather saying the agency follows the guidance of Circular A-4 by "focus[ing] on the direct impacts of climate change that are anticipated to occur within U.S. borders."[43] Below, we detail each of these three important aspects of climate damages for which the EPA's "domestic-only" valuation fails to account. [EPA-HQ-OAR-2018-0276-0183-A1, p.7]

International Spillovers: First, EPA's valuation of the social costs of greenhouse gases ignores significant, indirect costs to trade, human health, and security likely to "spill over" to the United States as other regions experience climate change damages.[44] As a federal court recently explained, this is "because emissions of most greenhouse gases contribute to damages around the world and the world's economies are now highly interconnected."[45] These spillover effects, "such as on trade and migration…must be considered in any attempt to estimate domestic impacts."[46] Due to its unique place among countries—both as the largest economy with trade- and investment-dependent links throughout the world, and as a military superpower—the United States is particularly vulnerable to effects that will spill over from other regions of the world. Spillover scenarios could entail a variety of serious costs to the United States as unchecked climate change devastates other countries. [EPA-HQ-OAR-2018-0276-0183-A1], pp.7-8

Correspondingly, mitigation or adaptation efforts that avoid climate damages to foreign countries will radiate benefits back to the United States as well.[47] While the current integrated assessment models ("IAMs") provide reliable but conservative estimates of global damages, they currently cannot calculate reliable region-specific estimates, in part because they do not model such spillovers. [EPA-HQ-OAR-2018-0276-0183-A1, p.8]

As climate change disrupts the economies of other countries, decreased availability of imported inputs, intermediary goods, and consumption goods may cause supply shocks to the U.S. economy. Shocks to the supply of energy, technological, and agricultural goods could be especially damaging. For example, when Thailand—the world's second-largest producer of hard-drives—experienced flooding in 2011, U.S. consumers faced higher prices for many electronic goods, from computers to cameras.[48] A recent economic study explored how heat stress-induced reductions in productivity worldwide will ripple through the interconnected global supply network.[49] Similarly, the U.S. economy could experience demand shocks as climate-affected countries decrease their demand for U.S. goods. Financial markets may also suffer as foreign countries become less able to loan money to the United States and as the value of U.S. firms declines with shrinking foreign profits. As seen historically, economic disruptions in one country can cause financial crises that reverberate globally at a breakneck pace.[50] [EPA-HQ-OAR-2018-0276-0183-A1, p.8]

The human dimension of climate spillovers includes migration and health effects. Water and food scarcity, flooding or extreme weather events, violent conflicts, economic collapses, and a number of other climate damages could precipitate mass migration to the United States from regions worldwide, especially, perhaps, from Latin America. For example, a 10% decline in crop yields could trigger the emigration of 2% of the entire Mexican population to other regions, mostly to the United States.[51] Such an influx could strain the U.S. economy and will likely lead to increased U.S. expenditures on migration prevention. Infectious disease could also spill across the U.S. borders, exacerbated by ecological collapses, the breakdown of public infrastructure in poorer nations, declining resources available for prevention, shifting habitats for disease vectors, and mass migration. [EPA-HQ-OAR-2018-0276-0183-A1, p.8]

Finally, climate change is predicted to exacerbate existing security threats—and possibly catalyze new security threats—to the United States.[52] Besides threats to U.S. military installations and operations at home and abroad from flooding, storms, extreme heat, and wildfires,[53] climate change is also a "source[] of conflict around the world" requiring U.S. response, according to a Department of Defense report issued last year.[54] This report corroborates a 2014 Department of Defense report declaring that climate effects "are threat multipliers that will aggravate stressors abroad such as poverty, environmental degradation, political instability, and social tensions—conditions that can enable terrorist activity and other forms of violence," and as a result "climate change may increase the frequency, scale, and complexity of future missions, including defense support to civil authorities, while at the same time undermining the capacity of our domestic installations to support training activities."[55] As an example of the climate-security-migration nexus, prolonged drought in Syria likely exacerbated the social and political tensions that erupted into an ongoing civil war,[56] which has triggered an international migration and humanitarian crisis.[57] [EPA-HQ-OAR-2018-0276-0183-A1, pp.8-9]

Because of these interconnections, attempts to artificially segregate a U.S.-only portion of climate damages will inevitably result in misleading underestimates. Some experts on the social cost of carbon have concluded that, given that integrated assessment models currently do not capture many of these key inter-regional costs, use of the global social cost of greenhouse gas estimates may be further justified as a proxy to capturing all spillover effects.[58] Though not all climate damages will spill back to affect the United States, many will, and together with other justifications, the likelihood of significant spillovers makes a global valuation the better, more transparent accounting of the full range of costs and benefits that matter to U.S. policymakers and the public. [EPA-HQ-OAR-2018-0276-0183-A1, p.9]

Reciprocal Foreign Actions: Second, an indirect consequence of the United States using a global social cost of greenhouse gas to justify actions that protect against climate damages is that foreign countries take reciprocal actions that benefit the United States. Yet EPA arbitrarily fails to account for this likely significant impact. Circular A-4 requires that the "same standards of information and analysis quality that apply to direct benefits and costs should be applied to ancillary benefits and countervailing risks."[59] Consequently, any attempt to estimate a domestic-only value of the social cost of greenhouse gas must include indirect effects from reciprocal foreign actions. [EPA-HQ-OAR-2018-0276-0183-A1, p.9]

As detailed more in Howard & Schwartz (2017), because the world's climate is a single interconnected system, the United States benefits greatly when foreign countries consider the global externalities of their greenhouse gas pollution and cut emissions accordingly. Game theory predicts that one viable strategy for the United States to encourage other countries to think globally in setting their climate policies is for the United States to do the same, in a tit-for-tat, lead-by-example, or coalition-building dynamic. In fact, most other countries with climate policies already use a global social cost of carbon or set their carbon taxes or allowances at prices above their domestic-only costs, consistent with the global perspective used to date by U.S. agencies to value the cost of greenhouse gases. Both Republican and Democratic administrations have recognized that the analytical and regulatory choices of U.S. agencies can affect the actions of foreign countries, which in turn affect U.S. citizens.[60] This impact can be incredibly significant: According to one study, by 2030, direct U.S. benefits from global climate policies already in effect could reach over $2 trillion.[61] Any attempt to estimate a domestic-only value of the social cost of greenhouse gases must include such indirect effects from reciprocal foreign actions.[62] [EPA-HQ-OAR-2018-0276-0183-A1, pp.9-10]

Extraterritorial Interests: Circular A-4 requires agencies to count all significant costs and benefits, and specifically explains the importance of including "non-use" values like "bequest and existence values". Yet by "ignoring these values" in calculating the social cost of carbon, contrary to Circular A-4's explicit instructions, EPA "significantly understate[s] the … costs" of the proposed change in methodology.[63] Similarly, Circular A-4 recognizes that U.S. citizens may have "altruism for the health and welfare of others," and instructs agencies that when "there is evidence of selective altruism, it needs to be considered specifically in both benefits and costs."[64] Many costs and benefits accrue to U.S. citizens from use values, non-use values, and altruism attached to climate effects occurring outside the U.S. borders, and DOE's valuation of the social cost of carbon fails to account for these significant effects. [EPA-HQ-OAR-2018-0276-0183-A1, p.10]

A domestic-only estimate based on some rigid conception of geographic borders or U.S. share of world GDP will fail to capture all the climate-related costs and benefits that matter to U.S. citizens,[65] including significant U.S. ownership interests in foreign businesses, properties, and other assets, as well as consumption abroad including tourism,[66] and even the 8.7 million Americans living abroad.[67] [EPA-HQ-OAR-2018-0276-0183-A1, p.10]

The United States also has a willingness to pay—as well as a legal obligation—to protect the global commons of the oceans and Antarctica from climate damages. For example, the Madrid Protocol on

Environmental Protection to the Antarctic Treaty commits the United States and other parties to the “comprehensive protection of the Antarctic environment,” including “regular and effective monitoring” of “effects of activities carried on both within and outside the Antarctic Treaty area on the Antarctic environment.”[68] The share of climate damages for which the United States is responsible is not limited to our geographic borders. [EPA-HQ-OAR-2018-0276-0183-A1, pp.10-11]

Similarly, U.S. citizens value natural resources and plant and animal lives abroad, even if they never use those resources or see those plants or animals. For example, the “existence value” of restoring the Prince William Sound after the 1989 Exxon Valdez oil tanker disaster—that is, the benefits derived by Americans who would never visit Alaska but nevertheless felt strongly about preserving the existence of this pristine environment—was estimated in the billions of dollars.[69] Though the methodologies for calculating existence value remain controversial,[70] U.S. citizens certainly have a non-zero willingness to pay to protect rainforests, charismatic megafauna like pandas, and other life and environments existing in foreign countries. U.S. citizens also have an altruistic willingness to pay to protect foreign citizens’ health and welfare.[71] This altruism is “selective altruism,” consistent with Circular A-4, because the United States is directly responsible for a huge amount of the historic emissions contributing to climate change.[72] [EPA-HQ-OAR-2018-0276-0183-A1, p.11]

II. Using a Domestic-Only Social Cost of Greenhouse Gases Estimate Is Arbitrary and Capricious [EPA-HQ-OAR-2018-0276-0183-A1, p.11]

EPA should not base the proposed greenhouse gas emissions standards for airplanes on a domestic-only social cost of greenhouse gases, but rather should continue to focus on a global value. Not only is it inconsistent with Circular A-4 and best economic practices to fail to estimate the global damages of U.S. greenhouse gas emissions in regulatory analyses, but existing methods for estimating a “domestic-only” value are unreliable, incomplete, and therefore inconsistent with Circular A-4. Indeed, in 2015, the Office of Management and Budget concluded, along with several other agencies, that “good methodologies for estimating domestic damages do not currently exist.”[73] Moreover, a domestic-only estimate misapplies models that were not built for the purpose of calculating regional damages, ignores recent literature on significant U.S. climate damages, and fails to reflect international spillovers to the United States, U.S. benefits from foreign reciprocal actions, and the extraterritorial interests of U.S. citizens including financial interests and altruism. [EPA-HQ-OAR-2018-0276-0183-A1, p.11]

a. A federal court has ruled that use of the “interim” domestic-only social cost of greenhouse gases is arbitrary and capricious [EPA-HQ-OAR-2018-0276-0183-A1, p.11]

In July 2020, the U.S. District Court for the Northern District of California ruled that the Bureau of Land Management’s use of the “interim,” domestic-only estimates for the social cost of greenhouse gases in its justification to rescind the 2016 Waste Prevention Rule was arbitrary and capricious.[74] The court found that not only did BLM “revers[e] [its] prior position” about the proper Social Cost of Carbon value without sufficient justification,[75] but also that the domestic-only social cost of greenhouse gases is methodologically flawed and inappropriate for use by federal agencies. The court noted that “focusing solely on domestic effects has been soundly rejected by economists as improper and unsupported by science.”[76] And by omitting global effects, BLM’s: analysis ignores impacts on 8 million United States citizens living abroad, including thousands of United States military personnel; billions of dollars of physical assets owned by United States companies abroad; United States companies impacted by their trading partners and suppliers broad; and global migration and geopolitical security.[77] [EPA-HQ-OAR-2018-0276-0183-A1, pp.11-12]

In other words, even though BLM claimed that its “interim” estimates captured the effects accruing to the United States, the agency in fact overlooked the tremendous damages to U.S. interests resulting from climate impacts occurring from outside the country’s geographical borders. In addition, the Northern District of California explained that by ignoring the National Academies’ findings “that international effects can have significant spill-over effects in the United States, such as on trade and migration, which must be considered in any attempt to estimate domestic impacts," BLM casted aside the best available science.[78] Nor was the fact that President Trump rescinded the IWG's documents by Executive Order of legal relevance, since "[t]he Executive Order in and of itself has no legal impact on the consensus that IWG's estimates constitute the best available science about monetizing the impacts of greenhouse gas emissions."[79] [EPA-HQ-OAR-2018-0276-0183-A1, p.12]

EPA is committing the same errors in its TSD for the Proposed Rule as BLM did its justification for the rescission of the Waste Prevention Rule. Such obfuscation of global climate damages is inconsistent with the best available science and economics, and without providing "evidence of specialists' conflicting views or alternative scientific models" to support its change from its prior position (i.e. use of the IWG's social cost of carbon estimates),[80] reliance on the "interim" domestic-only social cost of greenhouse gases is arbitrary and capricious. [EPA-HQ-OAR-2018-0276-0183-A1, p.12]

b. No current methodology for estimating a "domestic-only" value is consistent with practices for reasoned decision making, as confirmed in a recent GAO report [EPA-HQ-OAR-2018-0276-0183-A1, p.12]

The Office of Management and Budget, the National Academies of Sciences, the Government Accountability Office, and the economic literature all agree that existing methodologies for calculating a "domestic-only" value of the social cost of greenhouse gases are deeply flawed and result in severe and misleading underestimates. [EPA-HQ-OAR-2018-0276-0183-A1, p.12]

In developing the social cost of carbon, the IWG did offer some such domestic estimates. Using the results of one economic model (FUND) as well as the U.S. share of global gross domestic product ("GDP"), the group generated an "approximate, provisional, and highly speculative" range of 7–23% of the global social cost of carbon as an estimate of the purely direct climate effects to the United States.[81] Yet, as the IWG itself acknowledged, this range is almost certainly an underestimate because it ignores significant, indirect costs to trade, human health, and security that are likely to spill over into the United States as other regions experience climate change damages, among other effects.[82] [EPA-HQ-OAR-2018-0276-0183-A1, p.12]

Neither the existing IAMs nor a share of global GDP are an appropriate basis for calculating a domestic-only estimate. The IAMs were never designed to calculate a domestic SCC, since a global SCC is the economically efficient value. FUND, like other IAMS, includes some simplifying assumptions: of relevance, FUND and the other IAMs are not able to capture the adverse effects that the impacts of climate change in other countries will have on the United States through trade linkages, national security, migration, and other forces.[83] This is why the IWG characterized the domestic-only estimate from FUND as a "highly speculative" underestimate. Similarly, a domestic-only estimate based on some rigid conception of geographic borders or U.S. share of world GDP will fail to capture all the climate-related costs and benefits that matter to U.S. citizens.[84] U.S. citizens have economic and other interests abroad that are not fully reflected in the U.S. share of global GDP. GDP is a "monetary value of final goods and services—that is, those that are bought by the final user—produced in a country in a given period of time."[85] GDP therefore does not reflect significant U.S. ownership interests in foreign businesses, properties, and other assets, as well as consumption abroad including tourism,[86] or even the 8 million Americans living abroad.[87] [EPA-HQ-OAR-2018-0276-0183-A1, p.13]

At the same time, GDP is also over-inclusive, counting productive operations in the United States that are owned by foreigners. Gross National Income ("GNI"), by contrast, defines its scope not by location but by ownership interests.[88] However, not only has GNI fallen out of favor as a metric used in international economic policy,[89] but using a domestic-only SCC based on GNI would make the SCC metrics incommensurable with other costs in regulatory impact analyses, since most regulatory costs are calculated by U.S. agencies regardless of whether they fall to U.S.-owned entities or to foreign-owned entities operating in the United States.[90] Furthermore, both GDP and GNI are dependent on what happens in other countries, due to trade and the international flow of capital. The artificial constraints of both metrics counsel against a rigid split based on either U.S. GDP or U.S. GNI.[91] [EPA-HQ-OAR-2018-0276-0183-A1, p.13]

As a result, in 2015, OMB concluded, along with several other agencies, that "good methodologies for estimating domestic damages do not currently exist."[92] Similarly, the NAS recently concluded that current IAMs cannot accurately estimate the domestic social cost of greenhouse gases, and that estimates based on U.S. share of global GDP would be likewise insufficient.[93] William Nordhaus, the developer of the DICE model, cautioned earlier this year that "regional damage estimates are both incomplete and poorly understood," and "there is little agreement on the distribution of the SCC by region."[94] In short, any domestic-only estimate will be inaccurate, misleading, and out of step with the best available economic literature, in violation of Circular A-4's standards for information quality. [EPA-HQ-OAR-2018-0276-0183-A1, pp.13-14]

Consistent with this longstanding consensus, in June 2020 the Government Accountability Office ("GAO") published a report critiquing the federal government's reliance on the "interim" social cost of carbon and its failure to implement the National Academies' recommendations on updating the social cost of carbon estimates.[95] GAO concluded that the integrated assessment models EPA used to derive its domestic-only social cost of carbon "were not premised or calibrated to provide estimates of the social cost of carbon based on domestic damages."[96] GAO further noted that the National Academies found that country-specific social costs of carbon estimates were "limited by existing methodologies, which focus primarily on global estimates and do not model all relevant interactions among regions."[97] Moreover, it explained, the National Academies concluded that "accurately estimating the damages from carbon dioxide emissions for the United States would involve more than examining the direct impacts of climate change that occur within U.S. physical borders," as "U.S.-specific damages would need to consider how climate change and emissions reductions in other parts of the world could also affect the United States."[98] [EPA-HQ-OAR-2018-0276-0183-A1, p.14]

GAO also concluded that "[t]he federal government has no plans to address the recommendations of the National Academies [] for updating the methodologies used to develop the federal estimates of the social cost of carbon," and "therefore, the federal government may not be well positioned to ensure agencies' future regulatory analyses are using the best available science until the agencies finalize federal estimates that consider the National Academies' implemented recommendations."[99] [EPA-HQ-OAR-2018-0276-0183-A1, p.14]

Given the federal government's failure to act on the National Academies' recommendations to update the social cost of greenhouse gases estimates so that they are reflective of the best available science and economics, and given that the National Academies and many other organizations and economists aver that the IAMs are inappropriate for calculating domestic-only damages, EPA should not rely on so-called "interim" estimates. [EPA-HQ-OAR-2018-0276-0183-A1, p.14]

c. EPA Relies on Sources that Cannot Accurately Calculate a Domestic-Only Estimate and that Explicitly Caution Against Using Domestic-Only Estimates [EPA-HQ-OAR-2018-0276-0183-A1, p.14]

Despite broad consensus that there are no existing methodologies that accurately project domestic climate damages, EPA attempts to derive a domestic estimate anyway using existing international damage estimates. [EPA-HQ-OAR-2018-0276-0183-A1, p.14]

In particular, in the TSD, EPA reports that its domestic-only estimates are "calculated directly" from the models FUND and PAGE; for the model DICE, EPA simply assumes that U.S. damages are 10% of global damages.[100] EPA thus uses these models in ways they were never designed for—indeed, in ways their designers specifically cautioned against. EPA furthermore fails to assess the most up-to-date literature on U.S. damages and fails to take steps to reflect spillover effects, reciprocal benefits, or U.S. interests beyond our borders. EPA's methodology is deeply flawed. [EPA-HQ-OAR-2018-0276-0183-A1, pp.14-15]

The integrated assessment models used by the agency to calculate the social cost of greenhouse gases were designed to create global estimates and are best suited for those purposes. The models are limited in how accurately and fully they can estimate domestic values of the social cost of greenhouse gases. For example, the models make simplifying assumptions about the extent of heterogeneity in crucial parameters like relative prices and discount rates.[101] The models also simplify or ignore completely global spillovers from trade, migration, and other sources.[102] These types of spillovers will not, in many cases, affect the global estimate of climate change damages, but they will change (perhaps dramatically so) the domestic estimates. For example, trade effects will net to zero globally: A decrease in exports by one country must correspond to a decrease in imports for another country.[103] Global estimates will also generally be more accurate than domestic estimates because aggregation of multiple values reduces the error of the overall estimate.[104] [EPA-HQ-OAR-2018-0276-0183-A1, p.15]

An examination of the individual models used to calculate the "interim" domestic social cost of greenhouse gases—PAGE 2009, FUND 3.8, and DICE 2010[105]—highlights the current limitations to calculating of a domestic value of the social cost of greenhouse gases. For example, the only way that the PAGE model "calculate[s] directly" regional impacts is through its "regional scaling factors," which are "based on the length of each region's coastline relative to the [European Union]. Because of the long coastline in the EU, other regions are, on average, [deemed to be] less vulnerable than the EU for the same sea level and temperature increase."[106] In other words, PAGE calculates climate impacts occurring within U.S. borders by first estimating the climate damages that an additional ton of methane will cause in Europe, and then scaling down that value because the United States has a coastline that is three times shorter than Europe's.107 [EPA-HQ-OAR-2018-0276-0183-A1, p.15]

While relative coastline length may provide a reasonable scaling factor for certain climate damages, such as from coastal flooding, coastal storms, and other sea-level rise issues, it likely understates many other key climate damages—perhaps dramatically so—to the United States, where increases in mortality, agricultural losses, and other important climate effects will also occur in inland, warm areas of the country,[108] and will occur regardless of relative coastline length. Accordingly, EPA's methodology for calculating domestic climate damages from the PAGE model—one of just three models that the "interim" estimate incorporates—completely disregards significant damage categories. [EPA-HQ-OAR-2018-0276-0183-A1, p.15]

The other two models on which the "interim" domestic social cost of greenhouse gases estimate relies similarly overlook substantial damage categories. The FUND model generally estimates domestic damages from climate change by scaling estimates according to gross domestic product or population. For instance, forestry damages are "mapped to the FUND regions assuming that the impact is uniform [relative] to GDP."[109] Similarly, domestic energy consumption changes are a function of gross domestic product, and the authors note that "heating demand is linear in the number of people" in a FUND region.[110] Scaling damages by gross domestic product and population will fail to capture important differences between countries like pre-existing climate, interconnectedness of trade relationships, climate change preparedness, and preferences. [EPA-HQ-OAR-2018-0276-0183-A1, pp.15-16]

These issues are readily apparent in the case of agricultural damage estimates in FUND. Agriculture is one of the most important sectors driving the relatively low damages in the FUND model. Yet, recent evidence on this sector that incorporates cutting-edge estimates of crop yield changes finds that the FUND model substantially understates the agricultural damages from climate change.[111] Particularly for domestic damages, new research shows that FUND dramatically understates the effect of warming on agricultural outcomes globally and for individual countries like the United States.[112] These higher damage estimates come from updates to the relationship between warming and crop yield but also from a more thorough modeling of international trade in agricultural products. [EPA-HQ-OAR-2018-0276-0183-A1, p.16]

Finally, the author of DICE 2010 has explicitly warned against using a domestic-only value. In a recent article, William Nordhaus states, "The regional estimates [of the social cost of greenhouse gases] are poorly understood, often varying by a factor of 2 across the three models. Moreover, regional damage estimates are highly correlated with output shares." He later reiterates that "the regional damage estimates are both incomplete and poorly understood."[113] These statements reinforce the conclusion of OMB that "good methodologies for estimating domestic damages do not currently exist."[114] [EPA-HQ-OAR-2018-0276-0183-A1, p.16]

In conclusion, EPA's methodology to calculate a domestic-only interim social cost of greenhouse gases ignores "important aspect[s] of the problem" and fails to articulate a rational connection between the data and the choice made, and is therefore arbitrary and capricious in violation of the Administrative Procedure Act.[115] [EPA-HQ-OAR-2018-0276-0183-A1, p.16]

d. EPA Inconsistently Counts in Full the Portion of Cost that Will Accrue to Foreign Owners, While Ignoring Benefits from Global Climate Impacts [EPA-HQ-OAR-2018-0276-0183-A1, p.16]

In addition to its failure to account for significant domestic costs, EPA also effectively treats costs and benefits inconsistently by counting considerable benefits that will accrue to foreign residents from the proposed change in methodology. Therefore, the agency has unlawfully "put a thumb on the scale" by counting certain purported foreign benefits while ignoring foreign costs.[116] [EPA-HQ-OAR-2018-0276-0183-A1, p.16]

In the Proposed Rule, EPA estimates compliance costs for manufacturers. The technical support document at issue here lists several manufacturers that will have to comply with the proposed standards.[117] The list includes a number of foreign-owned companies, such as Airbus,118 Bombardier,[119] and Dassault.[120] Additionally, as detailed below, the list includes numerous U.S.-based companies with substantial foreign ownership. [EPA-HQ-OAR-2018-0276-0183-A1, pp. 16-17]

Yet nowhere in this proposal does EPA ever suggest that the agency will separate out cost effects to foreign interests, or relegate such effects to an appendix, in future rulemakings. Given the ownership of the corporations that produce aircraft engines, however, a significant portion of the costs from the Proposed Rule will ultimately accrue to foreign owners and customers. Consequently, EPA's choice to ignore U.S. financial interests in global climate benefits is a starkly arbitrary and inconsistent treatment of costs and benefits. [EPA-HQ-OAR-2018-0276-0183-A1, p.17]

Indeed, a significant portion of the effects of the Proposed Rule accrues to foreign entities. All industry compliance costs ultimately fall on the owners, employees, and customers of regulated and affected firms. At a minimum, many if not all regulated and affected firms that are public companies have significant foreign ownership of stock and corporate debt. As noted above, some of these companies are themselves foreign-based. For example, Airbus SE is a public company based in the Netherlands. And while foreign-based investment banks and funds will have U.S. investors, U.S.-based funds that invest heavily in Airbus, like BlackRock,[121] will similarly have foreign investors. [EPA-HQ-OAR-2018-0276-0183-A1, p.17]

Additionally, the major shareholders of the primary affected U.S.-based manufacturer, Boeing Co., are institutional investors with significant global portfolios.[122] Economy-wide, between 20-30% of U.S. stocks and 35% of U.S. corporate debt are held by foreigners,[123] with significant foreign direct investment in U.S. mining and fossil fuel extraction, in U.S. utilities, and in U.S. manufacturing.[124] A significant portion of the regulatory effects passing through publicly-traded regulated companies would ultimately be experienced by such foreign owners. [EPA-HQ-OAR-2018-0276-0183-A1, p.17]

Furthermore, whether or not affected companies have foreign ownership, many will have direct or indirect foreign consumers, since a relatively few aircraft engine manufacturers sell their goods worldwide.[125] Yet despite counting in full these effects to foreign owners and customers of U.S. firms, EPA ignores effects caused by climate change occurring outside U.S. borders. This inconsistent treatment of costs and benefits is patently arbitrary and capricious. [EPA-HQ-OAR-2018-0276-0183-A1, p.17]

EPA has arbitrarily drawn different geographic lines around which costs and benefits it chooses to consider. EPA should consider all significant global harms for a global pollutant like greenhouse gases, instead of inconsistently treating the costs and benefits that accrue to foreign versus domestic entities. [EPA-HQ-OAR-2018-0276-0183-A1, p.17]

III. EPA Should Use Other Assumptions Made by the IWG [EPA-HQ-OAR-2018-0276-0183-A1, p. 18]

EPA has made serious errors in the TSD regarding the treatment of critical parameters used to estimate climate damages such as the discount rate and the time horizon. Accordingly, we emphasize that EPA should continue to apply the IWG's recommendations on these fronts. [EPA-HQ-OAR-2018-0276-0183-A1], p.18

a. EPA Must Rely on a 3% or Lower Discount Rate for Intergenerational Effects—or a Declining Discount Rate [EPA-HQ-OAR-2018-0276-0183-A1, p.18]

Because of the long lifespan of greenhouse gases and the long-term or irreversible consequences of climate change, the effects of today's emissions changes will stretch out over the next several centuries. The time horizon for an agency's analysis of climate effects, as well as the discount rate applied to future costs and benefits, determines how an agency treats future generations. Traditionally, federal agencies have focused on a central estimate of the social cost of greenhouse gases calculated at a 3% discount rate. In the TSD, EPA's "interim" estimate gives equal consideration to 7% discount rate, alleging that this is recommended by Circular A-4.[132] This is wrong. [EPA-HQ-OAR-2018-0276-0183-A1, pp.18-19]

A 7% rate for intergenerational climate effects is inconsistent with best economic practices, including under Circular A-4. In 2015, OMB explained that "Circular A-4 is a living document. . . . [T]he use of 7 percent is not considered appropriate for intergenerational discounting. There is wide support for this view in the academic literature, and it is recognized in Circular A-4 itself. "[133] While Circular A-4 tells agencies generally to use a 7% discount rate in addition to lower rates for typical rules,[134] the guidance does not intend for default assumptions to produce analyses inconsistent with best economic practices. Circular A-4 clearly supports using lower rates to the exclusion of a 7% rate for the costs and benefits occurring over the extremely long, 300-year time horizon of climate effects. [EPA-HQ-OAR-2018-0276-0183-A1, p.19]

A 7% Discount Rate Is Not "Sound and Defensible" or "Appropriate" for Climate Effects [EPA-HQ-OAR-2018-0276-0183-A1, p.19]

Circular A-4 clearly requires agency analysts to do more than rigidly apply default assumptions: "You cannot conduct a good regulatory analysis according to a formula. Conducting high-quality analysis requires competent professional judgment."[135] As such, analysis must be "based on the best reasonably obtainable scientific, technical, and economic information available,"[136] and agencies must "[u]se sound and defensible values or procedures to monetize benefits and costs, and ensure that key analytical assumptions are defensible."[137] Rather than assume a 7% discount rate should be applied automatically to every analysis, Circular A-4 requires agencies to justify the choice of discount rates for each analysis: "[S]tate in your report what assumptions were used, such as . . . the discount rates applied to future benefits and costs," and explain "clearly how you arrived at your estimates."[138] Based on Circular A-4's criteria, there are numerous reasons why applying a 7% discount rate to climate effects that occur over a 300-year time horizon would be unjustifiable. [EPA-HQ-OAR-2018-0276-0183-A1, p.19]

First, basing the discount rate on the consumption rate of interest is the correct framework for analysis of climate effects; a discount rate based on the private return to capital is inappropriate. Circular A-4 does suggest that 7% should be a "default position" that reflects regulations that primarily displace capital investments; however, the Circular explains that "[w]hen regulation primarily and directly affects private consumption . . . a lower discount rate is appropriate."[139] The 7% discount rate is based on a private sector rate of return on capital, but private market participants typically have short time horizons. By contrast, climate change concerns the public well-being broadly. Rather than evaluating an optimal outcome from the narrow perspective of investors alone, economic theory requires analysts to make the optimal choices based on societal preferences and social discount rates. Moreover, because climate change is expected to largely affect large-scale consumption, as opposed to capital investment,[140] a 7% rate is inappropriate. [EPA-HQ-OAR-2018-0276-0183-A1, p.19]

In 2013, OMB called for public comments on the social cost of greenhouse gases. In its 2015 Response to Comment document,[141] OMB (together with the other agencies from the IWG) explained that: [T]he consumption rate of interest is the correct concept to use . . . as the impacts of climate change are measured in consumption-equivalent units in the three IAMs used to estimate the SCC. This is consistent with OMB guidance in Circular A-4, which states that when a regulation is expected to primarily affect private consumption—for instance, via higher prices for goods and services—it is appropriate to use the consumption rate of interest to reflect how private individuals trade-off current and future consumption.[142] [EPA-HQ-OAR-2018-0276-0183-A1, p.20]

The Council of Economic Advisers similarly interprets Circular A-4 as requiring agencies to choose the appropriate discount rate based on the nature of the regulation: "[I]n Circular A-4 by the Office of Management and Budget (OMB) the appropriate discount rate to use in evaluating the net costs or benefits of a regulation depends on whether the regulation primarily and directly affects private consumption or private capital."[143] The NAS also explained that a consumption rate of interest is the appropriate basis for a discount rate for climate effects.[144] There is also strong consensus through the economic literature that a capital discount rate like 7% is inappropriate for climate change.[145] Finally, each of the three integrated assessment models upon which EPA bases its analysis—DICE, FUND, and PAGE—uses consumption discount rates; a capital discount rate is thus inconsistent with the underlying models. (See the technical appendix on discounting attached to these comments for more details.) [See [EPA-HQ-OAR-2018-0276-0183-A1, p 43 for appendix] For these reasons, 7% is an inappropriate choice of discount rate for the impacts of climate change. [EPA-HQ-OAR-2018-0276-0183-A1, p.20]

Second, uncertainty over the long time horizon of climate effects should drive analysts to select a lower discount rate. As an example of when a 7% discount rate is appropriate, Circular A-4 identifies an EPA rule with a 30-year timeframe of costs and benefits.[146] By contrast, greenhouse gas emissions generate effects stretching out across 300 years. As Circular A-4 notes, "[p]rivate market rates provide a reliable reference for determining how society values time within a generation, but for extremely long time periods no comparable private rates exist."[147] [EPA-HQ-OAR-2018-0276-0183-A1, pp. 20-21]

Circular A-4 discusses how uncertainty over long time horizons drives the discount rate lower: "the longer the horizon for the analysis," the greater the "uncertainty about the appropriate value of the discount rate," which supports a lower rate.[148] Circular A-4 cites the work of renowned economist Martin Weitzman and concludes that the "certainty-equivalent discount factor . . . corresponds to the minimum discount rate having any substantial positive probability."[149] The National Academies of Sciences makes the same point about discount rates and uncertainty.[150] In fact, as discussed more below and in the technical appendix on discounting, [See EPA-HQ-OAR-2018-0276-0183-A1, p.43

for the appendix] uncertainty over the discount rate is best addressed by adopting a declining discount rate framework. [EPA-HQ-OAR-2018-0276-0183-A1, p.21]

Third, a 7% discount rate ignores catastrophic risks and the welfare of future generations. In the TSD, the 7% rate truncates the long right-hand tail of social costs relative to the 3% rate's distribution.[151] The long right-hand tail represents the possibility of catastrophic damages. The 7% discount rate effectively assumes that present-day Americans are barely willing to pay anything at all to prevent medium- to long-term catastrophes. At the same time, the 7% distribution also misleadingly exaggerates the possibility of negative estimates of the social cost of greenhouse gases.[152] A negative social cost of carbon implies a discount rate so high that society is willing to sacrifice serious impacts to future generations for the sake of small, short-term benefits (such as slightly and temporarily improved fertilization for agriculture). [EPA-HQ-OAR-2018-0276-0183-A1, p.21]

Fourth, a 7% discount rate would be inappropriate for climate change because it is based on outdated data and diverges from the current economic consensus. Circular A-4 requires that assumptions—including discount rate choices—are "based on the best reasonably obtainable scientific, technical, and economic information available."[153] Yet Circular A-4's own default assumption of a 7% discount rate was published 16 years ago and was based on data from decades ago.[154] Circular A-4's guidance on discount rates is in need of an update, as the Council of Economic Advisers detailed recently after reviewing the best available economic data and theory: The discount rate guidance for Federal policies and projects was last revised in 2003. Since then a general reduction in interest rates along with a reduction in the forecast of long-run interest rates, warrants serious consideration for a reduction in the discount rates used for benefit-cost analysis.[155] [EPA-HQ-OAR-2018-0276-0183-A1, pp.21-22]

In addition to recommending a value below 7% as the discount rate based on private capital returns, the Council of Economic Advisers further explains that, because long-term interest rates have fallen, a discount rate based on the consumption rate of interest "should be at most 2 percent."[156] The latest OMB updates to Circular A-94, the document on which Circular A-4 based its discount rates,[157] also show that more up-to-date long-run discount rates are historically low. In the February 2018 update to Circular A-94's discount rates, the OMB found that the real, 30-year discount rate is 0.6 percent,[158] the lowest rate since the OMB began tracking the number.[159] Notably, the OMB also shows that the current real interest rate is negative for maturities less than 10 years.[160] [EPA-HQ-OAR-2018-0276-0183-A1, p.22]

These low interest rates further confirm that applying a 7% rate to a context like climate change would be wildly out of step with the latest data and theory. Similarly, recent expert elicitations—a technique supported by Circular A-4 for filling in gaps in knowledge[161]—indicate that a growing consensus among experts in climate economics for a discount rate between 2% and 3%; 5% represents the upper range of values recommended by experts, and few to no experts support discount rates greater than 5% being applied to the costs and benefits of climate change.[162] Based on current economic data and theory, the most appropriate discount rate for climate change is 3% or lower. [EPA-HQ-OAR-2018-0276-0183-A1, p.22]

Fifth, Circular A-4 requires more than giving all possible assumptions and scenarios equal attention in a sensitivity analysis; if alternate assumptions would fundamentally change the decision, Circular A-4 requires analysts to select the most appropriate assumptions from the sensitivity analysis. [EPA-HQ-OAR-2018-0276-0183-A1, p.22]

Circular A-4 indicates that significant intergenerational effects will warrant a special sensitivity analysis focused on discount rates even lower than 3%: Special ethical considerations arise when comparing benefits and costs across generations. . . It may not be appropriate for society to demonstrate a similar preference when deciding between the well-being of current and future generations. . . If your rule will have important intergenerational benefits or costs you might consider a further sensitivity analysis using a lower but positive discount rate in addition to calculating net benefits using discount rates of 3 and 7 percent.[163] [EPA-HQ-OAR-2018-0276-0183-A1, pp.22-23]

Elsewhere in Circular A-4, OMB clarifies that sensitivity analysis should not result in a rigid application of all available assumptions regardless of plausibility. Circular A-4 instructs agencies to depart from default assumptions when special issues "call for different emphases" depending on "the sensitivity of the benefit and cost estimates to the key assumptions."[164] More specifically: If benefit or cost estimates depend heavily on certain assumptions, you should make those assumptions explicit and carry out sensitivity analyses using plausible alternative assumptions. If the value of net benefits changes from positive to negative (or vice versa) or if the relative ranking of regulatory options changes with alternative plausible assumptions, you should conduct further analysis to determine which of the alternative assumptions is more appropriate.[165] [EPA-HQ-OAR-2018-0276-0183-A1, p.23]

In other words, if using a 7% discount rate would fundamentally change the agency's decision compared to using a 3% or lower discount rate, the agency must evaluate which assumption is most appropriate. Since OMB, the Council of Economic Advisers, the National Academies of Sciences, and the economic literature all conclude that a 7% rate is inappropriate for climate change, agencies should select a 3% or lower rate. EPA's selection of a 7% discount rate cannot be justified as "based on the best reasonably obtainable scientific, technical, and economic information available" and so is inconsistent with best practices for cost-benefit analysis under Circular A-4.[166] It is therefore arbitrary for EPA to apply a 7% discount rate to the social costs of greenhouse gases. [EPA-HQ-OAR-2018-0276-0183-A1, p.23]

Application of a Declining Discount Rate Is Actionable Under the Current Economic Literature [EPA-HQ-OAR-2018-0276-0183-A1, p.23]

Circular A-4 contemplates the use of declining discount rates in its reference to the work of Weitzman.[167] As the Council of Economic Advisers explained, Weitzman and others developed the foundation for a declining discount rate approach, wherein rates start relatively higher for near-term costs and benefits but steadily decline over time according to a predetermined schedule until, in the very long-term, very low rates dominate due to uncertainty.[168] The National Academies of Sciences' report also strongly endorses a declining discount rate approach.[169] [EPA-HQ-OAR-2018-0276-0183-A1, p.23]

One possible schedule of declining discount rates was proposed by Weitzman.[170] It is derived from a broad survey of top economists and other climate experts and explicitly incorporates arguments around interest rate uncertainty. Work by Arrow et al, Cropper et al, and Gollier and Weitzman, among others, similarly argue for a declining interest rate schedule and lay out the fundamental logic.[171] Another schedule of declining discount rates has been adopted by the United Kingdom.[172] [EPA-HQ-OAR-2018-0276-0183-A1, pp.23-24]

Though it is buried in an appendix, EPA does conduct a sensitivity analysis using a 2.5% discount rate,[173] which the IWG intended to be a proxy for a declining discount rate.[174] However, EPA does not address that the results of this analysis deliver $77 million in climate benefits compared to about half a million dollars in benefits that are reported for the 7% discount rate. This further demonstrates why EPA should not use the 7% discount rate in its primary analysis, but rather focus on the 3% and 2.5% discount rates or a declining discount rate. [EPA-HQ-OAR-2018-0276-0183-A1, p.24]

The technical appendix on discounting attached [see EPA-HQ-OAR-2018-0276-0183-A1, p.43 for the appendix] to these comments more thoroughly reviews the various schedules of declining discount rates available for agencies to select and explains why agencies not only can, but should adopt a declining discount framework to address uncertainty. [EPA-HQ-OAR-2018-0276-0183-A1, p.24]

A 300-Year Time Horizon Is Required [EPA-HQ-OAR-2018-0276-0183-A1, p.24]

Related to the choice of discount rate, a 300-year time horizon for analysis of climate effects is required by best economic practices. In 2017, the National Academies of Sciences issued a report stressing the importance of a longer time horizon for calculating the social cost of greenhouse gases, finding that "[i]n the context of the socioeconomic, damage, and discounting assumptions, the time horizon needs to be long enough to capture the vast majority of the present value of damages."[175] The report goes on to note that the length of the time horizon is dependent "on the rate at which undiscounted damages grow over time and on the rate at which they are discounted. Longer time horizons allow for representation and evaluation of longer-run geophysical system dynamics, such as sea level change and the carbon cycle."[176] In other words, after selecting the appropriate discount rate based on theory and data (in this case, 3% or below), analysts should determine the time horizon necessary to capture all costs and benefits that will have important net present values at the discount rate. Therefore, a 3% or lower discount rate for climate change implies the need for a 300-year horizon to capture all significant values. The National Academies of Science reviewed the best available, peer-reviewed scientific literature and concluded that the effects of greenhouse gas emissions over a 300-year period are sufficiently well established and reliable as to merit consideration in estimates of the social cost of greenhouse gases.[177] [EPA-HQ-OAR-2018-0276-0183-A1, pp.24-25]

of greenhouse gas emissions over a 300-year period are sufficiently well established and reliable as to merit consideration in estimates of the social cost of greenhouse gases.[177] [EPA-HQ-OAR-2018-0276-0183-A1, p.25]

In 2016, the IWG published updated central estimates for the social cost of greenhouse gases: about $52 per ton of carbon dioxide, $1,480 per ton of methane, and $18,500 per ton of nitrous oxide (in 2019 dollars for year 2020 emissions).[178] Agencies must continue to use estimates of a similar or higher[179] value in their analyses and decisionmaking. [EPA-HQ-OAR-2018-0276-0183-A1, p.25]

a. IWG's Methodology Is Rigorous, Transparent, and Based on the Best Available Data [EPA-HQ-OAR-2018-0276-0183-A1, p.25]

Beginning in 2009, the IWG assembled experts from a dozen federal agencies and White House offices to "estimate the monetized damages associated with an incremental increase in carbon emissions in a given year" based on "a defensible set of input assumptions that are grounded in the existing scientific and economic literature."[180] IWG's methods combined three frequently used models built to predict the economic costs of the physical impacts of each additional ton of carbon.[181] The models together incorporate such damage categories as: agricultural and forestry impacts, coastal impacts due to sea level rise, impacts from extreme weather events, impacts to vulnerable market sectors, human health impacts including malaria and pollution, outdoor recreation impacts and other non-market amenities, impacts to human settlements and ecosystems, and some catastrophic impacts.[182] IWG ran these models using a baseline scenario including inputs and assumptions drawn from the peer-reviewed literature, and then ran the models again with an additional unit of carbon emissions to determine the increased economic damages.[183] IWG's social cost of carbon estimates were first issued in 2010 and have been updated several times to reflect the latest and best scientific and economic data.[184] [EPA-HQ-OAR-2018-0276-0183-A1, p.25]

Following the development of estimates for carbon dioxide, the same basic methodology was used in 2016 to develop the social cost of methane and social cost of nitrous oxide—estimates that capture the distinct heating potential of methane and nitrous oxide emissions.[185] These additional metrics used the same economic models, the same treatment of uncertainty, and the same methodological assumptions that IWG applied to the social cost of carbon, and these new estimates underwent rigorous peer-review.[186] [EPA-HQ-OAR-2018-0276-0183-A1, p.25]

IWG's methodology has been repeatedly endorsed by reviewers. In 2014, the U.S. Government Accountability Office concluded that IWG had followed a "consensus-based" approach, relied on peer-reviewed academic literature, disclosed relevant limitations, and adequately planned to incorporate new information through public comments and updated research.[187] In 2016 and 2017, the National Academies of Sciences, Engineering, and Medicine issued two reports that, while recommending future improvements to the methodology, supported the continued use of the existing IWG estimates.[188] And in 2016, the U.S. Court of Appeals for the Seventh Circuit held that the Department of Energy's reliance on IWG's social cost of carbon was reasonable.[189] It is, therefore, unsurprising that leading economists and climate policy experts have endorsed the IWG's values as the best available estimates.[190] [EPA-HQ-OAR-2018-0276-0183-A1, pp.25-26]

Furthermore, uncertainty over the values or range of values included in the IWG's social costs of greenhouse gases metric is not a reason to abandon the social cost of greenhouse gas methodologies;[191] quite the contrary, uncertainty supports higher estimates of the social cost of greenhouse gases, because most uncertainties regarding climate change entail tipping points, catastrophic risks, and unknown unknowns about the damages of climate change. Because the key uncertainties of climate change include the risk of irreversible catastrophes, applying an options value framework to the regulatory context strengthens the case for ambitious regulatory action to reduce greenhouse gas emissions. [EPA-HQ-OAR-2018-0276-0183-A1, p.26]

Not only was justifying omitted climate damages due to uncertainty rejected by the Ninth Circuit in Center for Biological Diversity—"while . . . there is a range of values, the value of carbon emissions reduction is certainly not zero"[192]—but the range of values recommended by the IWG[193] and endorsed by the National Academies of Sciences[194] is rather manageable. In 2016, the IWG recommended values at discount rates from 2.5% to 5%, calculated as between $12 and $62 for year 2020 emissions.[195] Numerous federal agencies have had no difficulty either applying this range in their environmental impact statements or else focusing on the central estimate at a 3% discount rate.[196] [EPA-HQ-OAR-2018-0276-0183-A1, p.26]

b. A Recent Executive Order Does Not Change the Requirements to Monetize Climate Damages [EPA-HQ-OAR-2018-0276-0183-A1, p.27]

In March 2017, President Trump disbanded the IWG and withdrew its technical support documents through Executive Order 13,783.[197] Nevertheless, Executive Order 13,783 assumes that federal agencies will continue to "monetiz[e] the value of changes in greenhouse gas emissions" and instructs agencies to ensure such estimates are "consistent with the guidance contained in OMB Circular A-4."[198] Consequently, while federal agencies no longer benefit from ongoing technical support from the IWG on using the social cost of greenhouse gases, by no means does the new Executive Order imply that agencies should not monetize potentially significant effects in their environmental impact statements. [EPA-HQ-OAR-2018-0276-0183-A1, p.27]

The Executive Order does not prohibit agencies from relying on the same choice of models as the IWG, the same inputs and assumptions as the IWG, the same statistical methodologies as the IWG, or the same ultimate values as derived by the IWG. To the contrary, because the Executive Order requires consistency with Circular A-4, as agencies follow the Circular's standards for using the best available data and methodologies, they will necessarily choose similar data, methodologies, and estimates as the IWG, since the IWG's work continues to represent the best available estimates.[199] The Executive Order does not preclude agencies from using the same range of estimates as developed by the IWG, so long as the agency explains that the data and methodology that produced those estimates are consistent with Circular A-4 and, more broadly, with standards for rational decisionmaking. [EPA-HQ-OAR-2018-0276-0183-A1, p.27]

Indeed, as noted above, a federal court recently explained that "[t]he Executive Order in and of itself has no legal impact on the consensus that IWG's estimates constitute the best available science about monetizing the impacts of greenhouse gas emissions."[200] And notably, some agencies under the Trump administration, have continued to use the IWG estimates even following the Executive Order. For example, in energy conservation program rules for air compressors,[201] commercial packaged boilers,[202] portable air conditioners,[203] and uninterruptible power supplies,[204] all released on January 10, 2020, the Department of Energy ("DOE") used the IWG social cost of carbon estimates.[205] DOE used the range of social cost of carbon estimates of global damages, including the estimates calculated at 2.5-percent, 3-percent, and 5-percent discount rates, as well as the 95th percentile estimate.[206] In fact, in announcing the final standards, DOE explained: "The CO_2 reduction is a benefit that accrues globally. DOE maintains that consideration of global benefits is appropriate because of the global nature of the climate change problem."[207] The Department further stated that "preference is given to consideration of the global benefits of reducing CO_2 emissions,"[208] over domestic-only benefits of emissions reductions. For all the reasons detailed above, EPA should do the same here. [EPA-HQ-OAR-2018-0276-0183-A1, p.27]

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[5] In fact, EPA acknowledges that Scenario 3 has no emissions reduction effects because the one aircraft model that would have been affected by that scenario, A380, will exit the market before the effective date of the Proposed Rule. TSD at 133 ("The early exit of A380 would result in no costs and no emission reductions from Scenario 3.").

[6] Scenario 3's benefits from carbon dioxide reductions for years 2023 through 2040 are reported in the TSD as $630,000 in 2015$ at a 7% discount rate. Id. at 140. This corresponds to $679,140 in 2019$, using a 7.8% cumulative inflation rate over that period (determined using the U.S Bureau of Labor Stat. CPI for All Urban Consumers (CPI-U), https://data.bls.gov/timeseries/CUUR0000SA0). However, according to our own calculations, benefits from CO_2 reductions would be $60 million (2019$) based on EPA's schedule of emissions reductions, id. at 140, if they were calculated using the 2016 IWG values (global damages at a 3% discount rate). We recognize that in the TSD, EPA reports present value climate benefits of $49 million at the 3% discount rate. Id. at 154.

[7] See Richard L. Revesz et al., Global Warming: Improve Economic Models of Climate Change, 508 NATURE 173 (2014); Tamma Carleton et al., Valuing the Global Mortality Consequences of Climate Change Accounting for Adaptation Costs and Benefits (Becker Friedmand Inst. Working Paper No. 2018-51) (finding substantial willingness to pay to avoid just climate-related mortalities); R.S. Pindyck, The Social Cost of Carbon Revisited (Nat'l Bureau of Econ. Res. Working Paper w22807, 2016) (estimating the social cost of carbon as between $100 and $200 per metric ton, based on expert elicitation to capture willingness to pay to avoid catastrophes). Even those estimates should be seen as lower bounds. Pindyck (2016) estimates the average SCC, and not the marginal SCC that IAMs estimate. Given that "we expect the [damage] function to be convex," R.S. Pindyck, Coase Lecture—Taxes, Targets, and the Social Cost of Carbon, Economics (2017), the average SCC is less than the marginal SCC.

[8] Id. at 154.

[9] See id. at 138.

[10] In IWG's 2016 Technical Support Document Update of the Social Cost of Carbon for Regulatory Impact Analysis, available at https://obamawhitehouse.archives.gov/sites/default/files/omb/inforeg/scc_tsd_final_clean_8_26_16.pdf [hereinafter "IWG 2016 TSD"], it reported the central estimate of the social cost of carbon at a 3% discount rate for year 2040 emissions as $60 in 2007$. Using a 23% cumulative inflation rate over that period (determined using the U.S Bureau of Labor Stat. CPI for All Urban Consumers (CPI-U), https://data.bls.gov/timeseries/CUUR0000SA0), that is worth $73.80 in 2019$. Compared to $73.80, $2 is a 97.3% reduction in value. Compared to IWG's estimate at a 2.5% discount rate ($103 for year 2040 emissions in 2019$), EPA's new interim estimates negate up to 98% of the value. In IWG's 2016 Addendum to technical Support Document on Social Cost of Carbon for Regulatory Impact Analysis under Executive Order 12866: Application of the Methodology to Estimate the Social Cost of Methane and the Social Cost of Nitrous Oxide, available at: https://obamawhitehouse.archives.gov/sites/default/files/omb/inforeg/august_2016_sc_ch4_sc_n2o_addendum_final_8_26_16.pdf [hereinafter IWG 2016 Addendum], the IWG reported the central estimate for the social cost of nitrous oxide at a 3% discount rate for year 2040 emissions at $28,290 (2019$). Compared to $28,000, $754 (the 'interim' social cost of nitrous oxide in 2015$ is $700) is a 97.3% reduction in value.

[11] 85 Fed. Reg. 51,556 (citing Finding That Greenhouse Gas Emissions From Aircraft Cause or Contribute to Air Pollution That May Reasonably Be Anticipated To Endanger Public Health and Welfare, 81 Fed. Reg. 54,421 (Aug. 15, 2016)).

[12] 42 U.S.C. § 7571(a)(2)(A).

[13] Motor Vehicle Manufacturers Assoc. v. State Farm Mutual Auto. Ins. Co., 463 U.S. 29, 41-43 (1983) (emphasis added); see also id. ("[W]e must 'consider whether the decision was based on a consideration of the relevant factors and whether there has been a clear error of judgment.'").

[14] Id.
[15] A few courts have also applied arbitrary and capricious review to the use or non-use of the social cost of carbon in environmental impact statements under the National Environmental Policy Act. In High Country Conservation Advocates v. Forest Service, the U.S. District Court of Colorado found that it was "arbitrary and capricious to quantify the benefits of the lease modifications and then explain that a similar analysis of the costs was impossible when such an analysis was in fact possible"—specifically, by applying the IWG's Social Cost of Carbon protocol. 52 F. Supp. 3d 1174, 1191 (D. Colo. 2014). The U.S. District Court of Oregon declined to follow suit in League of Wilderness Defenders v. Connaughton, but only because in that case the Forest Service had not conducted a quantitative analysis of either costs or benefits of climate change but rather addressed climate change qualitatively. No. 3:12-cv-02271-HZ, decided Dec. 9, 2014.
[16] 538 F.3d 1172, 1203 (9th Cir. 2008).
[17] Id. at 1199.
[18] Id. at 1198.
[19] 538 F.3d at 1199, 1201.
[20] See Average Fuel Economy Standards, Passenger Cars and Light Trucks; Model Years 2011-2015, 73 Fed. Reg. 24,352, 24,414 (May 2, 2008) (estimating that $14 per ton of carbon dioxide approximated global benefits).
[21] 832 F.3d 654, 677 (7th Cir. 2016).
[22] Id. at 679.
[23] California v. Bernhardt, 2020 WL 4001480 (N.D. Cal. July 15, 2020), at *24–25.
[24] Id. at *25.
[25] Id. at *27.
[26] Id. at *26 (internal quotation marks omitted).
[27] Id. at *27.
[28] See generally Peter Howard & Jason Schwartz, Think Global: International Reciprocity as Justification for a Global Social Cost of Carbon, 42 COLUMBIA J. ENVTL. L. 203 (2017) for more on applying standards of rationality to the social cost of carbon.
[29] See TSD at 154, (citing, among others, Gayer & Viscusi, infra note 30).
[30] Ted Gayer & W. Kip Viscusi, Determining the Proper Scope of Climate Change Policy Benefits in U.S. Regulatory Analyses: Domestic versus Global Approaches, 10 REV. ENVTL. ECON. & POL'Y 245 (2016) (citing Circular A-4 to argue against a global perspective on the social cost of carbon); see also, e.g., Petitioners Brief on Procedural and Record-Based Issues at 70, in West Virginia v. EPA, No. 15-1363, (D.C. Cir., filed Feb. 19, 2016) (challenging EPA's use of the global social cost of carbon).
[31] See TSD at 143, 147.
[32] Office of Mgmt. & Budget, Circular A-4 at 15 (2003). Note that Circular A-4 slightly conflates "accrue to citizens" with "borders of the United States": U.S. citizens have financial and other interests tied to effects beyond the borders of the United States.
[33] Circular A-4 at 3.
[34] Id. at 38 (counting international transfers as costs and benefits "as long as the analysis is conducted from the United States perspective").
[35] See Howard & Schwartz, supra note 25, at 268-69.
[36] See Garrett Hardin, The Tragedy of the Commons, 162 Science 1243 (1968) ("[E]ach pursuing [only its] own best interest . . . in a commons brings ruin to all.").
[37] Policy Integrity, Foreign Action, Domestic Windfall: The U.S. Economy Stands to Gain Trillions from Foreign Climate Action (2015), http://policyintegrity.org/files/publications/ForeignActionDomesticWindfall.pdf.
[38] See Robert Axelrod, The Evolution of Cooperation 10-11 (1984) (on repeated prisoner's dilemma games).
[39] See Howard & Schwartz, supra note 25, at Appendix B.
[40] See Heavy-Duty Vehicle and Engine Greenhouse Gas Emission Regulations, SOR/2013-24, 147 Can. Gazette pt. II, 450, 544 (Can.), available at http://canadagazette.gc.ca/rp-pr/p2/2013/2013-03-13/html/sor-dors24-eng.html ("The values used by Environment Canada are based on the extensive work of the U.S. Interagency Working Group on the Social Cost of Carbon."); Jason Furman & Brian Deese, The Economic Benefits of a 50 Percent Target for Clean Energy Generation by 2025, White House Blog, June 29, 2016 (summarizing the North American Leader's Summit announcement that U.S., Canada, and Mexico would "align" their SCC estimates).
[41] See e.g., DOE, 2016-12 Final Rule Technical Support Document: Energy Efficiency Program for Consumer Products and Commercial and Industrial Equipment: Air Compressors, 14-3 n. B.
[42] Richard Revesz, Kenneth Arrow et al., The Social Cost of Carbon: A Global Imperative, 11 REVIEW OF ENVTL. ECON. & POLICY 172 (2017).

[43] 2020 TSD at 14-1.
[44] Indeed, the integrated assessment models used to develop the global SCC estimates largely ignore inter-regional costs entirely. See Peter Howard, Omitted Damages: What's Missing from the Social Cost of Carbon (Cost of Carbon Project Report, 2014). Though some positive spillover effects are also possible, such as technology spillovers that reduce the cost of mitigation or adaptation, see S. Rao et al., Importance of Technological Change and Spillovers in Long-Term Climate Policy, 27 ENERGY J. 123-39 (2006), overall spillovers likely mean that the U.S. share of the global SCC is underestimated, see Jody Freeman & Andrew Guzman, Climate Change and U.S. Interests, 109 COLUMBIA L. REV. 1531 (2009).
[45] California, 2020 WL 4001480, at *23.
[46] Id. at *28.
[47] See Freeman & Guzman, supra note 43, at 1563-93.
[48] See Charles Arthur, Thailand's Devastating Floods Are Hitting PC Hard Drive Supplies, THE GUARDIAN (Oct. 25, 2011).
[49] Leonie Wenz & Anders Levermann, Enhanced Economic Connectivity to Foster Heat Stress-Related Losses, SCIENCE ADVANCES (June 10, 2016).
[50] See Steven L. Schwarcz, Systemic Risk, 97 GEO. L.J. 193, 249 (2008) (observing that financial collapse in one country is inevitably felt beyond that country's borders).
[51] Shuaizhang Feng, Alan B. Krueger & Michael Oppenheimer, Linkages Among Climate Change, Crop Yields and Mexico-U.S. Cross-Border Migration, 107 PROC. NAT'L ACAD. SCI. 14,257 (2010).
[52] See CNA Military Advisory Board, National Security and the Accelerating Risks of Climate Change (2014).
[53] U.S. Gov't Accountability Office, GAO-14-446 Climate Change Adaptation: DOD Can Improve Infrastructure Planning and Processes to Better Account for Potential Impacts (2014); Union of Concerned Scientists, The U.S. Military on the Front Lines of Rising Seas (2016).
[54] U.S. Dep't of Defense, Report on Effects of a Changing Climate to the Dep't of Defense 8 (Jan. 2019), available at https://media.defense.gov/2019/Jan/29/2002084200/-1/-1/1/CLIMATE-CHANGE-REPORT-2019.PDF. Recently-departed Secretary of Defense James Mattis has also explained that "[c]limate change is impacting stability in areas of the world where our troops are operating today." Andrew Revkin, Trump's Defense Secretary Cites Climate Change as National Security Challenge, ProPublica, Mar. 14, 2017.
[55] U.S. Dep't of Defense, Quadrennial Defense Review 2014 vi, 8 (2014).; see also U.S. Dep't of Defense, Report to Congress: National Security Implications of Climate-Related Risks and a Changing Climate (2015), available at http://archive.defense.gov/pubs/150724-congressional-report-on-national-implications-of-climate-change.pdf?source=govdelivery ("Global climate change will have wide-ranging implications for U.S. national security interests over the foreseeable future because it will aggravate existing problems—such as poverty, social tensions, environmental degradation, ineffectual leadership, and weak political institutions—that threaten domestic stability in a number of countries.")
[56] See Center for American Progress et al., The Arab Spring and Climate Change: A Climate and Security Correlations Series (2013); Colin P. Kelley et al., Climate Change in the Fertile Crescent and Implications of the Recent Syrian Drought, 112 PROC. NAT'L ACAD. SCI. 3241 (2014); Peter H. Gleick, Water, Drought, Climate Change, and Conflict in Syria, 6 WEATHER, CLIMATE & SOCIETY, 331 (2014).
[57] See, e.g., Ending Syria War Key to Migrant Crisis, Says U.S. General, BBC.COM (Sept. 14, 2015).
[58] See Robert E. Kopp & Bryan K. Mignone, Circumspection, Reciprocity, and Optimal Carbon Prices, 120 CLIMATE CHANGE 831, 833 (2013).
[59] Circular A-4 at 26.
[60] Howard & Schwartz, supra note 25, at 232-37 (citing acknowledgement of this phenomenon by both the Bush administration and the Obama administration).
[61] Policy Integrity, Foreign Action, Domestic Windfall: The U.S. Economy Stands to Gain Trillions from Foreign Climate Action 11 (2015), http://policyintegrity.org/files/publications/ForeignActionDomesticWindfall.pdf.
[62] Kotchen shows that the optimally strategic social cost of greenhouse gas value will be strictly higher than the domestic value for all countries. Matthew J. Kotchen, Which Social Cost of Carbon? A Theoretical Perspective (NBER Working Paper, 2016). See also Comments from Robert Pindyck to BLM on the Social Cost of Methane in the Proposed Suspension of the Waste Prevention Rule (submitted Nov. 5, 2017) for a discussion of Kotchen (2016), and for a related discussion of why a domestic social cost of carbon is not in the United States' interest.
[63] Circular A-4 at 22.
[64] Id.
[65] As the Northern District of California recently explained, the so-called "interim" Social Cost of Carbon "ignores impacts on 8 million United States citizens living abroad, including thousands of United States military personnel;

billions of dollars of physical assets owned by United States companies abroad; United States companies impacted by their trading partners and suppliers abroad; and global migration and geopolitical security." Thus, the court held, reliance on this estimate in rulemaking unlawfully "fail[s] to consider . . . important aspect[s] of the problem" and "runs counter to the evidence before the agency." California, 2020 WL 4001480, at *23 (internal quotation marks omitted).

[66] "U.S. residents spend millions each year on foreign travel, including travel to places that are at substantial risk from climate change, such as European cities like Venice and tropical destinations like the Caribbean islands." David A. Dana, Valuing Foreign Lives and Civilizations in Cost-Benefit Analysis: The Case of the United States and Climate Change Policy (Northwestern Faculty Working Paper 196, 2009), http://scholarlycommons.law.northwestern.edu/cgi/viewcontent.cgi?article=1195&context=facultyworkingpaper.

[67] Assoc. of Americans Resident Oversees, 8.7 million Americans (excluding military) live in 160-plus countries, available at https://www.aaro.org/about-aaro/8m-americans-abroad. Admittedly, 8.7 million is only 0.1% of the total population living outside the United States.

[68] Madrid Protocol on Environmental Protection to the Antarctic Treaty (1991), http://www.ats.aq/documents/recatt/Att006_e.pdf

[69] RICHARD REVESZ & MICHAEL LIVERMORE, RETAKING RATIONALITY 121 (2008).

[70] Id. at 129.

[71] See Arden Rowell, Foreign Impacts and Climate Change, 39 HARV. ENVT'L. L. REV. 371 (2015); Dana, supra note 65 (discussing U.S. charitable giving abroad and foreign aid, and how those metrics likely severely underestimate true U.S. willingness to pay to protect foreign welfare).

[72] Datablog, A History of CO_2 Emissions, THE GUARDIAN (Sept. 2, 2009) (from 1900-2004, the United States emitted 314,772.1 million metric tons of carbon dioxide; Russia and China follow, with only around 89,000 million metric tons each).

[73] In November 2013, OMB requested public comments on the social cost of carbon. In 2015, OMB along with the rest of the Interagency Working Group issued a formal response to those comments. Interagency Working Group on the Social Cost of Carbon, Response to Comments: Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12,866 at 36 (July 2015).

[74] California, 2020 WL 4001480, at *28.

[75] Id. at *18.

[76] Id. at *27.

[77] Id.

[78] Id. at *28.

[79] Id. at *25.

[80] Id. at *27.

[81] INTERAGENCY WORKING GROUP ON SOCIAL COST OF CARBON, TECHNICAL SUPPORT DOCUMENT: SOCIAL COST OF CARBON FOR REGULATORY IMPACT ANALYSIS 11 (2010) [hereinafter "IWG 2010 TSD"] (emphasis added).

[82] Id. (explaining that the IAMs, like FUND, do "not account for how damages in other regions could affect the United States (e.g., global migration, economic and political destabilization").

[83] See, e.g., Dept. of Defense, National Security Implications of Climate-Related Risks and a Changing Climate (2015), available at http://archive.defense.gov/pubs/150724-congressional-report-on-national-implications-of-climate-change.pdf?source=govdelivery.

[84] A domestic-only SCC would fail to "provide to the public and to OMB a careful and transparent analysis of the anticipated consequences of economically significant regulatory actions." Office of Information and Regulatory Affairs, Regulatory Impact Analysis: A Primer 2 (2011).

[85] Tim Callen, Gross Domestic Product: An Economy's All, IMF, http://www.imf.org/external/pubs/ft/fandd/basics/gdp.htm (last updated Mar. 28, 2012).

[86] "U.S. residents spend millions each year on foreign travel, including travel to places that are at substantial risk from climate change, such as European cities like Venice and tropical destinations like the Caribbean islands." Dana, supra note 65.

[87] Assoc. of Americans Resident Oversees, https://www.aaro.org/about-aaro/6m-americans-abroad. Admittedly 8 million is only 0.1% of the total population living outside the United States.

[88] GNI, Atlas Method (Current US$), THE WORLD BANK, http://data.worldbank.org/indicator/NY.GNP.ATLS.CD.

[89] Id.

[90] U.S. Office of Management and Budget & Secretariat General of the European Commission, Review of Application of EU and US Regulatory Impact Assessment Guidelines on the Analysis of Impacts on International Trade and Development 13 (2008).
[91] Advanced Notice of Proposed Rulemaking on Regulating Greenhouse Gas Emissions Under the Clean Air Act, 73 Fed. Reg. 44,354, 44,415 (July 30, 2008) ("Furthermore, international effects of climate change may also affect domestic benefits directly and indirectly to the extent U.S. citizens value international impacts (e.g., for tourism reasons, concerns for the existence of ecosystems, and/or concern for others); U.S. international interests are affected (e.g., risks to U.S. national security, or the U.S. economy from potential disruptions in other nations).").
[92] In November 2013, OMB requested public comments on the social cost of carbon. In 2015, OMB along with the rest of the Interagency Working Group issued a formal response to those comments. Interagency Working Group on the Social Cost of Carbon, Response to Comments: Social Cost of Carbon for Regulatory Impact Analysis under Executive Order 12,866, at 36 (July 2015) [hereinafter, OMB 2015 Response to Comments
[93] NATIONAL ACADEMIES OF SCIENCES, ENGINEERING, AND MEDICINE, VALUING CLIMATE DAMAGES: UPDATING ESTIMATION OF THE SOCIAL COST OF CARBON DIOXIDE 53 (2017) [hereinafter NAS Second Report].
[94] William Nordhaus, Revisiting the Social Cost of Carbon, 114 PNAS 1518, 1522 (2017).
[95] GAO, SOCIAL COST OF CARBON: IDENTIFYING A FEDERAL ENTITY TO ADDRESS THE NATIONAL ACADEMIES' RECOMMENDATIONS COULD STRENGTHEN REGULATORY ANALYSIS, GAO-20-254 (June 2020) [Attached].
[96] Id. at 29.
[97] Id. at 26.
[98] Id.
[99] Id. at 29.
[100] TSD at 147.
[101] Christian Gollier & James K. Hammitt, The Long-Run Discount Rate Controversy, 6 ANNU. REV. RESOUR. ECON. 273–295 (2014) at 287-289.
[102] See generally Howard & Schwartz, supra note 28.
[103] See, e.g. PAUL R. KRUGMAN, MAURICE OBSTFELD & MARC J. MELITZ, INTERNATIONAL ECONOMICS: THEORY AND POLICY (10 ed. 2015). Such changes could have an effect on overall levels of trade, in turn effecting global damage estimates.
[104] See, e.g. SIDNEY I RESNICK, A PROBABILITY PATH (2013) at 203.
[105] TSD at 147.
[106] INTERAGENCY WORKING GROUP ON THE SOCIAL COST OF GREENHOUSE GASES, TECHNICAL SUPPORT DOCUMENT: TECHNICAL UPDATE OF THE SOCIAL COST OF CARBON FOR REGULATORY IMPACT ANALYSIS 17 (2016).
[107] According to the CIA's World Factbook, EU's coastline is over three times longer than the U.S. coastline. Compare https://www.cia.gov/library/publications/the-world-factbook/geos/ee.html, with https://www.cia.gov/library/publications/the-world-factbook/geos/us.html.
[108] Solomon Hsiang et al., Economic Damage from Climate Change in the United States, 356 SCIENCE 1362–69 (2017).
[109] DAVID ANTHOFF & RICHARD S. J. TOL, THE CLIMATE FRAMEWORK FOR UNCERTAINTY, NEGOTIATION, AND DISTRIBUTION (FUND), TECHNICAL DESCRIPTION, VERSION 3.8 (2014) at 8.
[110] Id. at 10. 111 Frances C. Moore et al., Economic Impacts of Climate Change on Agriculture: A Comparison of Process-Based and Statistical Yield Models, 12 Envtl. Research Letters (2017).
[112] F. C. Moore et al., New Science of Climate Change Impacts on Agriculture Implies Higher Social Cost of Carbon, 1–43 (2017).
[113] William D Nordhaus, Revisiting the social cost of carbon, 114 PROC. NATL. ACAD. SCI. U. S. A. 1518–1523 (2017) at 1522.
[114] OMB 2015 Response to Comments, supra note 92.
[115] State Farm, 463 U.S. at 41-42 (applying the standards of review to deregulatory action and concluding that when "rescinding a rule" an agency "is obligated to supply a reasoned analysis for the change beyond that which may be required when an agency does not act in the first instance"); see also 5 U.S.C. § 706.
[116] Ctr. for Biological Diversity, 538 F.3d at 1198.
[117] TSD at 9.
[118] Based in the Netherlands, https://www.airbus.com/company.html.
[119] Based in Canada, https://www.bombardier.com/en/about-us.html.

[120] Based in France, https://www.dassault-aviation.com/en/group/about-us/company-profile/.
[121] Blackrock owns 0.11% of Airbus, according to CNN. See https://perma.cc/TTT8-EJG4.
[122] E.g. BlackRock, the Vanguard Group.
[123] Heather Long, Foreign Investors Can't Get Enough of the U.S., CNN, Oct. 1, 2015, http://money.cnn.com/2015/10/01/investing/foreign-investors-buy-us-stocks-bonds/index.html.
[124] Dept. of Treasury et al., U.S. Portfolio Holdings of Foreign Securities as of June 30, 2016 (2017), https://www.treasury.gov/press-center/press-releases/Documents/shl2016_final_20170421.pdf (see exhibit 19: market value of foreign holdings of U.S. securities, by industry, as of June 30, 2016).
[125] E.g. in 2019, 55% of Boeing's revenue was from non-U.S customers. See Boeing Co., 2019 Annual Report at 12 (2019), https://s2.q4cdn.com/661678649/files/doc_financials/2019/ar/2019_Boeing_Annual_Report.pdf.
[126] This subsection draws from Howard & Schwartz, supra note 28.
[127] 42 U.S.C. § 7571(a)(2)(A) ("The Administrator shall, from time to time, issue proposed emission standards applicable to the emission of any air pollutant from any class or classes of aircraft engines which in his judgment causes, or contributes to, air pollution which may reasonably be anticipated to endanger public health or welfare.").
[128] 42 U.S.C. § 7602(h); Massachusetts v. EPA, 127 S.Ct. 1438, 1447 (2007).
[129] Mass. v. EPA, 127 S.Ct. at 1461 (emphasis added).
[130] Coalition for Responsible Regulation v. EPA, 684 F.3d 102, 138 (D.C. Cir. 2012), aff'd in part Util. Air Regulatory Grp. v. EPA, 134 S.Ct. 2427 (2014).
[131] 85 Fed. Reg. 51,561.
[132] TSD at 151-52.
[133] OMB 2015 Response to Comments, supra note 92, at 36 (emphasis added).
[134] Circular A-4 at 36 ("For regulatory analysis, you should provide estimates of net benefits using both 3 percent and 7 percent….If your rule will have important intergenerational benefits or costs you might consider a further sensitivity analysis using a lower but positive discount rate in addition to calculating net benefits using discount rates of 3 and 7 percent.").
[135] Circular A-4 at 3.
[136] Id. at 17.
[137] Id. at 27 (emphasis added).
[138] Id. at 3.
[139] Id. at 33. 140 Maureen Cropper, How Should Benefits and Costs Be Discounted in an Intergenerational Context?, 183 RESOURCES 30, 33 (2013) ("There are two rationales for discounting future benefits—one based on consumption and the other on investment. The consumption rate of discount reflects the rate at which society is willing to trade consumption in the future for consumption today. Basically, we discount the consumption of future generations because we assume future generations will be wealthier than we are and that the utility people receive from consumption declines as their level of consumption increases. . . . The investment approach says that, as long as the rate of return to investment is positive, we need to invest less than a dollar today to obtain a dollar of benefits in the future. Under the investment approach, the discount rate is the rate of return on investment. If there were no distortions or inefficiencies in markets, the consumption rate of discount would equal the rate of return on investment. There are, however, many reasons why the two may differ. As a result, using a consumption rather than investment approach will often lead to very different discount rates."); see also Richard G. Newell & William A. Pizer, Uncertain Discount Rates in Climate Policy Analysis, 32 ENERGY POL'Y 519, 521 (2004) ("Because climate policy decisions ultimately concern the future welfare of people—not firms—the consumption interest rate is more appropriate.").
[141] Note that this document was not withdrawn by Executive Order 13,783.
[142] OMB 2015 Response to Comments, supra note 92, at 22.
[143] Council of Econ. Advisers, Discounting for Public Policy: Theory and Recent Evidence on the Merits of Updating the Discount Rate at 1 [hereinafter "CEA Issue Brief"], available at https://obamawhitehouse.archives.gov/sites/default/files/ page/files/201701_cea_discounting_issue_brief.pdf. In theory, the two rates would be the same, but "given distortions in the economy from taxation, imperfect capital markets, externalities, and other sources, the SRTP and the marginal product of capital need not coincide, and analysts face a choice between the appropriate opportunity cost of a project and the appropriate discount rate for its benefits." Id. at 9. The correct discount rate for climate change is the social return to capital (i.e., returns minus the costs of externalities), not the private return to capital (which measures solely the returns).
[144] NAS Second Report, supra note 93, at 28; see also Kenneth Arrow et al., Is There a Role for Benefit-Cost Analysis in Environmental, Health, and Safety Regulation?, 272 SCIENCE 221 (1996) (explaining that a consumption-based discount rate is appropriate for climate change).

[145] In addition to the CEA and NAS reports, see, for example, this article by the former chair of the NAS panel on the social cost of greenhouse gases: Richard Newell (2017, October 10). Unpacking the Administration's Revised Social Cost of Carbon. Available at http://www.rff.org/blog/2017/unpacking-administration-s-revised-social-cost-carbon. See also Comments from Robert Pindyck, to BLM, on the Social Cost of Methane in the Proposed Suspension of the Waste Prevention Rule (submitted Nov. 5, 2017).
[146] Circular A-4 at 34; see also OMB 2015 Response to Comments, supra note 92, at 21 (noting that "most regulatory impact analysis is conducted over a time frame in the range of 20 to 50 years," and thus do not fully implicate "special ethical considerations [that] arise when comparing benefits and costs across generations").
[147] Circular A-4 at 36.
[148] Id.
[149] Id.; see also CEA Issue Brief, supra note 143, at 9: "Weitzman (1998, 2001) showed theoretically and Newell and Pizer (2003) and Groom et al. (2007) confirm empirically that discount rate uncertainty can have a large effect on net present values. A main result from these studies is that if there is a persistent element to the uncertainty in the discount rate (e.g., the rate follows a random walk), then it will result in an effective (or certainty-equivalent) discount rate that declines over time. Consequently, lower discount rates tend to dominate over the very long term, regardless of whether the estimated investment effects are predominantly measured in private capital or consumption terms (see Weitzman 1998, 2001; Newell and Pizer 2003; Groom et al. 2005, 2007; Gollier 2008; Summers and Zeckhauser 2008; and Gollier and Weitzman 2010)."
[150] NAS Second Report, supra note 93, at 27.
[151] TSD at 151, Fig. 6-6 & 6-7.
[152] In the Monte Carlo simulation data, the 7% discount rate doubles the frequency of negative estimates compared to the 3% discount rate simulations, from a frequency of 4% to 8%.
[153] Circular A-4 at 17.
[154] The 7% rate was based on a 1992 report; the 3% rate was based on data from the 30 years preceding the publication of Circular A-4 in 2003. Id. at 33–34.
[155] CEA Issue Brief, supra note 143, at 1; see also id. at 3 ("In general the evidence supports lowering these discount rates, with a plausible best guess based on the available information being that the lower discount rate should be at most 2 percent while the upper discount rate should also likely be reduced."); id. at 6 ("The Congressional Budget Office, the Blue Chip consensus forecasts, and the Administration forecasts all place the ten year treasury yield at less than 4 percent in the future, while at the same time forecasting CPI inflation of 2.3 or 2.4 percent per year. The implied real ten year Treasury yield is thus below 2 percent in all these forecasts.").
[156] Id. at 1.
[157] Circular A-4 at 33.
[158] OMB Circular A-94 Appendix C (2018).
[159] https://obamawhitehouse.archives.gov/sites/default/files/omb/assets/a94/dischist-2017.pdf
[160] Circular A-94 Appendix C, supra note 15888.
[161] Circular A-4 at 41. 162 Peter Howard & Derek Sylvan, The Economic Climate: Establishing Expert Consensus on the Economics of Climate Change, INST. POLICY INTEGRITY WORKING PAPER 33–34 (2015) [hereinafter "Expert Consensus"]; M.A. Drupp, et al., Discounting Disentangled: An Expert Survey on the Determinants of the Long-Term Social Discount Rate (London School of Economics and Political Science Working Paper, May 2015) (finding consensus on social discount rates between 1-3%). Pindyck, in a survey of 534 experts on climate change, finds a mean discount rate of 2.9% in the climate change context and this rate drops to 2.6% when he omits individuals that lack confidence in their knowledge. Pindyck, R. S. (2016). The social cost of carbon revisited (No. w22807). National Bureau of Economic Research. Unlike Howard and Sylvan (2015), Pindyck (2016) combines economists and natural scientists in his survey, though the mean constant discount rate drops to 2.7% when including only economists. Again, this further supports the finding that the appropriate discount rate is between 2% and 3%.
[163] Circular A-4 at 35-36.
[164] Id. at 3.
[165] Id. at 42 (emphasis added).
[166] Id. at 17.
[167] Circular A-4 at 36, cites to Weitzman's chapter in Portney & Weyant, eds. (1999); that chapter, at page 29, recommends a declining discount rate approach: "a sliding-scale social discounting strategy" with the rate at 3-4% through year 25; then around 2% until year 75; then around 1% until year 300; and then 0% after year 300.
[168] CEA Issue Brief, supra note 143, at 9 ("[A]nother way to incorporate uncertainty when discounting the benefits and costs of policies and projects that accrue in the far future—applying discount rates that decline over time. This

approach uses a higher discount rate initially, but then applies a graduated schedule of lower discount rates further out in time. The first argument is based on the application of the Ramsey framework in a stochastic setting (Gollier 2013), and the second is based on Weitzman's 'expected net present value' approach (Weitzman 1998, Gollier and Weitzman 2010). In light of these arguments, the governments of the United Kingdom and France apply declining discount rates to their official public project evaluations.").

[169] NAS Second Report, supra note 93, at 166.

[170] Martin L. Weitzman, Gamma Discounting, 91 AM. ECON. REV. 260, 270 (2001). Weitzman's schedule is as follows: [NOTE: footnote 170 contains a table that is not reproduced here. See EPA-HQ-OAR-2018-0276-0183-A10, p. 23 for the table.]

[171] Kenneth J. Arrow et al., Determining Benefits and Costs for Future Generations, 341 SCIENCE 349 (2013); Kenneth J. Arrow et al., Should Governments Use a Declining Discount Rate in Project Analysis?, REV ENVIRON ECON POLICY 8 (2014); Maureen L. Cropper et al., Declining Discount Rates, AMERICAN ECONOMIC REVIEW: PAPERS AND PROCEEDINGS (2014); Christian Gollier & Martin L. Weitzman, How Should the Distant Future Be Discounted When Discount Rates Are Uncertain? 107 ECONOMICS LETTERS 3 (2010).

[172] Joseph Lowe, H.M. Treasury, U.K., Intergenerational Wealth Transfers and Social Discounting: Supplementary Green Book Guidance 5 (2008), available at http://www.hm-treasury.gov.uk/d/4(5).pdf. The U.K. declining discount rate schedule that subtracts out a time preference value is as follows: [NOTE: footnote 172 contains a table that is not reproduced here. See EPA-HQ-OAR-2018-0276-0183-A1, p.24 for the table.]

[173] See TSD at 154.

[174] IWG 2010 TSD, supra note 81, at 23 ("The low value, 2.5 percent, is included to incorporate the concern that interest rates are highly uncertain over time. It represents the average certainty-equivalent rate using the mean-reverting and random walk approaches from Newell and Pizer (2003) starting at a discount rate of 3 percent. Using this approach, the certainty equivalent is about 2.2 percent using the random walk model and 2.8 percent using the mean reverting approach. Without giving preference to a particular model, the average of the two rates is 2.5 percent. Further, a rate below the riskless rate would be justified if climate investments are negatively correlated with the overall market rate of return. Use of this lower value also responds to certain judgments using the prescriptive or normative approach and to ethical objections that have been raised about rates of 3 percent or higher.").

[175] NAS Second Report, supra note 93, at 78.

[176] Id.

[177] Nat'l Acad. Of Sci., Assessment of Approaches to Updating the Social Cost of Carbon 49 (2016), at 32.

[178] IWG 2016 TSD, supra note 10; IWG 2016 Addendum, supra note 10. Though these documents present cost values in 2007$, we have converted those values to 2019$ using the Bureau of Labor Statistics' consumer price index data, which is available at https://data.bls.gov/timeseries/CUUR0000SA0. As this data provides, 2007$ can be converted to 2019$ by multiplying by approximately 1.23.

[179] See, e.g., Richard L. Revesz et al., Global Warming: Improve Economic Models of Climate Change, 508 NATURE 173 (2014) (explaining that current estimates omit key damage categories and, therefore, are very likely underestimates).

[180] IWG 2010 TSD, supra note 81.

[181] Id. at 5. These models are DICE (the Dynamic Integrated Model of Climate and the Economy), FUND (the Climate Framework for Uncertainty, Negotiation, and Distribution), and PAGE (Policy Analysis of the Greenhouse Effect).

[182] Id. at 6–8.

[183] Id. at 24–25.

[184] IWG 2016 TSD, supra note 10, at 5–29.

[185] See IWG 2016 Addendum, supra note 10, at 2.

[186] Id. at 3.

[187] Gov't Accountability Office, Regulatory Impact Analysis: Development of Social Cost of Carbon Estimates 12–19 (2014). Available at http://www.gao.gov/assets/670/665016.pdf.

[188] Nat'l Acad. Sci., Engineering & Med., Valuing Climate Damages: Updating Estimation of the Social Cost of Carbon Dioxide 3 (2017), https://www.nap.edu/read/24651/chapter/1; Nat'l Acad. Sci., Engineering & Med., Assessment of Approaches to Updating the Social Cost of Carbon: Phase 1 Report on a Near-Term Update 1–2 (2016); https://www.nap.edu/read/21898/chapter/1.

[189] Zero Zone, Inc. v. U.S. Dep't of Energy, 832 F.3d 654, 678 (7th Cir. 2016).

[190] See, e.g., Richard Revesz et al., Best Cost Estimate of Greenhouse Gases, 357 Science 655 (2017); Michael Greenstone et al., Developing a Social Cost of Carbon for U.S. Regulatory Analysis: A Methodology and

Interpretation, 7 Rev. Envtl. Econ. & Pol'y 23, 42 (2013); Revesz, Global Warming: Improve Economic Models of Climate Change, supra note 207.
[191] Center for Biological Diversity v. NHTSA, 538 F.3d 1172, 1200 (9th Cir. 2008) ("[W]hile the record shows that there is a range of values, the value of carbon emissions reductions is certainly not zero.").
[192] 538 F.3d at 1200.
[193] See Interagency Working Group on the Social Cost of Greenhouse Gases, Technical Update (2016) (hereinafter 2016 TSD).
[194] See National Academies of Sciences, Assessment of Approaches to Updating the Social Cost of Carbon (2016) (hereinafter First NAS Report) (endorsing continued near-term use of the IWG numbers; in 2017, the NAS recommended moving to a declining discount rate, see National Academies of Sciences, Valuing Climate Damages (2017) (hereinafter Second NAS Report).
[195] IWG 2016 TSD, supra note 10. The values given here are in 2007$. The IWG also recommended a 95th percentile value of $123.
[196] BLM, Envtl. Assessment—Waste Prevention, Prod. Subject to Royalties, and Res. Conservation at 52 (2016); BLM, Final Envtl. Assessment: Little Willow Creek Protective Oil and Gas Lease, DOI-BLM-ID-B010-2014-0036-EA, at 82 (2015); Office of Surface Mining, Final Envtl. Impact Statement—Four Corners Power Plant and Navajo Mine Energy Project at 4.2-26 to 4.2-27 (2015) (explaining the social cost of greenhouse gases "provide[s] further context and enhance[s] the discussion of climate change impacts in the NEPA analysis."); U.S. Army Corps of Engineers, Draft Envtl. Impact Statement for the Missouri River Recovery Mgmt. Project at 3-335 (2016); U.S. Forest Serv., Rulemaking for Colorado Roadless Areas: Supplemental Final Envtl. Impact Statement at 120–23 (Nov. 2016) (using both the social cost of carbon and social cost of methane relating to coal leases); NHTSA EIS, Available at http://www.nhtsa.gov/staticfiles/rulemaking/pdf/cafe/FINAL_EIS.pdf at 9-77.
[197] Exec. Order No. 13,783 § 5(b), 82 Fed. Reg. 16,093 (Mar. 28, 2017).
[198] Id. § 5(c).
[199] See Richard L. Revesz et al., Best Cost Estimate of Greenhouse Gases, 357 SCIENCE 6352 (2017) (explaining that, even after Trump's Executive Order, the social cost of greenhouse gas estimate of around $50 per ton of carbon dioxide is still the best estimate).
[200] State of California v. Bernhardt, 2020 WL 4001480, at *25.
[201] 85 Fed. Reg. 1504 (Jan. 10, 2020).
[202] 85 Fed. Reg. 1592 (Jan. 10, 2020).
[203] 85 Fed. Reg. 1378 (Jan. 10, 2020).
[204] 85 Fed. Reg. 1447 (Jan. 10, 2020).
[205] 85 Fed. Reg. at 1506; see also 85 Fed. Reg. at 1649; 85 Fed. Reg. at 1381; 85 Fed. Reg. at 1477.
[206] See, e.g., 85 Fed. Reg. at 1507, tbl I.3 (Summary of Economic Benefits and Costs of Adopted Energy Conservation Standards for Air Compressors).
[207] Id. at 1508.
[208] Id. at 1564

Response:

In regard to the comments on the social cost (SC) of GHG emissions, the SC of GHG (CO_2 and N_2O) estimates presented in the Final TSD for this rulemaking are interim values developed under Executive Order 13783. The executive order withdrew previous TSDs used in regulatory impact analyses for prior rulemakings for describing the global social cost of greenhouse gas estimates developed under the prior Administration as no longer representative of government policy. Executive Order 13783 directs agencies to ensure that estimates of the social cost of greenhouse gases used in regulatory analyses are consistent with the guidance contained in OMB Circular A-4, "including the consideration of appropriate discount rates and with respect to the consideration of domestic versus international impacts" (Executive Order 13783, Section 5(c)). The Appendix to the Final TSD presents further analysis utilizing additional discount rates and global SC-GHG values.

Circular A-4 states that regulatory analyses "should provide estimates of net benefits using both 3 percent and 7 percent." The 7 percent rate is intended to represent the average before-tax rate of return to private capital in the U.S. economy. The 3 percent rate is intended to reflect the rate at which society discounts future consumption, which is particularly relevant if a regulation is expected to affect private consumption directly. The EPA follows this guidance by presenting estimates based on both 3 and 7 percent discount rates in the main analysis.

Circular A-4 suggests “further sensitivity analysis using a lower but positive discount rate in addition to calculating net benefit using discount rates of 3 and 7 percent” (page 36). The regulatory impact analysis considers the uncertainty in this key assumption by calculating the domestic SC-CH_4 based on a 2.5 percent discount rate in the Appendix, in addition to the 3 and 7 percent used in the main analysis.

Regarding the scope of analysis, Circular A-4 states: “Your analysis should focus on benefits and costs that accrue to citizens and residents of the United States. Where you choose to evaluate a regulation that is likely to have effects beyond the borders of the United States, these effects should be reported separately” (page 15). This guidance is relevant to the valuation of damages from CO_2 and other GHGs, given that GHGs contribute to damages around the world independent of the country in which they are emitted. Therefore, in the Appendix to the Final TSD, the EPA includes estimates of forgone global climate benefits corresponding to the model runs that generated the interim domestic SC-GHG estimates used in the main analysis.

The Appendix to the Final TSD also discusses the many limitations and uncertainties associated with the SC-GHG analysis, many of which are relevant to both global and domestic SC-GHG estimates, including among other things, the incomplete way in which inter-regional and inter-sectoral linkages are modeled. Further, the Appendix also summarizes the NAS report’s discussion of the challenges in developing domestic SC-GHG estimates, and that more thoroughly estimating a domestic SC-GHG would need to consider the potential implications of climate impacts on, and actions by, other countries, which also have impacts on the United States.

As stated in the Final TSD, the Agency plans to use the SC-GHG estimates developed under EO 13783 until more comprehensive domestic estimates can be developed, which would take into consideration the NAS recommendations.

With respect to the application of the SC-CO_2 and SC-N_2O in the benefit cost analysis for alternative Scenario 3, the analysis is provided for informational purposes under 12866.

15. Industry Characterization

Comments:

Organization: Anonymous Public Comment 22

EPA's accompanying technical support document and analysis suffers from a number of defects, many of which were exposed by interagency concerns:

EPA provides little evidence that "production of large quad airplanes is likely to end altogether by the mid-2020s" (See Comment A9: https://downloads.regulations.gov/EPA-HQ-OAR-2018-0276-0036/attachment_2.pdf). [EPA-HQ-OAR-2018-0276-0171 p. 1]

Organization: Boeing Company (Boeing)

Nonetheless, it is important to note that the COVID-19 pandemic presents a significant opportunity with respect to future aviation CO_2 emissions. The pandemic is significantly hastening airlines’ retirement of older, less fuel-efficient airplanes, thereby accelerating long-term increases in overall fuel-efficiency of the combined global fleet. As summarized by Mr. Calhoun: “More than 2,500 aircraft with 20-plus years of service were in active service prior to the crisis. Replacements will not be uniform, as airlines will focus on the oldest and least efficient to retire. Some airlines have already made announcements to this effect."[16] A May 15, 2020 article from Business Insider reported: "Aircraft are quickly becoming casualties of coronavirus. ... [A]irlines the world over have embarked on fleet renewal projects that will see aging aircraft being retired in favor of more efficient birds."[17] And a June 3, 2020 article from Barron's discussed a note from Cowen and Company predicting that U.S.-based airlines, in order to position themselves for a post-COVID world, will retire approximately 20% of their jets (between approximately 500 and 700 more aircraft than the more than 330 already announced by the airlines) resulting in "simpler, more fuel efficient fleets."[18] [EPA-HQ-OAR-2018-0276-0181-A2, p.9]

It is clear that COVID-19 has drastically reduced the demand for air travel – putting an even higher premium on economic efficiency. Thus, the COVID-19 pandemic has provided a strong additional economic incentive for airlines to reduce operating costs through increasing the fuel-efficiency of their fleets. This effect is not new. "[A]irlines typically use periods of low demand to restructure their fleets around newer aircraft, as seen with the post-9/11 period that saw a similar reduction in air travel."[19] [EPA-HQ-OAR-2018-0276-0181-A2, p.9]

Therefore, while the unprecedented financial challenges faced by the U.S. airline and commercial aerospace manufacturing industries strongly militate against the imposition of any unnecessary costs though this rulemaking, EPA should recognize that the COVID-19 pandemic is significantly accelerating long-term gains in the overall fuel-efficiency of the combined global fleet that will aid the effort to reduce commercial aviation CO_2 emissions as the world emerges from the global economic slow-down caused by the pandemic. [EPA-HQ-OAR-2018-0276-0181-A2, p.9]

Response:

Prior to the publication of the NRPM there were only two large quad airplanes being manufactured, the Boeing 747-8 and the Airbus A380. As we noted in Section 5.4 of the Technical Support Document (TSD), Boeing plans to discontinue production of the 747-8 in 2020. Also, in Footnote lxv in Section 5.5.2 of the TSD, we noted that Airbus announced plans to discontinue production of the A380 in 2021. These announcements are consistent with our assumptions in our analysis.

The EPA agrees that the COVID-19 pandemic has and will likely continue to impact fleet makeup decisions on the part of the airline industry, at least in the near term. It appears likely that airplane retirements will be higher than pre-pandemic projections, and that the airplanes most likely to be retired will be older and less fuel-efficient models. However, it is unclear at this point to what extent this will be a short-term aberration or part of a longer-term trend. Regardless, the likelihood and level of additional airplane retirements has no bearing on the rationale the EPA has put forth to adopt GHG emissions standards that harmonize with airplane CO_2 emissions standards adopted by ICAO.

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[16] The Boeing Company Q1 2020 Earnings Call Transcript, at 3 (Apr. 29, 2020), available at https://s2.q4cdn.com/661678649/files/doc_financials/quarterly/2020/q1/1Q20-Earnings-Call-Transcript.pdf.

[17] Business Insider, Even more iconic planes are disappearing from the sky earlier than planned as coronavirus wreaks airline havoc not seen since 9/11 (May 21, 2020), available at https://www.businessinsider.com/coronavirus-havoc-forces-airlines-to-retire-iconic-planes-sooner-2020-3.

[18] Barron's, Airline Fleets Must Shrink, Analyst Says. A Recovery Could Take 3 to 5 Years (June 3, 2020), available at https://www.barrons.com/articles/airline-fleets-recovery-pilots-fuel-efficient-planes-retirements-covid-19-51591197226.

[19] Business Insider, citing "The Points Guy."

16. Aircraft Engine Technical Amendments

Comments:

Organization: Aerospace Industries Association (AIA)

Changes to testing procedures for other emissions from aircraft engines

AIA has reviewed the changes proposed by the EPA to update domestic regulations to reference the latest ICAO test procedures for hydrocarbons (HC), carbon monoxide (CO), oxides of nitrogen (NO_X) and smoke. AIA supports these changes to bring domestic rules in line with the current international framework and has not identified any issues with the EPA's proposal. [EPA-HQ-OAR-2018-0276-0167-A1, p.14]

Response:

The EPA acknowledges AIA's comment in support of updating the domestic regulations to reference ICAO's most recent airplane engine emissions test procedures. The EPA notes that two days before the Administrator signed the proposed rule, ICAO released a new amendment to Annex 16 Volume II.[26] Consistent with the EPA's stated intention in the proposal to adopt any amendments to Annex 16 Volume II that might be adopted by ICAO following the proposal, it is this most recent amendment to the Annex that is being incorporated by reference in the final rule.

17. Alternative Compliance Mechanisms

Comments:

Organization: Anonymous Public Comment 3

The best way to control air pollution from airplanes is for fewer flights. While better fuel might help on the margins, reduction in flights and discouragement of non-essential airline flights is where we can get the most bang for the buck! [EPA-HQ-OAR-2018-0276-0102, p.1]

Organization: Anonymous Public Comment 8

ICAO and aviation executives falsely claim that the rule will somehow achieve "carbon neutrality" using carbon offsets and biofuels. These are false solutions. Carbon offsets schemes do not reduce greenhouse gas emissions and toxic co-pollutants from airplanes that disproportionately harm low-income communities of color. Offset projects can also have many other adverse consequences, including violating the human rights of local communities and Indigenous peoples in the Global South. Biofuels by and large have not proven to be carbon neutral or sustainable. For example, some jet biofuels derived from palm feedstocks actually increase overall emissions when accounting for all factors of production including land-use change. [EPA-HQ-OAR-2018-0276-0125, p.1]

Organization: California Air Resources Board (CARB)

I. The standard must incorporate additional demonstrated and in development technologies and measures.

EPA failed to consider a wide variety of existing and in-development technologies and measures. These include engine designs; aircraft designs; sustainable aviation fuels; partial or total electrification; measures for landing and takeoff; ground measures regarding taxiing, idling, and auxiliary power units (APU); and, potentially, offsets. [EPA-HQ-OAR-2018-0276-0169-A1, p.3]

b. The standard must incorporate sustainable aviation fuels.

In addition to improvements in engine specifications and standards, the rule could achieve significant reductions in GHG emissions and criteria pollutants by mandating or incentivizing the increased use of sustainable aviation fuels (SAFs), drop-in substitutes of petroleum jet fuels that are derived from renewable feedstock, such as vegetable- or waste-based oils. A drop-in jet fuel blend is "completely interchangeable and compatible with conventional jet fuel when blended with conventional jet fuel," and thus drop-in SAF would "not require adaption of the aircraft/engine fuel system or the fuel distribution network, and can be used 'as is' on currently flying turbine-powered aircraft."[27] The FAA's CLEEN program and other initiatives fund development and demonstration of "drop-in" SAFs that "require no modifications to aircraft or fuel supply infrastructure."[28]

SAFs are described by ICAO as "one element of the ICAO basket of measures to reduce aviation emissions, which also includes technology and standards, operational improvements, and the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA)."[29] In fact, use of SAFs reduces an aircraft operator's CORSIA offsetting requirement and thus requiring or incentivizing the use of SAFs will enable airline operators to meet CORSIA's requirements with less reliance on offsets projects. According to FAA, SAFs "also can help to expand jet fuel supplies beyond petroleum, improving jet fuel price stability, enhancing supply security, and contributing to economic development."[30] And in 2019, the ICAO Assembly adopted a resolution "[r]ecognizing that the technological feasibility of drop-in sustainable aviation fuels is proven and that the introduction of appropriate policies and incentives to create a long-term market perspective is required[.]"[31]

To achieve ICAO and industry commitments for carbon neutral growth by 2020 (a goal shared by FAA),[32] ICAO's 2019 environmental report envisions a significant increase in the use of SAFs, as Figure 1 shows.[33] The industry's commitment to achieving 50 percent GHG emissions reduction relative to a 2005 baseline by 2050 necessitates even more stringent reductions, and highlights the necessity of developing a robust SAF industry to supply increasing quantities of alternative fuels to airline operators.

[Figure 1 can be found on p. 8 of docket number EPA-HQ-OAR-2018-0276-0169-A1.]

CARB's Low Carbon Fuel Standard (LCFS) program has demonstrated in a short period of time that, with the appropriate economic incentive, SAFs are economically attractive products for fuel producers in the United States. Starting in 2019, the LCFS program allowed SAFs to opt-in the program and generate credits for replacing jet fuels in trips departing from California. Currently, the LCFS provides an incentive of around $1.50/gallon of SAF,[34] and in 2019 more than 1.9 million gallons of SAF were reported to the program, generating more than 11,000 credits.

Two facilities have registered to introduce SAFs into the program, including Altair's facility in Paramount, California, repurposing a refinery from producing fossil fuel-based petroleum products to producing SAFs for use in the State.[35] Moreover, several California refineries have announced similar plans to convert existing refineries to produce SAFs and renewable diesel products, including Phillip 66's Rodeo refinery,[36] Marathon's Martinez refinery,[37] and Alon's Bakersfield refinery.[38] This demonstrates how SAF use can contribute to the sustainable transition of assets in the oil and gas sector, and maintaining jobs in these communities.

A national aviation fuel standard would provide a much larger positive effect on the SAF production and use in the United States than state programs, meaning that the costs of such fuels would likely drop further were EPA to act, and their use would be more extensive.[39] First, the U.S. market is much larger than the California market, and an adoption of a national program would result in larger quantities of SAF being utilized, potentially resulting in decreased costs to scale and learning effects. Second, adopting a national standard would also allow the United States to potentially harmonize such programs with upcoming programs in other jurisdictions (such as the Canadian Clean Fuel Standard and the European Union Emissions Trading System (EUETS)) in regulating the GHG emissions from international travel between these regions. [EPA-HQ-OAR-2018-0276-0169-A1, pp.6-9]

c. EPA must consider electrification and hydrogen.

EPA must also consider zero-emissions and hybrid aircraft technologies that have shown promise in recent years. In a 2019 report, ICAO highlighted the promise of electric and hybrid technologies, noting that "a number of ongoing projects have been identified globally, [including] general aviation or recreational aircraft, business and regional aircraft, [and] large commercial aircraft. . . . Most of them target an entry-in-service date between 2020 and 2030, and some are already commercially available."[40]

In June 2020, a private company successfully flew a commercial-grade plane powered by a hydrogen-electric powertrain.[41] The company anticipates making retrofitted zero-emission aircraft commercially available as soon as the end of 2023. [42] Airbus recently announced three types of zero-emission hydrogen-fueled commercial aircraft that the company intends to introduce into service by 2035.[43] Collectively termed "ZEROe," the aircraft include a turbofan design with a range of over 2,000 nautical miles and a 120-200 passenger capacity, a turboprop design with a range of over 1,000 nautical miles and a 100 passenger capacity, and a "blended-wing design" with a 200 passenger capacity. These zero-emission aircrafts are anticipated to be able to execute short-haul and transcontinental flights.

It is evident that hydrogen-powered, electric, and hybrid aircraft will soon be a viable option. EPA should take these technologies and designs into consideration in promulgating its emissions standard. [EPA-HQ-OAR-2018-0276-0169-A1, pp.9-10]

EPA failed to consider potential emissions reductions from measures for landing and takeoff,[44] taxi, and idling, including from APUs. Along with GHG emissions, operational measures generally reduce co-pollutant emissions, which significantly affect air quality surrounding airports during near-ground and ground-based operations like landing and takeoff, taxi, and idling. [EPA-HQ-OAR-2018-0276-0169-A1, p.10]

While EPA must consider these technology developments for the next generation of NOx aircraft standard, it is also critical for the agency to consider measures that reduce both GHG and criteria emissions during the landing and take-off (cycle, as well as through the use of APUs. ICAO's metric value, used to establish its GHG standard for new aircraft, only takes into account the cruise performance and does not directly evaluate performance of other flight phases such as landing, takeoff, and climb. As with most other aspects of EPA's proposal, the agency proposed to adopt this ICAO policy without considering its merits or any alternatives. EPA should also consider strategies that improve the current air traffic operation and transition APUs toward zero-emission technologies.

Such strategies include:

- De-Rated Take Off: Aircraft are designed to take off safely without full thrust. By not applying full thrust during take-off, aircraft reduce emissions as well as the level of noise. A 2017 study by Koudis et al. has shown that using reduced thrust takeoff reduces fuel consumption, NOx, and black carbon emissions by 1.0 to 23.2 percent, 10.7 to 47.7 percent, and 49.0 to 71.7 percent, respectively, depending on aircraft-engine combinations relative to 100 percent thrust takeoff.[59] Additionally, a study by Electronic Navigation Research Institute of Japan has indicated that reduced thrust near the top of the climb can result in fuel saving.[60] The engine derate can also extend engine life and reduce maintenance cost.[61]

- Reduced Power during Taxiing: Most commercial aircraft are equipped with two to four engines. Aircraft engines, even at idle or minimal power settings, are used to taxi the aircraft while on the ground. Because of this, taxi-in, idle and even taxi-out can be completed with one or more of those engines not operating. Shutting down an engine during the taxi-in, until the aircraft is in an advanced stage of the taxiout for takeoff, has the potential to reduce emissions.[62]

- Improved Taxi Time: Minimizing taxi time, when the aircraft is taxi-in or taxi-out, reduces emissions. Such a control measure would require real-time optimization of air traffic with constant feedback from all associated airports.

- Reduced Usage of APUs: The typical aircraft APU is a small turbine engine that starts the aircraft main engines and powers the electrical systems on the aircraft when the main engines are off. Switching to the on-board rechargeable batteries as the power supply would reduce the usage of the gas turbine APU and hence emissions.

These are a few of the strategies that EPA should consider for reducing nearground GHG, criteria, and hazardous air pollutants.[63] These strategies, along with more stringent standards, would make major contributions to California and local air districts' ability to meet federal air quality standards and climate goals.

Such reductions could potentially be secured via work practice standards, flexible compliance mechanisms within a Clean Air Act standard, or collaborative work with the airlines and airports and other regulators. [EPA-HQ-OAR-2018-0276-0169-A1, pp.13-15]

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[27] ICAO, Sustainable Aviation Fuels Guide (Dec. 2018), available at https://www.icao.int/environmental-protection/Documents/Sustainable%20Aviation %20Fuels%20Guide_100519.pdf.
[28] FAA, Continuous Lower Energy, Emissions, and Noise (CLEEN) Program, updated June 19, 2020, https://www.faa.gov/about/office_org/headquarters_offices/apl/research/ aircraft_technology/cleen/; U.S. Department of Transportation, FAA Top Policy Issues, updated Jan. 27, 2017, available at https://www.transportation.gov/transition/FAA/Top-Policy- Issues.
[29] ICAO, 2019 Environmental Report: Aviation and Environment, available at https://www.icao.int/environmental-protection/Documents/ICAO-ENV-Report2019-F1- WEB%20(1).pdf.
[30] U.S. Department of Transportation, FAA Top Policy Issues, updated Jan. 27, 2017, available at https://www.transportation.gov/transition/FAA/Top-Policy-Issues.
[31] ICAO Assembly, Resolution A40-18, available at https://www.icao.int/environmentalprotection/ Documents/Assembly/Resolution_A40-18_Climate_Change.pdf.
[32] FAA, Aviation Environmental and Energy Policy Statement (July 2012), available at https://www.faa.gov/about/office_org/headquarters_offices/apl/environ_policy_guidance/policy/media/FAA_EE_Policy_Statement.pdf; ICAO Assembly, Resolution A40-18, available at https://www.icao.int/environmental-protection/Documents/Assembly/Resolution_A40-18_Climate_Change.pdf; International Air Transport Association, Working Toward Ambitious Targets, https://www.iata.org/en/programs/environment/climate-change/.
[33] ICAO, 2019 Environmental Report: Aviation and Environment, available at https://www.icao.int/environmental-protection/Documents/ICAO-ENV-Report2019-F1-WEB%20(1).pdf.
[34] Calculation is based on the following assumptions: $200/LCFS credit, and SAF's carbon intensity of 30 gCO_2e/MJ.
[35] "World Energy acquires AltAir biojet, renewable diesel assets," Biodiesel Magazine (March 20, 2018), available at http://www.biodieselmagazine.com/articles/2516317/world-energyacquires- altair-biojet-renewable-diesel-asset.
[36] Janet McGurty, "Phillips 66 to convert San Francisco-area refinery to produce renewable fuels," SP Global, (Aug. 12, 2020), available at https://www.spglobal.com/platts/en/market-insights/latestnews/ oil/081220-phillips-66-to-convert-san-francisco-area-refinery-to-produce-renewablefuels.
[37] Annie Sciacca, "Marathon refinery closure could signal big transition for Bay Area refineries," Mercury News (Aug. 8, 2020), available at https://www.mercurynews.com/2020/08/08/marathon-refineryclosure- could-signal-big-transition-for-area-refineries/.
[38] Joseph Luiz, "Alon Bakersfield Refinery sold, to be used to produce renewable fuel," KGET (May 8, 2020), available at https://www.kget.com/news/alon-bakersfield-refinery-sold-to-beused- to-produce-renewable-fuel/.
[39] While a national aviation fuel standard may require a joint rulemaking with FAA, 49 U.S.C. § 44714, EPA should consider and incorporate the reductions achievable through use of SAFs in setting its GHG emission standard.

[40] ICAO, Introduction to the ICAO Basket of Measures to Mitigate Climate Change, Climate Change Mitigation: Technology and Operations, Ch. 4 (2019), at 113, available at https://www.icao.int/environmental-protection/Documents/EnvironmentalReports/2019/ ENVReport2019_pg111-115.pdf.
[41] Ilana Marcus, "Can Airplanes Go Green?," Washington Post (July 31, 2020), available at https://www.washingtonpost.com/climate-solutions/2020/07/31/electric-airplane/; Anmar Frangoul, "A battery-electric plane takes to skies over England in latest example of 'zeroemission' flight," CNBC (June 24, 2020), available at https://www.cnbc.com/2020/06/24/ battery-electric-zero-emission-plane-takes-to-skies-over-england.html.
[42] Ibid.; Charles Alcock, "ZeroAvia Hydrogen Flight Paves Way to 2023 Service Entry," AINonline (Sept. 25, 2020), available at https://www.ainonline.com/aviation-news/airtransport/ 2020-09-25/zeroavia-hydrogen-flight-paves-way-2023-service-entry.
[43] Airbus, "Airbus reveals new zero-emission concept aircraft" (Sept. 21, 2020), available at https://www.airbus.com/newsroom/press-releases/en/2020/09/airbus-reveals-newzeroemission-concept-aircraft.html.
[44] The landing takeoff cycle is comprised of taxi-out, take-off, climb-out, approach, landing, and taxi-in modes, and does not include climb, cruise, and descent operation for aircraft above 3,000 feet. CARB, 2020 Mobile Source Strategy: Workshop Discussion Draft (Sept. 30, 2020), at 103, available at https://ww2.arb.ca.gov/sites/default/files/2020-09/Workshop_Discussion_Draft_2020_Mobile_Source_Strategy.pdf.
[59] G.S. Koudis et al., "Airport emissions reductions from reduced thrust takeoff operations," Transportation Research Part D: Transport and Environment, 52, 15-28 (2017). See also M. King and I. Waitz, "Assessment of the Effects of Operational Procedures and Derated Thrust on American Airlines B777 Emissions from London's Heathrow and Gatwick Airports," Partner, Cambridge, MA (2005) (showing that each 1 percent of derate can approximately reduce NOx emissions by 0.7 percent below 3000 feet while slightly increasing the fuel burn).
[60] R. Mori, "Fuel-Saving Climb Procedure by Reduced Thrust near Top of Climb," Journal of Aircraft (2020), at 1-7.
[61] R. Donaldson et al., "Economic Impact of Derated Climb on Large Commercial Engines," Proceedings of the Performance and Flight Operations Engineering Conference (2007).
[62] Sustainable Aviation, "Aircraft on the Ground CO_2 Reduction Programme," UK's Airport Operators Association.
[63] Congress has also recognized the potential for these measures to increase fuel efficiency and reduce emissions. The FAA Reauthorization Act of 2018 requires FAA, in coordination with NASA, to review and report to Congress on technologies and measures to increase aircraft fuel efficiency, including "the potential for novel flight pattern planning and communications systems to reduce aircraft taxiing and airport circling." FAA Reauthorization Act of 2018, Pub.L. 115-254, 115th Congress, 132 Stat. 3413, § 742. FAA does not appear to have completed its report. See https://www.faa.gov/about/plans_reports/congress/.

Organization: California Attorney General's Office and the California Air Resources Board (CARB) et al.

Major international airports have identified and implemented operational measures to control GHG emissions from aircraft on the ground. These include single-engine taxiing, requiring aircraft to plug into ground-based power and conditioned air while at airport gates, and use of tow vehicles and pushback tractors, especially vehicles and tractors powered by electricity or alternative fuels.[117] In the Commenting States, Boston Logan International Airport was the first airport in the country to receive LEED certification for a terminal; since then, more than 60 percent of its buildings and facilities have been constructed, renovated, or retrofitted for energy conservation, and five buildings at Boston Logan have achieved LEED certifications.[118] San Diego International Airport became the second major U.S. airport to achieve carbon-neutral accreditation through offsets and emission reduction programs, such as incentives to airport rideshares to use low- or zero-emitting vehicles and reduce trips.[119] In 2016, Los Angeles International Airport (LAX) launched a jet biofuel program with an agricultural waste feedstock that reduces GHG emissions by 60 percent on a lifecycle basis; in 2019, a commercial flight from Chicago O'Hare to LAX combined this alternative fuel, carbon offsets, and all-electric ground handling equipment.120 The Port Authority of New York and New Jersey, which oversees LaGuardia, John F. Kennedy, New York Stewart, and Newark airports, has pledged a 35 percent reduction in direct GHG emissions by 2025, with a goal of 80 percent reduction by 2050. Measures to achieve these reductions include conversions to all-electric vehicles at terminals, pilot testing of electric cargo equipment, and renewable energy investments at airport facilities.[121] Chicago O'Hare has received Federal Aviation Administration (FAA) and EPA grants to electrify ground support vehicles and equipment and has piloted numerous sustainability initiatives that reduce and offset emissions, including the installation of 10 acres of vegetated roofs on airport buildings.[122] The Port of Portland, Oregon has installed preconditioned air units at 26 jet bridges to reduce aircraft jet fuel emissions, allowing the jets to keep cool prior to takeoff without running their auxiliary engines. The Port also purchases certified Renewable Energy Certificates, exceeding 100% of Port-wide electric energy usage. And it completed an airport-wide lighting upgrade project, reducing annual energy consumption by 1,383,000 kWh and resulting in a CO_2 footprint reduction of approximately 1,020 metric tons per year.[123] [EPA-HQ-OAR-2018-0276-0176-A1, pp.19-20]

Nor did EPA consider ground operations measures, which airports have already implemented to reduce their GHG emissions, supra, pp. 19-20, or strategies to improve air traffic control and routes, which reduce fuel burn outside of efficiency improvements.[147] [EPA-HQ-OAR-2018-0276-0176-A1, p.31]

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117 Aviation and the Environment: Emissions, Hearing Before the Subcomm. on Aviation of the H. Comm. on Transportation and Infrastructure, 110th Cong. 176 (2008) (statement of James C. May, President and CEO, Air Transport Association of America, Inc.), https://www.congress.gov/110/chrg/CHRG- 110hhrg42305/CHRG-110hhrg42305.pdf.

118 Massport, 2019 Annual Sustainability and Resiliency Report, at 12, http://www.massport.com/media/3928/2019-sustainability-report-final_full-reduced.pdf.

119 Press Release: San Diego International Airport becomes second major airport in North America to earn carbon neutral rating, San Diego Int'l Airport (Sept. 18, 2019), https://www.san.org/news/newsdetail/san-diego-international-airport-becomes-second-major-airport-in-north-america-to-earn-carbonneutral- rating; Press Release: SAN Wins 'Airports Going Green' Award for Emissions Reduction, Carbon Offset and Food Waste Programs, San Diego Int'l Airport (Nov. 8, 2018), https://www.san.org/news/articledetail/san-wins-airports-going-green-award-for-emissions-reductioncarbon- offset-and-food-waste-programs.

120 Press Release: LAX Welcomes World's Most Eco-Friendly Commercial Flight as United Commits to LAX 'Eco-Hub- with Purchase of Biofuel, Los Angeles World Airports (June 5, 2019), https://www.lawa.org/news-releases/2019/news-release-52.

121 Press Release: Port Authority Embraces Paris Climate Agreement, Adopting Aggressive Measures to Reduce Greenhouse Gas Emissions, Port Authority of New York and New Jersey (Oct. 25, 2018), https://www.panynj.gov/port-authority/en/press-room/press-releasearchives/ 2018_press_releases/port_authority_embracesparisclimateagreementadoptingaggressiveme.html

122 Chicago Dept. of Aviation, https://www.flychicago.com/community/environment/Pages/default.aspx (last visited Oct. 5, 2020); Press Release – FAA Awards $33.7 Million in Environmental Grants to Airports, FAA (Nov. 4, 2016), https://www.faa.gov/news/press_releases/news_story.cfm?newsId=21075; Chicago Dept. of Aviation, "Chicago O'Hare Awarded U.S. EPA Grant To Purchase Zero Emission Electric Equipment and Save More Than 1.4 Million Gallons of Diesel Fuel" (Feb. 12, 2018), https://www.chicago.gov/city/en/depts/doa/provdrs/flight/news/2018/february/chicago-o-hare-awarded-us-- epa-grant-to-purchase-zero-emission-.html.

123 See Port of Portland, 2016-2017 Environmental Objectives and Targets Results, at 2, 3, http://cdn.portofportland.com/pdfs/Env_16_17_RsltsObjTrgts.pdf. 139 See Press Release: EPA Proposes First Greenhouse Gas Emissions Standards for Aircraft, EPA (Jul. 22, 2020), https://www.epa.gov/newsreleases/epa-proposes-first-greenhouse-gas-emissions-standardsaircraft.

147 See Regulating Greenhouse Gas Emissions under the Clean Air Act, 73 Fed. Reg. 44,354, 44,741 (Jul. 30, 2008) (discussing ground operational changes and air traffic control techniques as GHG reduction strategies for aviation).

Organization: Center for Biological Diversity, Earthjustice, on behalf of the Sierra Club and Friends of the Earth, and the Natural Resources Defense Council (NRDC)

B. Standards should include emissions reductions achievable through design and operational improvements.

A wide range of regulatory options are available to curb aircraft greenhouse gas emissions. EPA has long assumed that emission standards may be met through operational efficiencies where those would be more cost-effective than applying certain technologies to the engine itself,[175] and has generally set performance standards that offer flexibility as to the technologies used to achieve the standards. In the 2008 ANPR, EPA specifically discussed "a declining fleet average emissions program" which would involve consideration of efficiency gains from improved "engine, aircraft and operational greenhouse gas control[s]."[176] EPA also reiterated in the 2015 ANPR that the "broad degree of discretion" afforded the agency under section 231 enables reconciliation of ICAO's holistic "aircraft standards" with domestic standards "even if the GHG standards take a different form than the traditional thrust-based NOx aircraft engine standards."[177] EPA listed a wide range of technologies that can cost-effectively reduce emissions and that "illustrate that it is best to consider the aircraft as a whole in addressing CO_2 emissions."[178]

Operational improvements that ultimately reduce fuel consumption must also be considered, including:

• Minimizing engine idling time on runways and employing single engine taxiing;[179]

• Reducing engine thrust and reverse during high-intensity periods such as take-off and landing;[180]

• Optimizing timetables, route networks, and flight frequencies to reduce stopovers and select fuel-efficient routes;[181]

• Reducing the use of auxiliary power units;[182]

• Reducing the amount of excess fuel carried;[183]

• More regular maintenance and cleaning of engines and airframes to correct minor deterioration;[184] and

• Retiring older, more polluting aircraft in favor of newer, more efficient aircraft.

Because the electrification and decarbonization of air travel lags behind the decarbonization of other transportation modes, it is essential that all possible opportunities for emission reduction are considered in setting aircraft engine greenhouse gas emission standards. Any standards should be based not just on the reductions that can be gained through technological innovation at the engine, but also through airframe design and operational improvements. [EPA-HQ-OAR-2018-0276-0150-A1, pp.25-26]

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[175] Control of Air Pollution from Aircraft and Aircraft Engines, 38 Fed. Reg. at 19,089 ("Commenters representing general aviation interests opposed the introduction of emission standards applicable to piston engine aircraft, on the arounds that compliance would require introductions of exhaust system reactors which would have drastic and costly effects on the configuration of the entire aircraft. The Agency has concluded that sufficient evidence is already available in the form of measured emissions data on current aircraft to indicate that the proposed standards can be met by improved fuel management and will not require exhaust system reactors.")

[176] Regulating Greenhouse Gas Emissions Under the Clean Air Act, 73 Fed. Reg. at 44,473. Section 231's language is similar to that in Section 202, under which EPA has historically employed a fleet-wide averaging approach to regulate of emissions from new motor vehicles. The D.C. Circuit has upheld this approach as lawful, emphasizing the "absence of any clear evidence that Congress intended to prohibit averaging" under section 202 and the strong policy arguments for adopting this approach. See NRDC v. Thomas, 805 F.2d 410, 425 (D.C. Cir. 1986).

[177] Proposed Finding That Greenhouse Gas Emissions From Aircraft Cause or Contribute to Air Pollution That May Reasonably Be Anticipated To Endanger Public Health and Welfare and Advance Notice of Proposed Rulemaking, 80 Fed. Reg. at 37,794, n.227 (emphasis added).

[178] Id. at 37,797 (discussing use of advanced materials, new manufacturing processes, aircraft changes to improve propulsion and aerodynamics, and means to reduce drag and improve combustion and engine cycle refinements).
[179] Waitz, Ian A. et al., Aviation and the Environment: A National Vision Statement, Framework for Goals and Recommended Actions, Report to the United States Congress (Dec. 2004) ("Aviation & the Environment") at 34, available at: http://web.mit.edu/aeroastro/partner/reports/congrept_aviation_envirn.pdf; Center for Clean Air Policy and Northeast States for Coordinated Air use Management, Controlling Airport Related Pollution, (June 2003) ("CCAP Report") at III-7-8, available at: https://crp.trb.org/acrp0267/controlling-airport-related-air-pollution/.
[180] CCAP Report at III-9.
[181] CCAP Report at III-7-11; see also Aviation & the Environment at 34.
[182] Aviation & the Environment at 34.
[183] Id.
[184] Id.

Organization: Center for Biological Diversity, et al.

A declining fleetwide average standard would allow airlines to reduce their emissions through operational changes and design improvements, decreasing demand growth, electrifying aircraft, or some combination of these options. EPA should act quickly to set such a standard and bring aviation emissions in line with climate reality. [EPA-HQ-OAR-2018-0276-0154-A1], [EPA-HQ-OAR-2018-0276-0154-A1, p.2]

[The following comments were submitted as testimony at the virtual public hearing on September 17, 2020.]

Rather than finalize the proposed rule, EPA must quickly issue a revised standard that follows several principles. First, the standard should apply to the entire aircraft and should include reductions achievable through changes in operations and management

The delegation provided to EPA under Section 231 of the Clean Air Act is very broad. We encourage EPA to fully utilize its authority and to set a fleet-wide average emissions standard for all aircraft. The standard should decline over time to rapidly decrease U.S. aviation emissions over the next decade and to fully decarbonize the industry by 2050.

Organization: Environmental Defense Fund

Specifically, EPA could, within its statutory authority:

set stringent emissions limits for aircraft engines that recognize the emission reductions actually achieved [EPA-HQ-OAR-2018-0276-0158-A1, p.8]

- by flight techniques that reduce total emissions per flight;37 [EPA-HQ-OAR-2018-0276-0158-A1, p.8]
- through the use of Sustainable Aviation Fuels (SAF) that have been determined by EPA, working from the framework established by ICAO with the participation and approval of the United States, to meet rigorous sustainability criteria adopted by ICAO's Committee on Aviation Environmental Protection (CAEP), 38 provided that EPA has determined that the fuels emit at least 60% less GHGs than conventional jet fuels on a lifecycle basis, and these reductions are not double-counted or double-claimed; 39 [EPA-HQ-OAR-2018-0276-0158-A1, p.8]
- Emissions units that, in EPA's judgment, assure environmental integrity, including the avoidance of double-counting and double claiming, and that have been approved by ICAO with the participation of the United States.40 [EPA-HQ-OAR-2018-0276-0158-A1, p.8]

Such approaches would spur American innovation and could create jobs here in the United States producing the engines, aircraft, lightweighted materials, flight systems, emission reductions and fuels of the future. These approaches could foster co-benefits by encouraging technologies, flight patterns, and the uptake of SAFs that reduce local air pollution around airports, and thereby benefit the health of local communities and disadvantaged groups. EPA and FAA have in fact previously asserted the authority to consider "new air traffic systems and flight management techniques that can result in environmental benefits," when developing and implementing standards.41 EPA can build on this authority in developing significantly more ambitious standards for aviation GHG emissions, and can work cooperatively with FAA to ensure these methods are enforceable by integrating the obligations directly into each aircraft's airworthiness certificate. [EPA-HQ-OAR-2018-0276-0158-A1, p.8-9]

Organization: Environmental Protection Network (EPN)

The US leads in research and deployment of alternative low-carbon fuels, so it would do well competitively with more ambitious standards. And as planes meeting these standards would also fly throughout the world, the impact would extend beyond our borders, multiplying the positive effect on residents and businesses in the US. [EPA-HQ-OAR-2018-0276-0155-A1, pp.1-2]

Organization: Mira's Garden

[The following comments were submitted as testimony at the virtual public hearing on September 17, 2020.]

A Port of Seattle commissioner told me that when he had talked to an engineer at Boeing about the electric planes, he said, "Why aren't you guys investing more into electric plane research?"

And the Boeing executive said, "Well, it doesn't pencil out for us." We need to make that pencil out for them. We need to do whatever it takes.

Organization: National Tribal Air Association

There are several possibilities for effectively lowering emissions from the aviation industry that are within the EPA's control:

3. Set incremental reductions that are increasingly stringent in the future.

4. Apply flexibility mechanisms, such as averaging and banking (this concept is discussed more in-depth in Zheng and Rutherford, 2020).[EPA-HQ-OAR-2018-0276-0179-A1, p.3]

Organization: Shell Oil Products US (Shell)

Shell recognizes the need to reduce emissions in the aviation sector. In addition to aircraft emission standards, we believe that there are two other key components to reducing and offsetting emissions in this sector – sustainable aviation fuel (SAF) to reduce emissions and nature based solutions (NBS) to offset emissions that cannot otherwise be eliminated. Both of these levers to address emissions need further policy support. [EPA-HQ-OAR-2018-0276-0097-A1, p.1]

SAF can be incentivized further in the U.S. under the Renewable Fuel Standard (RFS). SAF, made from renewable feedstock, qualifies as both a biomass-based diesel fuel and an advanced renewable fuel under the RFS program. When setting the volume mandates for the biomass-based diesel and advanced categories in the annual RFS standards setting process, we urge EPA to consider the volumes of SAF that can be consumed in the aviation sector. By setting more challenging, yet achievable, mandates, EPA can create an environment for investment that can support additional production and use of SAF to help the aviation sector reduce emissions. We would also encourage the government to expand the blenders' tax credit for biodiesel and renewable diesel to create an additional tax credit to incentivize the production of SAF and its use in the aviation sector. [EPA-HQ-OAR-2018-0276-0097-A1, p.2]

In addition to aircraft emission standards and expanded use of SAF to reduce emissions, we encourage the government to take a holistic approach and implement regulatory programs to recognize emission offsets, such as through NBS, that will be needed to offset emissions that cannot be eliminated. While avoiding and reducing emissions through, e.g., increases in aircraft efficiency and the use of SAF should be the primary means of reducing aviation emissions, we recognize that more needs to be done to offset emissions in the near term. As such, Shell sees an immediate and valuable role for high quality carbon credits, specifically NBS, to compensate for unavoidable emissions and to act as a bridge to the future. NBS comprise all activities related to the protection, or redevelopment, of natural ecosystems – such as forest, grasslands, and wetlands – to lower concentrations of greenhouse gases in the atmosphere. Such activities can lead to the marketing, trading and sale of carbon credits. A regulatory system that recognizes the use of such offsets can greatly facilitate their use to meet emission reduction goals in harder to abate sectors, like aviation. As EPA goes forward with future action to reduce emissions in the aviation sector, we urge EPA to develop programs to incentivize the use of NBS. [EPA-HQ-OAR-2018-0276-0097-A1, p.2]

Organization: South Coast Air Quality Management District (South Coast AQMD)

EPA Should Consider Aircraft Operational Practices That Can Reduce NOx

In addition to establishing more stringent aircraft NOx engine standards, there are also opportunities to reduce emissions through aircraft operational improvements. For example, the latest draft of the California Air Resources Board's (CARB's) Mobile Source Strategy identifies operational improvements such as de-rated take-off and reduced engine taxiing as strategies that could achieve substantial NOx reductions.[7] We recommend that EPA evaluate these and other operational practices and consider developing specific guidelines for airlines and airports for the safe implementation of these practices and quantification of emission benefits. [EPA-HQ-OAR-2018-0276-0144-A1.pdf, p.2]

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[7] California Air Resources Board, Mobile Source Strategy https://ww2.arb.ca.gov/resources/documents/2020-mobile-source-strategy

Organization: Transport Canada, Civil Aviation (TCCA)

Representation 3

General [EPA-HQ-OAR-2018-0276-0084-A2, p.2]

Comment

The NPRM discusses that the proposed rules do not bring CO_2 reductions due to the ICAO standard setting process and the response from OEMs in advance to ensure compliance with the stringencies. However, the CO_2 standard is 1 of a 'basket of measures' from ICAO that are intended to contribute to an overall reduction in GHGs and other LAQ impacts (such as additional engine emission regulations for NVPM, SAF, CORSIA). To help contextualize the purpose of this particular rule making (which is a fuel efficiency standard based on aircraft in cruise), some discussion should be included about other measures being taking to reduce GHGs and improve LAQ in aviation in general. [EPA-HQ-OAR-2018-0276-0084-A2, p.2]

Suggested resolution

Add additional information about other GHG reduction / LAQ improvement measures in aviation which EPA is involved with via ICAO. [EPA-HQ-OAR-2018-0276-0084-A2, p.2]

Organization: Washington State Department of Ecology (Ecology)

Specifically, the rule should:

- Establish standards that increase stringency over time and allow for manufacturers to trade credits. [EPA-HQ-OAR-2018-0276-0140-A1, p.1]

Response:

Commenters suggested four primary ways of addressing airplane GHG emissions that go beyond the proposed adoption of GHG standards that match the ICAO standards: changing airplane operations; changing aviation fuels (e.g. using sustainable alternative fuels, electrification, or hydrogen), by introducing increasingly stringent requirements over time, and by establishing fleet averaging and carbon offset programs.

While EPA agrees that some or all of these potential measures might also address airplane GHG emissions, they would require substantial new data gathering, and technical, legal, and economic analysis. EPA does not, at this time, have sufficient record information to evaluate whether to propose future standards reflecting these measures. The EPA continues to believe that the appropriate approach at this time is to adopt GHG standards that match the ICAO standards, an action that we believe is well justified by the analysis laid out in this final rule.

18. Other Comments

18.1. Legal Considerations/Statutory Authority

Comments:

Organization: Airlines for America (A4A) and Air Line Pilots Association, International (ALPA)

A. Adoption of GHG Aircraft Engine Standards that are Equivalent to the ICAO CO_2 Aircraft Standards into U.S. Law is Consistent with the Authority Conferred to EPA Under Section 231 of the Clean Air Act

The ICAO CO_2 Aircraft Standards clearly meet the criteria for adoption of aircraft engine standards set out in Section 231 of the Clean Air Act. As EPA highlights in the preamble to the Proposed Rule, the ICAO CO_2 Aircraft Standards resulted from an intense, multi-year effort within ICAO to assess aircraft and aircraft engine technologies, develop a metric for evaluating CO_2 emissions from aircraft, and agree on the applicability, timing and stringency of the standards. The technical grounding for the standards was established through many meetings of the ICAO Committee on Aviation Environmental Protection ("CAEP"). Upon recommendation of the standards by CAEP in 2016, the ICAO Council reviewed and voted to adopt the standards, a proposal that was endorsed by the ICAO Assembly (ICAO's governing authority). After a final review period involving all ICAO Member States, in early 2017 the ICAO CO_2 Aircraft Standards were formally adopted into ICAO's Standards and Recommended Practices ("SARPs") and codified in Annex 16, Volume III of the Convention on International Civil Aviation (commonly referred to as the "Chicago Convention").

Importantly, the U.S. government plays a leading role within ICAO and its leadership within CAEP is particularly strong. The FAA serves as the U.S. representative to CAEP (also referred to as the "CAEP Member"), with EPA serving as an advisor to FAA "on aviation emissions, technology, and environmental policy matters" throughout the CAEP process.[11] As EPA recounts, both FAA and EPA worked over an eight-year period "from 2009 to 2016 within the ICAO/CAEP standard-setting process on the development of" the ICAO CO_2 Aircraft Standards.[12] Indeed, both FAA and EPA served as leaders of key technical working groups and task groups, as CAEP worked to collect data, and complete comprehensive technical and economic analyses to inform development of the standards. In addition, EPA often contributed technical analyses and data for the CAEP's consideration. A4A was privileged to be included on the International Air Transport Association's delegation, which serves as an "observer" to CAEP. ALPA also participated as an observer as part of the International Federation of Air Line Pilots' Associations. As observers, A4A and ALPA were able to provide input into the process and – like EPA and FAA – devoted many, many hours and resources to the effort. Other organizations representing industry stakeholders and non-governmental organizations ("NGOs") also served as observers and contributed data and analyses. In the end, with the U.S FAA and EPA playing key leading roles, it was only after dozens of in-person meetings and many more teleconferences in which hundreds of formal analytical papers authored by some 170 aviation experts from government, industry and environmental organizations were painstakingly considered, that CAEP agreed to the ICAO CO_2 Aircraft Standards. [EPA-HQ-OAR-2018-0276-0161-A1, pp.4-7]

As a result, there is no doubt that the ICAO CO_2 Aircraft Standards are technically sound.[13] In addition, there is no doubt that the standards are consistent with the Terms of Reference ("TOR") for CAEP, which provide that such standards must be technologically feasible, economically reasonable, environmentally beneficial, and balanced against interdependencies (aircraft noise and competing emission reductions of other pollutants, such as oxides of nitrogen and particulate matter).[14]

Critically, the CAEP TOR align well with the criteria EPA must follow pursuant to CAA Section 231 and ICAO's assessment of each element of the TOR is directly related to the decisions EPA must make when adopting aircraft engine emission standards. Section 231(b) requires any engine emissions standard to allow sufficient lead time "to permit the development and application of the requisite technology, giving appropriate consideration to the cost of compliance within such period." Due to the rigorous performance criteria required of aircraft dictated by safety imperatives and the need to match aircraft mission capability to demand, the process involved in designing, certifying, and building new aircraft is inherently lengthy. In addition, Section 231 expressly prohibits changes in engine emission standards that "would significantly increase noise and adversely affect safety." 231(a)(2)(B)(ii).[15] Also particularly relevant here is that, as EPA explains in its preamble, ICAO/CAEP evaluates "technological feasibility" using the Technological Readiness Level ("TRL") scale and deems technologies that have attained TRL8 (defined as the "actual system completed and 'flight qualified' through test and demonstration") to be "technologically feasible."[16] Use of TRL8 to evaluate "technological feasibility" thus ensures emissions standards reflect what aircraft technologies can safely deliver, rather than hypothetical "technology forcing" standards that could pose a potential threat to air safety.

EPA affirms the "long-established ICAO/CAEP terms of reference were taken into account when deciding the international CO_2 Airplane Emissions Standards, principal among these being technical feasibility."[17] Given the close relationship between the criteria it must follow under CAA Section 231 and the ICAO/CAEP TOR, it is clear that the comprehensive technical and economic data and analyses developed by CAEP to support its standards also is more than sufficient to support the adoption of those standards into U.S. law. [EPA-HQ-OAR-2018-0276-0161-A1, pp.4-7]

We do emphasize that the approach taken to the ICAO CO_2 Aircraft Standards, which is based on a fuel-efficiency metric applied to the aircraft as a whole (the "ICAO CO_2 Metric"), must be reconciled with EPA's authority under Section 231 of the Clean Air Act, which is limited to promulgating "emissions standards applicable to the emission of any air pollutant from any class or classes of aircraft engines."[18] The ICAO CO_2 Metric allows the CO_2 standard to be met through the development and deployment of the wide range of technologies incorporated into aircraft that affect its fuel efficiency, including, for example, combustion systems, winglets, and aerodynamic innovations. While Section 231 clearly does not confer authority upon EPA to regulate aircraft generally,[19] we do agree with the Agency that its adoption of the ICAO CO_2 Aircraft Standards is consistent with U.S. law given the unique, direct and linear relationship between aircraft fuel-efficiency and the aircraft engine emissions EPA proposes to regulate here (CO_2 and nitrous oxide ("N_2O")).

A necessary predicate for the Agency's action here was its 2016 *Finding That Greenhouse Gas Emissions From Aircraft Cause or Contribute to Air Pollution That May Endanger Public Health and Welfare (*the "2016 Findings").[20] There, the Agency found that "[p]ursuant to CAA section 231(a)(2)(A) . . . emissions of the six well-mixed greenhouse gases (GHGs) from certain classes of aircraft ***engines*** used in certain types of aircraft . . . contribute to air pollution that may reasonably be anticipated to endanger the public health and welfare of current and future generations."[21] The Agency was careful to acknowledge that of the "six well-mixed" GHGs, aircraft engines covered by the findings emit only CO_2 and N_2O, a fact it emphasizes in the present preamble as well.[22] GHG emissions from aircraft engines are comprised almost entirely of CO_2, making up 99 percent of such emissions, while N_2O comprises less than one percent.

Of critical importance in this context, however, is that emissions of both CO_2 and N_2O are directly and linearly related to fuel burn, and thus, the fuel efficiency of the aircraft as whole. This is also confirmed, for example, in EPA's *Inventory of Greenhouse Gas Emissions and Sinks: 1990-2018*, which relies on data evaluating jet fuel combustion and applies emission factors (grams emitted / kilograms of fuel burned) to determine CO_2 and N_2O emissions from commercial aircraft. As a result, we agree with EPA's conclusion that the ICAO CO_2 Metric "as a measure of airplane fuel efficiency" is a reasonable "surrogate for GHG emissions from covered airplanes" . . . "because the fuel efficiency metric controls emissions of both CO_2 and N_2O."[23] In these circumstances, EPA may adopt the ICAO CO_2 Aircraft Standards, which regulate aircraft fuel efficiency through the ICAO CO_2 Metric, as aircraft ***engine*** emission standards, because of the direct, linear connection between the GHG emissions it is regulating (CO_2 and N_2O) from aircraft engines and the fuel efficiency of the aircraft as a whole. Thus, we agree that EPA may exercise the authority conferred by Section 231 of the Clean Air Act to regulate GHG (CO_2 and N_2O) emissions from aircraft engines by adopting standards equivalent to the ICAO CO_2 Aircraft Standards.[24] [EPA-HQ-OAR-2018-0276-0161-A1, pp.4-7]

B. The Proposed GHG Aircraft Engine Emissions Standards Should Be Clarified to Ensure, Consistent with the Authority Conferred by Section 231 of the Clean Air Act, they Apply to Aircraft Engine Emissions

As noted above, A4A and ALPA believe the aircraft-wide fuel-efficiency metric approach under the ICAO CO_2 Aircraft Standard can be reconciled with EPA's authority for regulating aircraft engine emissions in the unique case presented by the particular emissions at issue. However, we believe EPA needs to better reflect this in the structure of the Proposed Rule. We are concerned that as presently worded proposed section 1030.1(a) could be read to assert regulatory authority more broadly over aircraft than authorized under Section 231. To make clear that EPA is regulating emissions from aircraft engines consistent with its authority, we respectfully request the provision be amended to read:

(a) ~~Except as provided in paragraph (c) of this section, when an~~ Greenhouse Gas (GHG) emissions from an aircraft engine subject to 40 CFR part 87 shall not exceed levels such that the aircraft ~~is installed on an airplane that is described in this section and subject to title 14 of the Code of Federal Regulations, the airplane may not~~ exceeds ~~the Greenhouse Gas (~~GHG~~)~~ standards of this part when ~~certification under title 14 is sought~~ when the engine is installed on: [EPA-HQ-OAR-2018-0276-0161-A1, pp.11-12]

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11 85 Fed. Reg at 51560.
12 85 Fed. Reg at 51561.
13 As EPA notes, CAEP provided a summary of its analyses and findings, ICAO, 2016: Doc. 10069 – Report of the Tenth Meeting, Montreal, 1-12 February 2016, Committee on Aviation Environmental Protection, CAEP 10.
14 The CAEP TOR are available at https://www.icao.int/environmental-protection/Pages/Caep.aspxz#ToR. In its Draft Airplane GHG Standards Technical Support Document (TSD), EPA-HQ-OAR-2018-0276-0024) EPA provides extensive information regarding ICAO/CAEP's analysis. Additional information and detail on ICAO/CAEP's analysis has been made publicly available by the European Aviation Safety Agency ("EASA") in its Notice of Proposed Amendment 2017-01, Appendix 3, ICAO ANNEX 16, VOL III AMENDMENTS, which we incorporate here by reference (available at: https://www.easa.europa.eu/sites/default/files/dfu/NPA%202017-01.pdf).

[15] Section 231(c) creates an additional mechanism to ensure aircraft engine emission standards are not inconsistent with the imperative to maintain air safety, providing that any requirements promulgated pursuant to Section 231 "shall not apply" if the Secretary of Transportation makes a finding that the regulation "would create a hazard to aircraft safety" and the President disapproves the requirement after public notice and comment.
[16] 85 Fed. Reg at 51585.
[17] 85 Fed. Reg at 51585.
[18] Section 231(a)(2)(A) (emphasis added).
[19] EPA does not have authority to regulate aircraft operations, airport operations, individual carrier fleets or the aviation industry. Congress has vested the authority to regulate the movement or operation of aircraft, both in flight and on the ground exclusively in the FAA through the Federal Aviation Act of 1958.
[20] Finding That Greenhouse Gas Emissions From Aircraft Cause or Contribute to Air Pollution That May Endanger Public Health and Welfare and Advance Notice of Proposed Rulemaking; Final Rule, 81 Fed. Reg. 54422 (August 15, 2016). A4A and ALPA submitted extensive comments on the proposed findings and associated ANPR (see Docket EPA-HQ-OAR-2014-0828-0747, joint comments of Airlines for America and Air Line Pilots Association), which are incorporated here by reference.
[21] 81 Fed. Reg. at 54423 (footnote omitted; emphasis added).
[22] 85 Fed. Reg. at 51563 ("only two of the six well-mixed GHGs, CO_2 and N_2O, are emitted from covered aircraft").
[23] 85 Fed. Reg. at 51565. We emphasize that the ICAO CO_2 Standards do not reference N_2O emissions or establish any direct limit on N_2O emissions. This does not represent an inconsistency between the ICAO CO_2 Standards and EPA's proposed GHG Aircraft Engine Emissions Standards. Given the direct, linear relationship between fuel-efficiency and N_2O emissions from aircraft engines, we agree that EPA may reasonably use the ICAO CO_2 Standards as a means of also addressing N_2O, fulfilling EPA's obligation under U.S. domestic law – triggered by its 2016 Findings – to regulate both CO_2 and N_2O emissions from aircraft engines.
[24] The very first sentence of EPA's preamble to the Proposed Rule affirms its intent is to promulgate "[GHG] emission standards applicable to certain classes of engines used by certain civil subsonic jet aircraft . . . ." 85 Fed. Reg. at 51556 (emphasis added). See also 85 Fed. Reg. at 51558 ("We are proposing a new rule that controls aircraft engine GHG emissions through the use of the ICAO regulatory metric that quantifies airplane fuel efficiency") (emphasis added). Notably, the Agency also affirms that although the ICAO CO_2 Aircraft Standards can be met by "incorporat[ing] characteristics of the whole airplane," the Agency "is not asserting independent regulatory authority over airplane design." 85 Fed. Reg. 51562. That authority, of course, is vested exclusively in FAA, which is why, while Congress conferred authority to promulgate aircraft engine emissions standards on EPA (in consultation with FAA) under Section 231, it conferred authority to enforce compliance with those standards on FAA pursuant to Section 232. Accordingly, FAA will review and certify aircraft to the ICAO CO_2 Metric, ensuring compliance with the GHG Aircraft Engine Emissions Standards.

Response:

EPA agrees that in this case of the first ever GHG standards for aircraft engine emissions applicable to manufacturers obtaining certification in the United States, aligning the EPA's airplane GHG standards under CAA section 231 with ICAO's Terms of Reference (TOR), Technological Readiness Level 8, and the ICAO CO2 fuel efficiency metric established in the first set of international CO2 standards reflects a reasonable and well-supported approach to implementing EPA's authority under the CAA. However, EPA does not agree that it is necessary to amend section 1030.1(a) as the commenter suggests, in order to clarify that EPA's standards are consistent with EPA's authority under the CAA. In addition, issues related to the EPA's authorities to regulate aircraft operations, airport operations, individual carrier fleets or the aviation industry's operations in the air or on the ground are outside the scope of this rulemaking. An example of EPA's authority to regulate such operations is the long-established provision prohibiting "fuel venting emissions," defined as "raw fuel, exclusive of hydrocarbons in the exhaust emissions, discharged from aircraft gas turbine engines during all normal ground and flight operations," in EPA's regulations at 40 CFR part 87, sections 87.1 and 87.10-87.11. Moreover, section 110(a)(5)(A)-(B) provides states and EPA authority to implement "indirect source review programs" for facilities, buildings, structures and other entities that attract, or may attract, mobile sources of air pollution, and Congress explicitly identified federally assisted airports as being such entities. The single reviewing court that has ruled on EPA's authority under CAA section 231 held the provision to provide EPA "both explicit and extraordinarily broad" authority to regulate aircraft emissions, and that "because Congress has 'explicitly left a gap for the agency to fill, the agency's regulation is given controlling weight unless [it is] … manifestly contrary to the statute,'" NACAA v. EPA, 489 F.3d 1221, 1229 (D.C. Cir. 2007). In regard to the A4A-ALPA comments to clarify the applicability section of the regulations, introductory paragraph of section 1030.1(a), to ensure consistency with section 231 of the Clean Air Act, see the response to these same comments in Section 5 of the Response to Comments document.

Organization: Anonymous Public Comment 22

There are non-harmless, procedural defects for this proposed rule under Section 307(d) of the Clean Air Act:

EPA has failed to "set forth or summarize and provide a reference to any pertinent findings, recommendations, and comments by... the National Academy of Science, and, if the proposal differs in any important respect from any of these recommendations, an explanation of the reasons for such differences." Potentially pertinent findings, recommendations, or comments include reports on negative emission technologies and sequestration from aviation, the social cost of carbon, commercial aircraft propulsion and energy systems research, benefits from proposed air pollution regulations, valuation for regulatory cost-effectiveness, advancing aerial mobility and risk assessment, and verifying international greenhouse gas emissions. [EPA-HQ-OAR-2018-0276-0171 p. 1]

Response:

The legislative history of the Clean Air Act demonstrates that Congress envisioned particular instances in which EPA must consult with the National Academy of Science ("NAS"), and such a case is not applicable in this rulemaking. The EPA is not aware of any findings, recommendations, or comments made by the NAS in regard to this rulemaking. So, there were no "pertinent findings, recommendations, or comments" from NAS for the EPA to set forth or summarize in the notice of proposed rulemaking. The EPA interprets CAA 307(d)(3) to require EPA to consider any pertinent findings, recommendations, or comments made by the NAS, not to docket any and all relevant NAS reports even if the EPA did not consider them. The EPA also notes that all scientific information considered by EPA in this rulemaking has been included in the docket, and so, consequently, all pertinent findings, recommendations, and comments have been included in the docket as well.

Organization: Boeing Company (Boeing)

Thus, EPA should promptly finalize the proposed rule (with the limited modifications noted above), recognizing that it has the authority to revise emission standards from "time to time,"[3] and has consistently exercised that authority as ICAO has updated its corresponding standards. [EPA-HQ-OAR-2018-0276-0181-A2, p.3]

As noted above, CAA section 231 also expressly requires that EPA consult with the FAA when promulgating an emission standard, and it directs that considerations of safety and noise – considerations that are within the province of the FAA to resolve – are paramount. Section 231 makes clear that CAA standards cannot be changed if the resulting standards would significantly increase noise or have an adverse effect on safety,[41] and further provides that already promulgated standards may be disapproved by the President on the basis of a finding by the Secretary of Transportation that such standards "create a hazard to aircraft safety."[42] [EPA-HQ-OAR-2018-0276-0181-A2, pp.12-13]

In sum, CAEP's terms of reference considering environmental effectiveness, technical feasibility, economic reasonableness, and environmental interdependencies (such as trade-offs between noise and emissions and trade-offs between emissions of different air pollutants), and the key criterion of safety are highly correlated with the statutory criteria of section 231 which consider safety, noise timing, and costs in determining the "requisite technology" and arriving at a standard that EPA "deems appropriate." [EPA-HQ-OAR-2018-0276-0181-A2, p.13]

Most importantly, both ICAO and the CAA give primacy to safety in the development of standards for emissions from aircraft engines. A "key criterion" in the development of the ICAO CO_2 standard was that "[t]he certification standard must not compromise safety."[52] As stated more generally in ICAO's 2019 Environmental Report:

Any decision on environmental management should result from a careful evaluation of all the possible environmental impacts. This means identifying interdependencies and trade-off [sic] among environmental impacts (e.g., noised and greenhouse gas emissions), or between environment and other strategic areas of aviation operations, such as capacity, safety, and economics. Sound guidance has been developed and documented by ICAO's CAEP group on this matter. …

[I]t is important to recognize that all aviation stakeholders have worked hard to achieve an enviable level of safety within the sector. In this respect, safety must always be the overriding consideration in all civil aviation operations … ."[53] [EPA-HQ-OAR-2018-0276-0181-A2, pp.14-15]

The ICAO process assures safety through its technical review. As explained by EPA in the 2015 ANPRM: "CAEP determined in 2012 that all technology responses would have to be based on technology that would be in common use by the time the standard was to be decided upon in 2016 or shortly thereafter. This generation of technology was defined within CAEP as a Technology Readiness Level (TRL) 8 - an actual system completed and 'flight qualified' through test and demonstration - by 2016 or shortly thereafter."[54] Thus, by designing standards that can be met through the application of "flight qualified" technologies, and setting applicability dates that allow even further maturation of those technologies, ICAO purposely avoids airworthiness risks. ICAO's approach to safety is fully consistent with CAA section 231's prohibition of EPA's promulgation of an emission standard that would "adversely affect safety,"[55] as well as the President's authority to disapprove a proposed or promulgated standard based on a finding by the Secretary of Transportation that the standard would "create a hazard to aircraft safety."[56] [EPA-HQ-OAR-2018-0276-0181-A2, p.15]

EPA and FAA therefore thoroughly considered safety, noise, timing, and the costs of the proposed standards in the ICAO process, consistent with the requirements of CAA section 231. EPA may properly rely on ICAO's CO_2 standard in this rulemaking given: (a) ICAO's consideration of environmental effectiveness, technical feasibility, economic reasonableness, and environmental interdependencies (such as trade-offs between noise and emissions and trade-offs between emissions of different air pollutants); (b) EPA's and FAA's direct participation in that process; and (c) EPA's discretion, when promulgating regulations to control CO_2 emissions from aircraft engines that EPA "deems appropriate,"[57] to consider the "manner, timing, content, and coordination of its regulations with those of other agencies."[58] [EPA-HQ-OAR-2018-0276-0181-A2, p.15]

B. EPA Has a More Limited Mandate to Control Aircraft Emissions Than Emissions From Other Mobile Sources

Some commenters on the 2015 ANPRM suggest that CAA section 231 provides a "comprehensive scheme for the regulation of harmful aircraft emissions" and that "the regulations promulgated under section 231 must actually reduce pollutants." In their view, which is unsupported by the text of the CAA section 231 or the judicial interpretations of it, "slightly altering" the trajectory of emissions is insufficient to satisfy section 231.[106] [EPA-HQ-OAR-2018-0276-0181-A2, p.25]

The CAA provides specific direction to EPA for setting standards for emissions from aircraft engines:

- EPA must consult with the FAA on aircraft engine emission standards. CAA § 231(a)(2)(B)(i). [EPA-HQ-OAR-2018-0276-0181-A2, p.25]

- EPA is prohibited from promulgating standards that "significantly increase noise and adversely affect safety." Id. § 231(a)(2)(B)(ii).
- EPA standards must take effect only after EPA consults with the Department of Transportation (DOT) and determines the minimum period necessary for the "development and application of requisite technology, giving appropriate consideration to the cost of compliance within such period." Id. § 231(a)(2)(B)(iii).
- EPA regulations shall not take effect if disapproved by the President on the basis of a DOT finding that the standards would "create a hazard to aircraft safety." Id. § 231(c).
- DOT is to prescribe regulations to assure compliance with EPA's aircraft engine emission standards through the aircraft certification process. CAA § 232(a).

These provisions are unique within Title II of the CAA. Similar constraints do not exist with respect to EPA's authority to promulgate and assure compliance with emission standards for automobiles, light duty trucks, medium- and heavy-duty trucks, or nonroad engines, vehicles, and equipment.[107] In other mobile source programs, EPA is not required to consult (as it is within section 231) with other parts of the federal government prior to establishing emission standards. Nor do other parts of Title II of the CAA provide any parallel authority to another agency or instrumentality of government to prevent EPA standards from taking effect (or to make inapplicable existing standards),[108] or to assure compliance with EPA standards that are in effect.[109] Thus, the unique statutory constraints and allocations of authority contained in sections 231 and 232 must be interpreted as intentional; Congress intentionally limited EPA's authority in setting and enforcing aircraft engine emission standards to a far greater extent than with respect to other mobile source programs.[110] [EPA-HQ-OAR-2018-0276-0181-A2,p.26]

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[41] Id. § 231(a)(2)(B)(ii), 42 U.S.C. § 7571(a)(2)(B)(ii). While first incorporated within the Clean Air Act of 1970, CAA section 231 was amended in 1977 and 1996. The 1977 Clean Air Act Amendments added section 231(c) providing that the President may make a disapproval finding based on a "hazard to aircraft safety." Pub. L. No. 95-95, § 225. The requirement for EPA to consult with the FAA on aircraft engine emission standards and a prohibition of changing such standards "if such change would significantly increase noise and adversely affect safety" was adopted as part of the Federal Aviation Reauthorization Act of 1996, which amended CAA section 231(a)(2). Pub. L. No. 104-264, § 406.
[42] Id. § 231(c), 42 U.S.C. § 7571(c).

[52] ICAO, 2016: Tenth Meeting Committee on Aviation Environmental Protection Report, Doc 10069, CAEP/10, Appendix C, §3.1.5, available at https://www.icao.int/publications/Pages/catalogue.aspx ("CAEP/10 Report"). The CAEP/10 Report is found on page 27 of the English Edition 2020 catalog and is copyright protected; Order No. 10069.
[53] See ICAO, 2019 Environmental Report, Aviation and Environment, at 88 (emphasis added), available at https://www.icao.int/environmental-protection/Documents/ICAO-ENV-Report2019-F1-WEB%20(1).pdf, citing https://www.icao.int/environmental-protection/Pages/CAEP-Operational-InterdependencyTask.aspx.
[54] 80 Fed. Reg. 37,758, 37,794 n.228 (July 1, 2015). "TRL is a scale from 1 to 9, TRL1 is the conceptual principle, and TRL9 is the 'actual system 'flight proven' on operational flight.' The TRL scale was originally developed by NASA." Id. at 37804 n.261, citing ICF International, CO2 Analysis of CO2-Reducing Technologies for Aircraft, Final Report, EPA Contract Number EP–C–12–011, at 40 (Mar. 17, 2015).
[55] CAA § 231(a)(2)(B)(ii), 42 U.S.C. § 7571(a)(2)(B)(ii).
[56] CAA § 231(c), 42 U.S.C. § 7571(a)(2)(B)(c).
[57] CAA § 231(a)(3).
[58] Massachusetts v. EPA, 549 U.S. 497, 533 (2007).

[106] Environmental NGO 2015 ANPRM Comments, at 17. As authority, commenters cite Center for Biological Diversity v. EPA, 794 F. Supp. 2d 151 (D.D.C. 2001). However, this case did not address the level of pollution

reduction required pursuant to CAA section 231. Instead, it addressed only the duty of EPA to conduct an endangerment determination for aircraft GHGs, something which has already been done.

[107] See CAA §§ 202(a), 213(a)(3)-(5).

[108] See, e.g., CAA § 231(c).

[109] See CAA § 232.

[110] For example, when promulgating emission standards for new light duty vehicles, specific authority is provided to EPA to promulgate requirements for testing and certification, and EPA is also authorized to administer associated requirements, e.g., minimum warranty periods that are applicable to vehicles entering into commerce in the U.S. See CAA §§ 206, 207(i), 42 U.S.C. §§ 7525, 7541(i). Other mobile source provisions within CAA Title II contain provisions concerning implementation of emission standards, including directives regarding engine rebuilding (CAA §202(a)(3)(D), 42 U.S.C §7521(a)(3)(D)), how long regulatory standards should apply (CAA § 202(a)(3)(C) , 42 U.S.C. § 7521(a)(3)(C)) the means by which emission regulations must be verified (e.g., through compliance testing and certification), (CAA § 206, 42 U.S.C. § 7525) and consumer protection/enforcement provisions (e.g., emission warranties) (CAA § 207(i), 42 U.S.C. § 7541(i)). Such provisions are absent in CAA section 231. Further, over the past 40 years, Congress has only acted to further confine EPA's authority to promulgate emission standards for aircraft engines, never acting to expand that authority. Amendments to the CAA contained in Pub. L. No. 95-95, § 255 and Pub. L. No. 1040264, § 406 both acted to constrain EPA authority with regard to the promulgation of new emission standards. The first enactment provided a mechanism for Presidential disapproval of EPA standards; the second prohibited EPA from changing existing aircraft standards "if such change would significant increase noise and adversely affect safety." See CAA §§ 231(c) and 231(a)(2), 42 U.S.C. §§ 7571(c) and 7571(a)(2).

Response:

As discussed above in response to A4A's comments, EPA agrees that it is reasonably exercising its extraordinarily broad authority under CAA section 231 in these initial airplane GHG standards to align with the first set of international airplane CO2 standards. Although EPA agrees it has authority to revise aircraft emissions from "time to time" pursuant to CAA section 231(a)(3), and that under section 231 EPA has specific requirements to consult with the FAA in devising such standards, which may not significantly increase noise and adversely affect safety, EPA does not agree that safety must be considered the "paramount" factor that EPA must consider in setting aircraft emission standards, or that EPA's authority is generally more "limited" than when establishing emission standards for other mobile source sectors. In certain respects, EPA's authority is broader than it is under other CAA provisions, in that EPA is not required in setting aircraft emission standards to achieve a specified degree of emissions reduction (as under CAA sections 202(a)(3) or 213(a)(3) and (5), for example), or to limit their scope to only "new" engines and vehicles. As noted previously, the U.S. Court of Appeals for the D.C. Circuit found that EPA has "both explicit and extraordinarily broad" authority to regulate aircraft emissions, and that "because Congress has 'explicitly left a gap for the agency to fill, the agency's regulation is given controlling weight unless [it is] … manifestly contrary to the statute.'" NACAA v. EPA, 489 F.3d 1221, 1229 (D.C. Cir. 2007). The Court explained that EPA acts "pursuant to an express delegation of authority," which "arises when 'Congress has expressly delegated to [an agency] the authority to prescribe regulations containing such classifications, differentiations, or other provisions as, in the judgment of the [agency], are necessary or proper to effectuate the purposes of [the authorizing statute], to prevent circumvention or evasion thereof, or to facilitate compliance therewith.'" Id. The Court characterized EPA's authority to regulate aircraft engine emissions as "expansive," and stated that provided EPA's reading of the Act is not manifestly contrary to the statute, "it must be given controlling weight" and the Court "therefore defer[s] to EPA's construction." Id. at 1230.

Organization: California Attorney General's Office and the California Air Resources Board (CARB) et al.

Although the Fourth Assessment credits emission reduction strategies the Commenting States and others have already put into action, it concludes that current global and regional efforts “do not yet approach the scale considered necessary to avoid substantial damages to the economy, environment, and human health over the coming decades.”[124] Moreover, aircraft are generally out of States’ jurisdiction. 42 U.S.C. § 7573 (preempting State and local emission standards for aircraft and aircraft engines that differ from federal standards). This makes the Commenting States dependent on EPA to adopt federal standards to reduce emissions, protect the health and welfare of their residents, and avoid damage to their economies. [EPA-HQ-OAR-2018-0276-0176-A1, pp.20-21]

EPA has arbitrarily dismissed federalism impacts. Under Executive Order 13132, EPA must analyze and consult with States on the cooperative federalism implications of the Proposed Rule. Here, EPA failed to fulfill these requirements. EPA incorrectly claims the Proposed Rule does not have federalism implications and would not have substantial direct effects on the States or affect the relationship between the National Government and the States. 85 Fed. Reg. at 51,590. In fact, this rulemaking would have substantial direct effects on the States, and particularly the Commenting States, and disrupt the cooperative relationship between the Commenting States and the federal government.

The Clean Air Act represents a hallmark example of cooperative federalism, as EPA and state air agencies partner to protect public health from the harmful effects of air pollution. An essential aspect of this relationship includes the federal government setting appropriate standards for aviation that will protect the public health and welfare on behalf of all States, particularly given the States’ surrender of their sovereign authority to set their own standards for aircraft pollution. See supra, Part III.A.4. The States depend on the federal government to adequately regulate aircraft emissions to protect their population. EPA has abdicated its role under the Clean Air Act by failing to set a standard that would meet the Act’s requirements. The Proposed Rule—which fails to mitigate GHG emissions, and which also fails to achieve reductions in associated criteria and toxic emissions—poses a risk of significant public health and economic harms to the Commenting States. The relationship between the States and the federal government suffers when the States cannot trust the government to fulfill its obligations to protect the public health and welfare as required under federal law. [EPA-HQ-OAR-2018-0276-0176-A1, pp.35-36]

B. Failure to consider any options that reduce greenhouse gas emissions violates section 231 and is arbitrary and capricious.

By considering only emission standards that do not reduce GHG emissions, EPA has violated section 231 and failed to consider an “important aspect of the problem.” See Motor Vehicle Mfrs. Ass’n v. State Farm Mut. Auto. Ins. Co., 463 U.S. 29, 43 (1983). EPA’s analysis shows that the Proposed Rule does not result in any GHG reductions over “business-as-usual,” i.e., the reductions that would likely happen in the absence of any regulation.

[124] Fourth Assessment, Vol. II, at 26 (Summary Findings).

Response:

EPA disagrees the rule fails to meet the requirements of the Clean Air Act. As previously explained, the D.C. Circuit has held that EPA's authority to determine what aircraft engine emission standards are appropriate is "extraordinarily broad." NACAA, at 1229. An express delegation arises when “Congress has expressly delegated to [an agency] the authority to prescribe regulations containing such classifications, differentiations, or other provisions as, in the judgment of the [agency], are necessary or proper to effectuate the purposes of [the authorizing statute], to prevent circumvention or evasion thereof, or to facilitate compliance therewith.” Household Credit Servs., Inc. v. Pfennig, 541 U.S. 232, 238-39, 242 (2004) (internal quotation marks omitted). That is precisely what Congress has done in the CAA in requiring the Administrator of EPA to study and investigate emissions of air pollutants from aircraft and adopt regulations to control them. The Act states that "[t]he Administrator shall, from time to time, issue proposed . . . standards applicable to the emission of any air pollutant from . . . aircraft engines which in his judgment causes, or contributes to, air pollution which may reasonably be anticipated to endanger public health or welfare." 42 U.S.C. § 7571(a)(2)(A). After hearings, the Administrator is authorized to "issue such regulations with such modifications as he deems appropriate." Id. § 7571(a)(3) (emphasis added). This delegation of authority is both explicit and extraordinarily broad. See Atkins v. Rivera, 477 U.S. 154, 162 (1986) (finding an express delegation of authority where "Congress conferred on the Secretary exceptionally broad authority to prescribe standards for applying certain sections of the Act") (internal quotation marks omitted). Accordingly, because Congress has "explicitly left a gap for the agency to fill, the agency's regulation is given controlling weight unless [it is] . . . manifestly contrary to the statute." Household Credit Servs., 541 U.S. at 239 (internal quotation marks omitted). Notably, the D.C. Circuit in NACAA did not adopt the petitioner's view that CAA section 231 requires EPA's standards to reflect a "technology forcing" result that reduced the baseline of emissions from aircraft engines being produced, and affirmed EPA's approach even though the rule at issue did not mitigate air pollution emissions and the agency did not in its action consider more stringent options that would have reduced emissions. Consequently, EPA disagrees with the commenters' claims that in these initial airplane GHG standards CAA section 231 compels EPA to adopt standards that mitigate the impacts of GHG pollution, or ancillary criteria pollutant or hazardous air pollutant (HAP) emissions.

EPA also disagrees with the commenters' claims that the proposed rule, particularly due to the pre-emption of states adopting conflicting standards under CAA section 233, raises federalism concerns under Executive Order 13132 or is inconsistent with the cooperative federalism framework of the Clean Air Act. EPA does not believe this rule raises federalism concerns because its adoption of these first ever airplane GHG standards, against a backdrop of the absence of any GHG standards regulating aircraft engine emissions, does not take away any authority that a state would otherwise have to regulate such pollution. The cooperative federalism framework of the Clean Air Act includes areas where Congress has decided to preempt state and local regulation, and aircraft emissions are one area where state and local governments may not adopt standards different from those that the United States adopts. Accordingly, EPA believes that this rule is consistent with the Clean Air Act and its policies.

Organization: Center for Biological Diversity, Earthjustice, on behalf of the Sierra Club and Friends of the Earth, and the Natural Resources Defense Council (NRDC)

III. The Proposal Violates Section 231 of the Clean Air Act.

When it passed the Clean Air Act, Congress was specific about its purpose: the Act "promote[s] reasonable Federal, State, and local government actions . . . for pollution prevention."[72] Congress specifically defined "pollution prevention" as the "reduction or elimination, through any measure, of the amount of pollutants produced or created at the source."[73] To implement this purpose, the Clean Air Act's provisions require EPA to issue endangerment findings for those pollutants emitted by specified sources that endanger human health and welfare, and then issue emission standards to meaningfully regulate those emissions. Thus, the purpose of EPA's endangerment findings and standard-setting practices under the Act is not merely to slightly alter an ever upwards-bending curve of pollution increases, or hold the pollution level steady, but to reduce or eliminate altogether the pollution from sources subject to its regulation.

Section 231 carries out this purpose. It provides "a comprehensive scheme for the regulation of harmful aircraft emissions, of which paragraph 231(a)(2)(A) is the centerpiece."[74] In issuing the 2016 Endangerment Findings, EPA recognized that its "duties regarding aircraft air pollution emissions under CAA section 231 reflect a combination of the CAA's goals to protect public health and welfare and encourage improved emissions performance."[75] But the Proposal adopting ICAO's CO_2 standards achieves neither of these goals.

The Proposal does nothing to reduce emissions from aircraft beyond reductions that will occur absent any regulation, despite the fact that EPA has determined that those emissions harm public health and welfare. Indeed, EPA acknowledges that the Proposal would have no effect on greenhouse gas emissions from aircraft. In discussing the implications of the Proposal, EPA stated that it "is not projecting emission reductions associated with these proposed GHG regulations."[76] The Proposal "[is] not expected to result in reductions in fuel burn and GHG emissions beyond the baseline."[77] EPA "does not project that the proposed GHG rule would cause manufacturers to make technical improvements to their airplanes that would not have occurred in the absence of the rule."[78] On the contrary, "EPA projects that the manufacturers would meet the proposed standards independent of the EPA standards" because ICAO premised its international Airplane CO_2 Emission Standards on "proven technology by 2016/2017 that was expected to be available over a sufficient range of in-production and on-order airplanes by approximately 2020."[79] As such, "most or nearly all in-production and on-order airplanes already meet the levels of the proposed standards," with the exception of a "few in-production airplane models that . . . are at the end of their production life and are expected to go out of production in the near term."[80] Similarly, "a technology response is not necessary for new type design airplanes to meet the GHG rule proposed."[81] In plain English, the Proposal requires no technical changes, has no effect on greenhouse gas emissions, and, aside from some $16,000 annually for preparing reports,[82] imposes no costs.

EPA's wholesale adoption of ICAO's technology-following emission standards violates section 231. Section 231(b) provides that standards should take effect "after such period as [EPA] finds necessary . . . to permit the development . . . of the requisite technology."[83] Thus, as EPA explained in its first rulemaking under section 231, "the standards set by EPA may reflect technology which may reasonably be obtained within a given time frame but which is not yet available."[84] EPA does not have to "demonstrate that a [necessary] technology is currently available universally or over a broad range of aircraft" to require implementation of its standards.[85]

The legislative history of the 1970 Clean Air Act Amendments further demonstrates Congress's intent to prompt effective and technology-forcing regulatory action. In 1970, Congress expanded EPA's authority to regulate mobile sources of pollution "to include authority to set air pollution emission standards for aircraft."[86] Explaining the implications of the 1970 amendments on EPA's authority to regulate mobile sources, the Committee on Public Works stated that "standards should be a function of the degree of control required" based "on the contribution of moving sources to deterioration of air quality," "not the degree of technology available today."[87]

EPA posits that the proposed rule is an "anti-backsliding cap on future emissions of airplanes by ensuring that all new type design airplanes are at least as efficient as today's airplanes."[88] However, where EPA has made a finding that current levels of emissions endanger public health and welfare, preventing further increases of pollution does not satisfy the purposes of the CAA.[89] Moreover, because airplane travel is increasing, under this Proposal, CO_2 emissions would increase by 40 percent to 53 percent above 2015 levels in 2040.[90] Thus, the Proposal does not even function to prevent backsliding, as EPA asserts, but will instead contribute to further harms to public health and welfare.

EPA relies on National Association of Clean Air Agencies (NACAA) v. EPA, 489 F.3d 1221 (D.C. Cir. 2007), in defense of its do-nothing Proposal[91] but that case does not authorize EPA's action here. In NACAA, EPA had, in 2004, issued a proposal to adopt a 1999 ICAO NOx standard just "three months before the 1999 ICAO standards were set to take effect."[92] Because manufacturers were already designing new engines to meet the tougher ICAO standards at the time of EPA's proposal, that unusually short lead time did not impede the implementation of the 1999 ICAO standards even though it increased the stringency of the NOx standard by 16 percent. But in 2005, after the comment period on EPA's proposal had already closed, ICAO overtook EPA again, lowering the international NOx emissions standard a second time.[93] Under these circumstances, EPA decided to finalize the less stringent 1999 standards as it had proposed. Acknowledging that, in light of ICAO's newer 2005 standards, "[m]ore stringent [EPA] standards . . . will likely be necessary and appropriate in the future," EPA nonetheless adopted the 1999 ICAO standards because "assess[ing] the costs (and emission benefits) of more stringent standards" would have required additional time that EPA did not then have "since [it had] already gone past the implementation date of the [1999 ICAO] standards."[94] In light of these unusual and exigent circumstances, the NACAA court upheld EPA's decision.[95]

EPA's instant Proposal, covering its first greenhouse gas standards for aircraft, is materially different from the standards at issue in NACAA. There, the deadline for implementation of the more stringent 1999 ICAO standards was just three months from the date of EPA's proposal, and EPA could not possibly have reconsidered that proposal to evaluate, propose and potentially implement the second new ICAO standards within the remaining three months without causing U.S. planes to fall out of compliance with the 1999 ICAO standards. Instead, EPA determined—and the court upheld EPA's decision—to increase its own NOx standards by 16 percent immediately, while preparing to undertake a second rulemaking to evaluate more stringent standards.

By contrast, EPA here is not purporting to act under any exigencies. In fact, EPA projects that no new airplanes will be built that would require certification under the ICAO CO_2 standards for at least ten years.[96] Moreover, EPA's actions in NACAA of increasing the NOx standard's stringency by 16 percent were in line with the Clean Air Act's and section 231's mandate to reduce harmful emissions. Here, EPA's Proposal would have no effect on emissions at all.

Whatever discretion is afforded to EPA in adopting aircraft emissions standards, it does not encompass a rule that fails to achieve any reduction in greenhouse gas emissions even though the agency has determined that existing emissions levels endanger public health and welfare. The Proposal is patently unreasonable and contrary to the requirements of section 231.

IV. The Proposal is Arbitrary and Capricious.

An agency rule is arbitrary and capricious "if the agency has relied on factors which Congress has not intended it to consider, entirely failed to consider an important aspect of the problem, offered an explanation for its decision that runs counter to the evidence before the agency, or is so implausible that it could not be ascribed to a difference in view or the product of agency expertise."[97] EPA's reasoning to support its Proposal is deeply flawed and demonstrates its disregard of its statutory obligation. EPA does not consider any of the statutory factors that must guide its determination of how to reduce emissions: what technology will be available to do so, what lead time would be adequate, or what the cost of compliance might be. 42 U.S.C. § 7571(a), (b). EPA also does not accurately assess the climate or human health and welfare costs that failure to reduce emissions will cause and conducts a deficient alternatives analysis.

A. The Proposal is arbitrary and capricious because it fails to consider the agency's duty to reduce greenhouse gas emissions to protect public health and welfare.

EPA has an obligation under the Clean Air Act to reduce or prevent pollution consistent with the goal of protecting public health and welfare. This Proposal fails to fulfill this duty.

Clean Air Act section 231 is intended to promote the "public health [and] welfare,"[98] and imposes on EPA both a duty to conduct endangerment findings and "a post-endangerment finding duty to regulate" to reduce these emissions.[99] Yet even while EPA's endangerment findings make clear that greenhouse gas emissions from aircraft endanger public health and welfare and that "without substantial and near-term efforts to significantly reduce emissions, it can be expected that atmospheric concentrations of . . . GHGs will continue to climb and thus lead to ever greater rates of climate change,"[100] the Proposal ignores EPA's public health and environmental protection duties. The

Proposal states that the ICAO fuel-efficiency-based metric "reasonably serves as a surrogate" for controlling greenhouse gas emissions from aircraft.[101] Elsewhere, EPA states that "[a]s a result of the 2016 [Endangerment] Findings, CAA sections 231(a)(2)(A) and (3) obligate the EPA to propose and adopt, respectively, GHG standards for these covered aircraft engines."[102] But the Proposal fails to offer any explanation as to how the proposed standards actually reduce or prevent pollution consistent with the goal of protecting public health and welfare. Nor can it, since EPA is clear that the Proposal does not reduce emissions.

For these reasons, the Proposal is a clear example of arbitrary agency decision-making:

As the Supreme Court stated in State Farm, an agency's rule normally is arbitrary and capricious if it "entirely failed to consider an important aspect of the problem" before it. 436 U.S. at 43. A statutorily mandated factor, by definition, is an important aspect of any issue before an administrative agency, as it is for Congress in the first instance to define the appropriate scope of an agency's mission. When Congress says a factor is mandatory, that expresses its judgment that such a factor is important. In accordance with this principle, we have held that "the complete absence of any discussion" of a statutorily mandated factor "leaves us with no alternative but to conclude that [the agency] failed to take account of this statutory limit on [its] authority," making the agency's reasoning arbitrary and capricious.[103]

Because the Proposal does not address how the proposed standards will fulfill EPA's statutory duties, it is arbitrary and capricious.

B. The Proposal is arbitrary and capricious because EPA does not consider the costs and benefits of the reduction of other harmful aircraft emissions.

As discussed, the combustion of aircraft fuel creates emissions of criteria and hazardous pollutants that cause well-recognized harm to human health and the environment.[104] NOx, in particular, is a precursor to ozone and particulate matter, pollutants with well-recognized, serious effects on human health and the environment.[105] Standards that increase aircraft fuel efficiency decrease fuel use, and thus the emissions of both greenhouse gases and these other pollutants. But EPA failed to consider these costs and benefits of its Proposal. It never assessed the amount of criteria and toxic pollutants emitted under the standard it proposed, nor under the two alternatives it did consider, nor under any alternative that would actually reduce greenhouse gases and thus these other pollutants. And it never estimated or compared the damage to human health done by criteria and toxic emissions resulting from the proposal or from any alternative course of action. EPA has consistently assessed, disclosed and compared the costs and benefits of increasing or reducing criteria and toxic pollutants in the greenhouse gas regulations it has issued for the nation's light duty vehicle fleet under section 202.[106] But in the Proposal, it did not consider this matter at all. EPA's failure to consider an important aspect of the problem before it is arbitrary and capricious.[107]

C. The Proposal is arbitrary and capricious because EPA does not adequately explain its reasoning and relies on factors Congress didn't intend to be considered.

In articulating the purpose of the Proposal, EPA states that the rule was developed for the benefit of industry, to harmonize international aviation standards, and avoid imposing additional costs on manufacturers.[108] EPA does not discuss the purpose of section 231, nor the statutory factors that Congress directed EPA to consider in setting aircraft emission standards. International standard harmonization and beneficence to industry are not among the relevant factors Congress identified for setting emissions limits, yet these are the only factors EPA relies on to justify the Proposal. Therefore, EPA's reliance on them to justify the Proposal is improper.[109]

The Proposal correctly notes that, in addition to developing standards that meet the requirements of section 231, the U.S. must adopt standards that are at least as strict as those adopted by ICAO for planes that are certified in the U.S. to operate abroad without additional certification.[110] But EPA goes on to assert that standards that are in any way "different" from ICAO standards are not acceptable because they purportedly would disadvantage manufacturers and thwart international consistency.[111] EPA provides no legitimate basis for this assertion. Nothing prevents the U.S. from adopting standards that are more stringent than ICAO's (see Section IV.D., infra), and EPA has a responsibility to do so if that is what public health and environmental protection require.[112] At a minimum, under section 231, EPA must determine whether more stringent standards are necessary to protect public health and welfare, consider whether the requisite technology will be available to achieve those protections, and provide adequate lead time for its development. Instead, without considering these statutory requirements, EPA refuses to adopt stricter standards in the Proposal, because it "believes that meeting the United States' obligations under the Chicago Convention by aligning domestic standards with the ICAO standards, rather than adopting more stringent standards, will have substantial benefits for future international cooperation on airplane emission standards, and such cooperation is the key for achieving worldwide emission reductions."[113] EPA has provided no support in the record for this speculation. While concern for international emissions is laudatory, EPA's mandate is to set health-protective standards for U.S. airplanes. Even if international emissions reductions were EPA's central obligation, refusing to consider whether emissions from U.S. planes can be reduced is arbitrary and capricious in light of the fact that U.S.-departing flights alone contributed 24 percent of global aviation's passenger transport-related carbon dioxide emissions in 2018.[114] Furthermore, more stringent standards could actually support future international cooperation, as ICAO has adopted a goal of carbon neutral growth for international aviation from 2020 and is currently exploring the feasibility of a long-term aspirational climate goal.[115]

In addition, EPA states its belief that "requiring U.S. manufacturers to certify to a different standard than has been adopted internationally (even one more stringent) could have disruptive effects on manufacturers' ability to market planes for international operation."[116] EPA provides no support for this claim either. For example, EPA could adopt as part of its standards a more stringent fuel efficiency requirement that has an earlier implementation date but employs the same test and measurement procedures as the ICAO standards to avoid any difficulties in comparing standards for certification purposes. Further, EPA does not explain why more stringent standards would disadvantage manufacturers rather than advantage them by decreasing fuel costs and thus directly increasing profit margins, while ushering in the modernization and emissions reduction that will allow the industry to survive and evolve.

Lastly, EPA also fails to explain how its additional proposal to adopt a regulatory exemption procedure established by ICAO relates to the purpose of section 231 or the statutory factors that Congress directed EPA to consider. The ICAO exemption criteria allow in production planes to be modified between 2023 and 2028 so long as modifications do not exceed a 1.5 percent degradation in the CO_2 metric value.[117] As currently written, this exemption procedure appears to allow manufacturers or airlines to propose a series of smaller changes that, even if cumulatively more than a 1.5 percent degradation in the CO_2 metric value, would still not trigger the standard. EPA failed to analyze the emissions consequences of this provision or justify it as in accordance with section 231, aside from stating that it was adopted by ICAO.

EPA has some discretion under section 231 to consider cost, safety, and noise when setting emission standards,[118] and must determine whether the effective date of a regulation "permit[s] the development and application of the requisite technology."[119] However, EPA has not tied the purpose of the Proposal to these factors. A decision to balance the cost of imposing requirements that more aggressively reduce emissions with the potential safety and environmental benefits is different from a decision to dismiss any standard that diverges from the international standard as categorically harmful to manufacturers and therefore unworthy of consideration. EPA is not permitted to prioritize factors that are irrelevant to its duties under section 231 of the Clean Air Act. [EPA-HQ-OAR-2018-0276-0150-A1, pp.9-16]

VI. EPA Should Replace the Proposal With a Rule that Complies with Section 231 and Basic Requirements of the Administrative Procedure Act.

The Proposal violates section 231 of the Clean Air Act because it fails to reduce greenhouse gas emissions from aircraft despite EPA's findings that such emissions endanger public health and welfare. Moreover, the Proposal's failure to consider the statutory factors laid out in section 231, over-reliance on factors outside the statute, failure to analyze the costs and benefits of a sufficient range of possible emission standards, and refusal to select an alternative based on the evidence before the agency are arbitrary and capricious. These flaws cannot be remedied in a final rule. Instead, EPA must replace the Proposal with one that meets its duties under the Clean Air Act. The final regulations must employ strong mechanisms to reduce emissions from aircraft and protect the public health and welfare, and in doing so, EPA must consider the full panoply of available measures, including declining fleetwide emissions averages and operational and design improvements. [EPA-HQ-OAR-2018-0276-0150-A1, p.28]

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[72] 42 U.S.C. § 7401(c).
[73] 42 U.S.C. § 7401(a)(3).
[74] Center for Biological Diversity v. EPA, 794 F. Supp. 2d 151, 160 (D.D.C. 2011).
[75] 81 Fed. Reg. at 54,425; see also 42 U.S.C. § 7401(b).
[76] 85 Fed. Reg. at 51,558.
[77] Id. at 51,583.
[78] Id. at 51,586.
[79] Id (emphasis added).
[80] Id.
[81] Id. at 51,587.
[82] Id. at 51,588.
[83] 42 U.S.C. 7571(b) (1990); 80 Fed. Reg. at 37,804.
[84] Control of Pollution from Aircraft and Aircraft Engines, 38 Fed. Reg. 19,087, 19,089 (July 17, 1973); see also Control of Air Pollution From Aircraft and Aircraft Engines; Emission Standards and Test Procedures, 70 Fed. Reg. 69,664, 69,676 (Nov. 17, 2005) ("forward-looking language" of section 231 does not preclude EPA from setting a technology-forcing standard).
[85] 70 Fed. Reg. at 69,676.
[86] National Air Quality Standards Act of 1970, Report of the Committee on Public Works United States Senate together with Individual Views to Accompany S. 4358 at 23-24, 91st Cong., 2nd Session, Report No. 91-1196.
[87] Id.
[88] 85 Fed. Reg. at 51,571.
[89] 42 U.S.C. § 7401(a), (c); see also Coalition for Responsible Regulation v. EPA, 684 F.3d 102, 122 (D.C. Cir. 2012, aff'd in part Util. Air Regulatory Group v. EPA, 134 S. Ct. 2427 (2014) (noting in connection with EPA's endangerment findings for vehicles under Clean Air Act section 202 that EPA is to "utiliz[e] emission standards to prevent reasonably anticipated endangerment from maturing into concrete harm," consistent with the Act's "'precautionary and preventive orientation'" (quoting Lead Indus. Ass'n., Inc. v. EPA, 647 F.2d 1130, 1155 D.C. Cir. 1980)).
[90] See Technical Support Document at 105.
[91] 85 Fed. Reg. at 51,562.
[92] 489 F.3d at 1225.
[93] Id.
[94] Id. at 1225-26.
[95] Id. at 1229-30.
[96] 85 Fed. Reg. 51,566; see also Technical Support Document at 39 ("The EPA is currently not aware of a specific model of a new type design airplane that is expected to enter service after 2020 (no announcements have been made by airplane manufacturers).").
[97] Motor Vehicle Mfrs. Ass'n of U.S., Inc. v. State Farm Mut. Auto. Ins. Co., 463 U.S. 29, 43 (1983).
[98] See 42 U.S.C. § 7571(a)(2)(A).
[99] Center for Biological Diversity v. EPA, 794 F. Supp. 2d 151, 159-62 (D.D.C. 2011).

[100] 81 Fed. Reg. at 54,444.
[101] 85 Fed. Reg. at 51,556.
[102] Id. at 51,557.
[103] Public Citizen v. Federal Motor Carrier Safety Admin., 374 F.3d 1209, 1216 (D.C. Cir. 2004) (quoting United Mine Workers v. Dole, 870 F.2d 662, 673 (D.C. Cir. 1989)).
[104] See supra n.23; Manisalidis 2020.
[105] ANPR, 80 Fed. Reg. at 37,784; see also Cross-State Air Pollution Rule Update for the 2008 Ozone NAAQS, 81 Fed. Reg. 74,504, 74,511 (Oct. 26, 2016) (noting that NOx is an "important precursor[] of regionally transported" PM2.5 and ozone)
[106] See, e.g., The Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule for Model Years 2021-2026 Passenger Cars and Light Trucks, 84 Fed. Reg. 24,174, 24,585 (April 20, 2020); see also Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards; Final Rule, 75 Fed. Reg. 25,324, 25,657 (May 7, 2010); see also 2017 and Later Model Year Light-Duty Vehicle Greenhouse Gas Emissions and Corporate Average Fuel Economy Standards, 77 Fed. Reg. 62,624, 63,119 (Oct. 15, 2012).
[107] State Farm, 463 U.S. at 43; Michigan v. E.P.A., 576 U.S. 743, 753 (2015) (explaining that "reasonable regulation ordinarily requires paying attention to the advantages and the disadvantages of agency decisions").
[108] See, e.g., 85 Fed. Reg. at 51,564 ("In order to promote international harmonization of aviation standards and to avoid placing U.S. manufacturers at a competitive disadvantage that likely would result if EPA were to adopt standards different from the standards adopted by ICAO, the EPA is proposing to adopt standards . . . [that match those] adopted by ICAO."); 51,556 (noting the proposed standards are "consistent with U.S. efforts to secure the highest practicable degree of uniformity").
[109] State Farm, 463 U.S. at 43 (An agency rule is arbitrary and capricious "if the agency has relied on factors which Congress has not intended it to consider.").
[110] 85 Fed. Reg. at 51,564, 51,557 ("The[] proposed standards would allow U.S. manufacturers of covered airplanes to remain competitive in the global marketplace. In the absence of U.S. standards for implementing the ICAO Airplane CO_2 Emission Standards, U.S. civil airplane manufacturers could be forced to seek CO_2 emissions certification from an aviation certification authority of another country . . . in order to market and operate their airplanes internationally").
[111] Id. at 51,564 ("We anticipate U.S. manufacturers would be at a significant competitive disadvantage if the U.S. fails to adopt standards that are aligned with the ICAO standards for CO_2 emissions."); id. at 51,584 ("By implementing the requirements that conform to ICAO requirements in the United States, we would remove any question regarding the compliance of airplanes certificated in the United States. The Proposal, if adopted, would facilitate the acceptance of U.S. airplanes and airplane engines by member States and airlines around the world. Conversely, U.S. manufacturers would be at a competitive disadvantage compared with their international competitors without this domestic action.").
[112] Id. at 51,564 (acknowledging that EPA can simply notify ICAO if it adopts more stringent standards). To the extent that EPA is basing its decision to align its standard with ICAO's on the false belief that it cannot adopt more stringent standards under its international treaty obligations, the Proposal is subject to vacatur for legal error if finalized. See Prill v. NLRB, 755 F.2d 941, 947-48 (D.C. Cir. 1985) ("An agency decision cannot be sustained, however, where it is based not on the agency's own judgment but on an erroneous view of the law. For it is a fundamental principle of law that 'an administrative order cannot be upheld unless the grounds upon which the agency acted in exercising its powers were those upon which its action can be sustained.'") (citing SEC v. Chenery Corp., 318 U.S. 80, 95 (1943)).
[113] 85 Fed. Reg. at 51,564.
[114] Graver 2019, supra n.21.
[115] ICAO, Resolution A40-18 of Resolutions Adopted by the Assembly in the 40th Session (October 2019), https://www.icao.int/environmental-protection/Documents/Assembly/Resolution_A40-18_Climate_Change.pdf.
[116] 85 Fed. Reg. at 51,564.
[117] Id. at 51,571, 51,592.
[118] Nat'l Ass'n of Clean Air Agencies v. EPA, 489 F.3d 1221, 1230 (2007).
[119] 42 U.S.C. § 7571(b).

Response:

EPA disagrees the final rule violates CAA section 231. EPA also disagrees that NACAA is distinguishable on the basis of the exigency of the ICAO NOx standards. In fact, many of the objections raised by the petitioner in NACAA are similar to those raised by the commenters here. For example, NACAA argued that EPA's interpretation of section 231 to allow codification of current practices rather than requiring a technology-forcing approach is inconsistent with CAA's "forward-looking" language and overall purpose and legislative history, and rendered meaningless section 231's reference to technology in the section 231(b) provision addressing lead time. Petitioner argued there that although the rule tightened the NOx standard what would apply to future new type certified aircraft engines, if any, by 16%, almost all type-certified aircraft engines already being produced (to which the rule did not apply) already met this level by virtue of their compliance with ICAO standards. Since section 231 is intended to promote the public health and welfare, see 42 U.S.C. § 7571(a)(2)(A), petitioner argued, not to establish consistency with international standards, EPA must require use of new technology to effect even greater emissions reduction. Following that logic, NACAA argued that section 231 only permits EPA to consider compliance costs where the standard ultimately issued would require development of new technology. In other words, the NACAA petitioner read section 231 to focus primarily upon emissions reduction and to give all other concerns – including international standards, safety concerns, and compliance costs – a subsidiary role, and that EPA impermissibly interpreted section 231 to permit EPA to promulgate a rule that will not actually effect an emissions reduction. EPA, instead argued in NACAA a different view of the statutory scheme, noting that other provisions of the CAA, such as section 213(a)(3), require EPA to obtain the "greatest degree of emission reduction achievable." But section 231 does not contain such language. EPA reasoned that it is not required to achieve a "technology-forcing" result in the aircraft engine emissions context, nor must it give subordinate status to factors such as cost, safety, and noise. Rather, EPA has greater flexibility under section 231 in determining what standards are most reasonable for aircraft engines, there is an added emphasis on the consideration of safety, and it is reasonable for EPA to give greater weight to considerations of safety in this context than it might in balancing emissions reduction, cost, and energy factors under other CAA provisions. The Court deferred to EPA's reading, explaining "[W]e need not find that [this interpretation] is the only permissible construction that EPA might have adopted but only that EPA's understanding of this very complex statute is" not manifestly contrary to the CAA. Chem. Mfrs. Ass'n v. Natural Res. Def. Council, Inc., 470 U.S. 116, 125 (1985) (internal quotation marks omitted). When Congress enacted § 231 providing that the Administrator could, "from time to time," act "in his judgment," as "he deems appropriate," it conferred broad discretion to the Administrator to weigh various factors in arriving at appropriate standards. Moreover, to the extent that § 231 requires rules promulgated thereunder to tighten emission standards, the Final Rule in fact does so by 16%. NACAA's argument that § 231 additionally requires a technology-forcing result and prohibits consideration of such factors as safety and compliance costs is a familiar one. In George E. Warren Corp. v. EPA, the petitioners argued that "the maintenance or improvement of air quality is the sole focus of the anti-dumping provision [of the CAA]." 159 F.3d 616, 623 (D.C. Cir. 1998). Finding nothing in "the text or structure of the statute to indicate that the Congress intended to preclude the EPA from considering [factors other than air quality]," we refused "to infer from congressional silence an intention to preclude the agency from considering factors other than those listed in a statute." Id. at 623-24; see also Allied Local, 215 F.3d at 78; George E. Warren Corp., 159 F.3d at 623-24 ("'In the absence of clear congressional direction to the contrary, we will not deprive the agency of the power to fine-tune its regulations to accommodate worthy nonsafety interests' under a statute focused upon safety." (quoting Int'l Bhd. of Teamsters v. United States, 735 F.2d 1525, 1529 (D.C. Cir. 1984))). Congress has delegated expansive authority to EPA to enact appropriate regulations applicable to the emission of air pollutants from aircraft engines. Because we find that the Final Rule is not "manifestly contrary to the statute," it must be given controlling weight. We therefore defer to EPA's construction of § 231."

Likewise here, although the GHG standards, unlike the standard at issue in NACAA, apply both to new type aircraft and to already certified in-production aircraft, they function essentially as anti-backsliding standards that prevent aircraft GHG emissions from increasing on a per-airplane basis. (The standards at issue in NACAA did that only with respect to new type designs, if any were developed, but did not address emissions from continued production of certified designs.) Similarly, as the January 1, 2020, applicability date under the international CO2 standards has already passed, it is essential that the EPA expeditiously issue this rule in order to help fulfill the U.S. obligations under the Chicago Convention. As with the situation under NACAA, EPA does not at this time have the data or time to develop and propose more stringent standards that would require reduction of per-airplane emissions after application of to-be-developed technology, and still enable the United States to meet its treaty obligations under the Chicago Convention. Consequently, EPA disagrees that the situation here is materially different than that in NACAA. Instead, the situations are remarkably similar, and the NACAA Court's reason for affirming EPA's interpretation of section 231 and affirming EPA's regulatory approach there applies here as well. In addition, although EPA did not consider the costs and benefits of ancillary reductions of air pollutants other than greenhouse gases, nothing in section 231 compels EPA to do so, and EPA reasonably views such consideration as being outside the scope of this rulemaking as proposed. EPA considered all statutory factors, and stressed that a central purpose of this rule is align US standards that are already expected to be in effect in Member states and in fact already are in effect in several. In considering impacts on manufacturers of further delay in adopting standards that align with the international standards, EPA was rightly weighing "cost" per CAA section 231(b). EPA did consider alternative, more stringent standards, as described in the Technical Support Document, and the CAA does not compel that considered alternatives reflect a specified degree of additional emissions control or reduction or application of as-yet-undeveloped technology. Instead, EPA notes that aircraft GHGs are currently unregulated, and that the rule will for the first time limit them -- which easily reflects an increase in stringency compared to their allowable rates being completely uncontrolled. Finally, EPA disagrees the rulemaking violates the Administrative Procedure Act (APA), and notes that CAA section 307(d)(1) makes most of the APA inapplicable to EPA's adoption of standards under section 231.

Organization: Center for Biological Diversity, et al.

EPA has broad authority under section 231 of the Clean Air Act to be much more aggressive in pressing for the development of improved technology. It should use that authority to replace the currently proposed rule with one that (1) applies to in-service aircraft, not just to new aircraft and new aircraft designs; (2) includes the emissions reductions achievable through both airframe design and operational improvements; and (3) includes a ratchet mechanism to decrease emissions over time and fully decarbonize the industry by 2045 or sooner. [EPA-HQ-OAR-2018-0276-0154-A1, p.2]

Response:

The EPA agrees that EPA has substantial discretion under the CAA section 231 to adopt final aircraft emission standards as the agency deems appropriate. (*National Ass'n of Clean Air Agencies v. EPA*, 489 F.3d 1221 (D.C. Cir. 2007)). As explained in the Preamble Section IV.I, the EPA finds it appropriate to finalize the stringency, timing, and scope of the standards as proposed. Under the necessary schedule to adopt standards under U.S. law that fulfills our obligations under the Chicago Convention, EPA does not have time to gather and analyze information necessary to propose a rule that would reflect the commenters' request that standards apply to already-manufactured in-service aircraft, mandate further airframe design and operational improvements, or implement a ratcheting mechanism to reduce GHGs and decarbonize aviation by 2045 or sooner.

Organization: Chesapeake Bay Foundation, Inc. (CBF)

III. CBF Opposes the Proposed Airplane GHG Emissions Standards and Test Procedures Rule Because This Rule Is Legally Inadequate and Does Nothing but Formalize a Business-as-usual Scenario.

B. As Proposed, the GHG Emission Standards Violate the Clean Air Act and Rulemaking Process.

Additionally, the Proposed Rule violates the Clean Air Act (CAA) and federal rulemaking process because the standards do not comport with the goals of the CAA or impose any limits that will mitigate the GHG air pollution anticipated to impact human health in the Endangerment Finding. [EPA-HQ-OAR-2018-0276-0093-A1, p.7]

CAA Section 7401(b) outlines the purposes of the CAA, which include the goal “to protect and enhance the quality of the Nation’s air resources so as to promote the public health and welfare . . . .” Additionally, Section 7401(c) explains that pollution prevention is a primary goal of the Act. Both of these provisions highlight the expectation that CAA regulations would not simply promote status quo pollution, but rather take action to protect and improve air quality. [EPA-HQ-OAR-2018-0276-0093-A1, p.7]

As EPA acknowledges in Section VI.C., “the proposed GHG standards are not expected to result in reductions in fuel burn and GHG emissions beyond the baseline.” EPA therefore “do[es] not project a cost (except for limited reporting costs . . .) or benefit for the proposed GHG standards.”[50] Put another way, the proposed standards do nothing to prevent air pollution, much less improve air quality. This Proposed Rule thus runs counter to the express purpose of the CAA and the standards as proposed are arbitrary and capricious. [EPA-HQ-OAR-2018-0276-0093-A1,p.7]

Likewise, the Endangerment Finding concluded that aircraft GHGs cause and contribute to air pollution that is reasonably anticipated to harm public health and welfare. The standards that are required to follow such a finding must logically take some action to mitigate that harm. Here, by EPA’s admission, they do not. Without providing any meaningful impact on anticipated GHG emissions, these standards are arbitrary, capricious, and contrary to law. [EPA-HQ-OAR-2018-0276-0093-A1p.7]

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[50] Proposed Rule, 85 FR at 51,583.

Response:

The commenter raises the same objections raised by other commenters above. See our responses to those comments. The EPA has substantial discretion under the CAA section 231 to adopt final aircraft emission standards as the agency deems appropriate. (*National Ass’n of Clean Air Agencies v. EPA*, 489 F.3d 1221 (D.C. Cir. 2007)). Greenhouse gas emissions from aircraft are currently unregulated. Finalizing these standards will in fact have a meaningful impact on GHG emissions, in that in the absence of EPA's standards that align with the international standards GHG emissions from future airplane type designs and from future production of already certified designs could increase to unknown and uncontrolled levels on a per airplane basis. These GHG standards cap the allowable rate of GHG emissions by imposing a fuel efficiency metric for both new type and in-production airplanes, a pairing that the standards at issue in NACAA, which the Court affirmed, did not impose.

Organization: Davis, Lauren and Nguyen, Johnie Q.

PROCEDURE

The Clean Air Act (42 U.S.C. §7401 et seq. (1970)) in Title II sets emissions standards for airplanes and adopts those set by the International Civil Aviation Organization (ICAO). However, the standard proposed to be adopted was set in 2017. This proposed rule fails to explain why there was over a three year delay in consulting with the Secretary of Transportation and ensuring inspections took place.

The Clean Air Act also states that its purpose is to protect and enhance the quality of the Nation's air resources so as to promote public health (42 U.S.C. § 7401 (b)(1)) as well as to "preserve, protect, and enhance the air quality". (42 U.S.C. § 7470(2).)

This proposed rule fails to meet these purposes. This rule does very little to improve the air quality in our Nation and it certainly does nothing to enhance the air quality considering this rule will a) not affect airplanes for many years to come and b) does little if anything to actually improve the quality of our air since, according to the proposed rule itself "GHG standards are not expected to result in reductions in fuel burn and GHG emissions beyond the baseline" (P.R. at 583). This is unacceptable and the EPA must be held to set a responsible example in light of combating the climate crisis.

Particularly, this is unacceptable in light of two things. First, the Clean Air Act Airplane Emission Standards (42 U.S.C. § 7571) states "the Administrator shall, from time to time, issue proposed emission standards applicable to the emission of any air pollutant from any class or classes of aircraft engines which in his judgment causes, or contributes to, air pollution which may reasonably be anticipated to endanger public health or welfare". (§ 7571(2)(A).) Second, the EPA found in 2009 that "elevated concentrations of GHGs in the atmosphere may reasonably be anticipated to endanger the public health and welfare of current and future generations (81 Fed. Reg. 157 at 54441) and again in 2016 that airplanes were one of the leading sources in greenhouse emissions. (Id. at 54422.)

Additionally, a paper from the International Council on Clean Transportation found in 2019 that flights departing from airports in the United States emitted 24% of global "passenger transport-related CO_2 emissions," two-thirds of which came from domestic flights. (https://theicct.org/sites/default/files/publications/ICCT_CO_2-commercl-aviation-2018_2019091 8.pdf at 1).

When considering these factors, this rule clearly demonstrates that the EPA has failed to uphold its obligations to meaningfully prioritize the mission of reducing emissions in order to improve air quality and to protect public health within the United States. Adopting an international standard that does not actively seek to reduce emissions and protect public health is a disregard of duty and a failure to abide by the Clean Air Act.

As well, under the Administrative Procedure Act (APA), this proposed rule should be found to be arbitrary and capricious and an abuse of discretion due to the significant and unexplainable delay in adopting this rule over the past three years in addition to its failure to provide for a meaningful reduction in GHG emissions. Under the APA, 5 U.S.C. § 706(2)(A), a Court could set aside this action if the agency does not more fully explain why it failed to act sooner and why this proposed rule is not more stringent in light of the need to protect and improve our Nation's air quality.

Though the EPA may not be required to conduct its own studies before adopting the ICAO standard, or be obligated to comply with any sort of NEPA analysis, the EPA must be held accountable to explain why this rule is being proposed as such in light of its own findings from 2016 that airplanes are one of the largest sources of emissions in the transportation industry. Acknowledging that the EPA does not wish to comment on any of these findings at this time, it would seem inconsequential that we ask those findings to be considered. However, the fact remains that since this proposed rule only occurred after a threat to file suit was brought by other environmental organizations, it suggests the EPA has not acted in good faith to protect our Nation's air and public health. It must offer a better explanation within its record for why this proposed rule should be allowed to go forward.

Furthermore, the mission of the EPA under the Clean Air Act states its focus on "reducing emissions of toxic air pollutants that are known to caus[e] serious health effects." The EPA has failed to achieve its stated purpose by not proposing a rule that is going to effect a positive change in the amount of greenhouse gas emissions emitted by airplanes. [EPA-HQ-OAR-2018-0276-0145-A1, pp.3-5]

Response:

Please see our responses to prior comments that incorrectly assert that CAA section 231 requires EPA's standards to achieve a certain degree of protection or reflect a reduction in actual emissions. The EPA is acting within its substantial discretion under CAA section 231 to adopt final aircraft emission standards as the agency deems appropriate. (*National Ass'n of Clean Air Agencies v. EPA*, 489 F.3d 1221 (D.C. Cir. 2007)). This rulemaking is an action under CAA section 307(d)(1), and so the relevant procedural requirements are found in 307(d), not the Administrative Procedure Act ("APA"). Accordingly, all consultations with DOT and other federal agencies were docketed per CAA section 307(d). In any event, APA section 706(2)(A), which allows a court to compel an agency to act if there has been an unreasonable delay but does not authorize a court to set aside a delayed action, does not apply to rules adopted under CAA section 307(d), as provided by section 307(d)(1). Instead, if a person believes EPA has unreasonably delayed taking an action for which EPA has a mandatory duty, they may bring an action in U.S. District Court to compel such action per CAA section 304(a), provided they first give EPA the required 180 days' notice of intent to bring such suit. The EPA did conduct its own studies before adopting the ICAO standard, and a summary of the results of those studies may be found in the Technical Support Document in the docket for this rulemaking.

Organization: Environmental Defense Fund, Institute for Policy Integrity at New York University School of Law, Montana Environmental Information Center, Natural Resources Defense Council, Sierra Club, Union of Concerned Scientists

e. A Global Focus Is Required by the Clean Air Act[126] [EPA-HQ-OAR-2018-0276-0183-A1, p.17]

Section 231 of the Clean Air Act charges EPA with protecting "public health [and] welfare,"[127] with "welfare" defined to include "effects on . . . weather . . . and climate."[128] When interpreting similar language in Section 202 of the Clean Air Act, the Supreme Court found "there is nothing counterintuitive to the notion that EPA can curtail the emission of substances that are putting the global climate out of kilter."[129] In other words, Section 231 calls for more than simply a domestic focus when EPA regulates to protect the global climate. Indeed, when industry challenged another EPA climate program by arguing that the Clean Air Act "was concerned about local, not global, effects," the U.S. Court of Appeals for the D.C. Circuit had "little trouble disposing of Industry Petitioners' argument that the [Clean Air Act's prevention of significant deterioration] program is specifically focused solely on localized air pollution," finding instead that the statute was "meant to address a much broader range of harms," including "precisely the types of harms caused by greenhouse gases."[130] [EPA-HQ-OAR-2018-0276-0183-A1, pp.17-18]

To assess the necessary protections of public welfare under Section 231 of the Clean Air Act, EPA must value not only domestic welfare changes from climate effects occurring within U.S. borders, but also other significant U.S. welfare interests affected by climate—including U.S. interests in foreign businesses and property, in global tourism, in global commons like the oceans, and in global existence values and altruism; U.S. benefits from reciprocal foreign actions on climate; and U.S. effects that spill over from foreign climate damages through our interconnected economy, national security, and public health—as well as other significant global effects. Using the global estimate of climate damages—as opposed to a domestic-only value—is the only defensible way to accurately capture the full costs of climate pollution to public welfare. [EPA-HQ-OAR-2018-0276-0183-A1, p.18]

Given the international nature of air travel in general, a global perspective in rulemakings, including by using the global SCC, under Section 231 is appropriate. In the Proposed Rule, EPA notes that the proposed emissions standards must "be at least as stringent as the [International Civil Aviation Organization ("ICAO")] Airplane CO_2 Emission Standards in order to ensure global acceptance of FAA airworthiness certification,"[131] highlighting both the international importance of U.S. standards and the willingness of the U.S. to cooperate with international partners on global issues. However, EPA is proposing standards that merely meet the 2017 ICAO standards, rather than anticipating updated international standards with which the U.S. will eventually have to comply, further emphasizing why EPA should consider more stringent alternatives. [EPA-HQ-OAR-2018-0276-0183-A1, p.18]

[126] This subsection draws from Howard & Schwartz, supra note 28.
[127] 42 U.S.C. § 7571(a)(2)(A) ("The Administrator shall, from time to time, issue proposed emission standards applicable to the emission of any air pollutant from any class or classes of aircraft engines which in his judgment causes, or contributes to, air pollution which may reasonably be anticipated to endanger public health or welfare.").
[128] 42 U.S.C. § 7602(h); Massachusetts v. EPA, 127 S.Ct. 1438, 1447 (2007).
[129] Mass. v. EPA, 127 S.Ct. at 1461 (emphasis added).
[130] Coalition for Responsible Regulation v. EPA, 684 F.3d 102, 138 (D.C. Cir. 2012), aff'd in part Util. Air Regulatory Grp. v. EPA, 134 S.Ct. 2427 (2014).
[131] 85 Fed. Reg. 51,561.

Response:

Please see our previous responses to comments asserting that EPA should give greater weight to specific considerations in adopting standards under CAA section 231. Also, note that the Court in NACAA rejected petitioner's claim that EPA's near-term standards should have accounted for possible future more stringent standards developed at ICAO.

Organization: General Electric Company (GE)

C. EPA's proposal to adopt ICAO-equivalent CO_2 standards is consistent with the law, precedent, and the administrative record

The proposed standards comply with the statutory requirements of the Clean Air Act and treaty obligations. The standards continue the long collaborative tradition between EPA and ICAO. They also are well supported by an extensive administrative record.

1. EPA's proposal is consistent with the Clean Air Act

As a result of EPA's 2016 findings concerning GHG emissions from aircraft, EPA is obligated under Section 231 of the CAA to propose and issue GHG emission standards applicable to the classes of engines used by covered aircraft included in those findings. However, there is an absence of a statutory directive on what form a CAA Section 231 standard must take. In addition, the D.C. Circuit ruled in 2007 that Section 231 of the CAA confers a broad degree of discretion on EPA in establishing airplane emission standards. Consequently, EPA's proposal to control GHG emissions in a manner identical to ICAO's standards is well within its broad legal discretion.

Section 231 of the CAA requires EPA to consider noise, safety, and cost in developing aircraft standards. This section is different from other CAA provisions, which require explicit performance standards. Congress charged EPA with proposing emission standards for aircraft, in consultation with the FAA Administrator, and to "not change the aircraft engine emission standards if such change would significantly increase noise and adversely affect safety." Additionally, Congress made clear that proposed standards should take effect after the EPA Administrator, with consultation from the Secretary of Transportation, gives "appropriate consideration to the cost of compliance within such period."

Here, EPA properly weighed these factors through its participation in the development of the CO_2 standards with ICAO. ICAO's Committee on Aviation Environmental Protection's ("CAEP") terms of reference for adopting airplane emission standards include technical feasibility, environmental benefit, economic reasonableness, and "interdependencies of measures taken to control noise and to control engine emissions."[7] CAEP considered all of these factors in developing the ICAO CO_2 standards. CAEP undertook a "modeling exercise involv[ing] several analytical tools, including fleet evolution modeling, environmental benefits, recurring costs, non-recurring costs, costs per metric tonne of CO_2 avoided, certification costs, applicability scenarios and various sensitivity studies to inform the decision-making process."[8] Additionally, a key criteria in CAEP developing the CO_2 standards was that "the certification standard must not compromise safety."[9] These criteria correlate with the noise, safety, and cost factors under Section 231 of the CAA, thus showing EPA's proposal is consistent with Section 231.

2. The proposed standards would fulfill U.S. treaty commitments

EPA's proposal to adopt ICAO-equivalent standards under CAA Section 231 is consistent with the 1944 Convention on International Civil Aviation, also known as the Chicago Convention. The purpose of the Chicago Convention is to foster global cooperation and promote an atmosphere where international civil aviation could be developed in a safe and orderly manner, while being operated soundly and economically.

This purpose is reflected in more detail in Articles 37 and 38 of the Chicago Convention. Article 37 makes clear that ICAO Member States should strive to achieve "the highest practicable degree of uniformity," thereby avoiding a hodgepodge of regulation. Article 38 provides for exceptions to this norm while providing context for the circumstances of a Member State's decision to derogate from an ICAO standard. The net effect of Articles 37 and 38 of the Chicago Convention is to pledge a strong preference toward uniform international standards absent exceptional circumstances that might warrant a Member State's deviation.

EPA previously noted the connection between the Chicago Convention and CAA's Section 231 in a 2012 rulemaking, when the Agency stated that adopting standards identical to ICAO standards provided, "a means by which the United States can meet its obligations under the Chicago Convention and ensure that engine manufacturers maintain worldwide acceptability of their products."[10]

Here, EPA's proposal satisfies the obligations of the Chicago Convention. By proposing standards consistent with the ICAO CO_2 standards, EPA is ensuring compliance with U.S. treaty commitments. Additionally, this harmonization allows U.S. manufacturers to remain competitive in the international market and ensures a level playing field.

3. The proposed standards are consistent with EPA's precedent of collaboration with ICAO

EPA and FAA have long worked within the standard-setting process of ICAO's CAEP to help establish international emission standards and related requirements, which Member States adopt into domestic law and regulations. Historically, under this approach, international emission standards are first adopted by ICAO, and subsequently EPA has initiated rulemakings under CAA Section 231[11] to create domestic standards that are at least as stringent as ICAO's standards. Here, EPA collaborated with FAA and CAEP on ICAO's 2017 adoption of the first-ever international standards to regulate CO_2 emissions from airplanes.

In this proposed rulemaking, EPA continues the long collaboration effort with ICAO and CAEP. EPA's adoption of ICAO-equivalent standards under CAA section 231 rulemakings extends back multiple decades. In 1997, EPA, in consultation with FAA, adopted ICAO nitrogen oxides ("NOx") and carbon monoxide ("CO") requirements for gas turbine (turbofan and turbojet) engines.[12] In 2005, EPA, in consultation with FAA, adopted ICAO NOx standards for gas turbine engines.[13] And, in 2012, EPA, in consultation with FAA, adopted ICAO NOx standards for gas turbine engines.[14] Thus, this proposed rulemaking adopting ICAO-equivalent CO_2 standards adheres to longstanding EPA precedent.

4. Administrative Record

EPA has also thoroughly considered the CAA's statutory considerations of noise, safety, and cost through the 2015 Advance Notice of Proposed Rulemaking ("ANPRM").[15] In 2015, EPA heard the perspectives of stakeholders on those factors by issuing the ANPRM on airplane GHG standards. Most major stakeholders, including airplane manufacturers, engine manufacturers, airlines, states, and environmental organizations, expressed their support for the United States' engagement in ICAO/CAEP for the adoption of the international airplane CO_2 emission standards, as well as for the subsequent EPA adoption of equivalent domestic GHG standards.

Following the ANPRM, EPA performed its own emissions inventory assessment, technological feasibility study, and economic impact assessment independent of the ICAO standard development.[16] These studies emphasize why adoption of an ICAO-equivalent standard within the specified time frame is important. As EPA has stated, adopting "U.S. GHG standards that match the ICAO Airplane CO_2 Emission Standards will help ensure international consistency and acceptance of U.S. manufactured airplanes worldwide." [EPA-HQ-OAR-2018-0276-0157-A1, pp.5-8]

[The following comments were submitted as testimony at the virtual public hearing on September 17, 2020.]

Third, we believe that ICAO-equivalent standards are consistent with the law. They comply with the statutory requirements of the Clean Air Act and are well within the broad discretion that EPA exercises in developing aircraft emission standards. They are also consistent with the agency's past practices in developing aircraft emission standards and is supported by a thorough administrative record.

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[7] See ICAO, CAEP Terms of Reference, https://www.icao.int/environmental-protection/Pages/Caep.aspx#ToR. See also 85 Fed. Reg. 54,556, 51,560 (Aug. 20, 2020).
[8] ICAO, 2016 Environmental Report, The CAEP/10 Recommendation on New ICAO Aeroplane CO_2 Emissions Standard 113 (2016), https://www.icao.int/environmental-protection/Documents/EnvironmentalReports/2016/ENVReport2016_pg112-114.pdf.
[9] ICAO, CAEP/10 Report, Appendix C Information on the ICAO CO_2 Standard to Support the Rulemaking Processes of ICAO Member States 5C-4 (Feb. 2016), http://www.icscc.org.cn/upload/file/20190102/Doc.10069-EN%20Report%20of%20the%20Tenth%20Meeting%20of%20the%20Committee%20on%20Aviation%20Environmental%20Protection%20(CAEP).pdf.
[10] 77 Fed. Reg. 36,342, 36,379 (June 18, 2012).
[11] 42 U.S.C. § 7571.
[12] 62 Fed. Reg. 25,356 (May 8, 1997).
[13] 70 Fed. Reg. 69,664 (Nov. 17, 2005).
[14] 77 Fed. Reg. 36,342 (June 18, 2012).
[15] U.S. EPA, 2015: Proposed Finding that Greenhouse Gas Emissions from Aircraft Cause or Contribute to Air Pollution that May Reasonably Be Anticipated to Endanger Public Health and Welfare and Advance Notice of Proposed Rulemaking, 80 Fed. Reg. 37,758 (July 1, 2015).
[16] 85 Fed. Reg. at 51,578-588

Response:

EPA agrees that its approach to developing its initial airplane GHG standards is consistent with CAA section 231 and is well supported by the administrative record.

Organization: International Council on Clean Transportation (ICCT)

EPA's 2015 endangerment finding concluded that GHG emissions from aircraft contribute to air pollution that may reasonably be anticipated to endanger public health and welfare under section 231(a) of the Clean Air Act. Therefore, EPA is legally obligated to establish a standard of this type. [EPA-HQ-OAR-2018-0276-0168-A1, p.1]

Response:

EPA agrees that EPA is obligated under CAA section 231 to propose and promulgate aircraft engine GHG standards following issuance of the 2016 Findings, and believes it is fully discharging its duty to do so in these initial GHG standards.

Organization: Washington State Department of Ecology (Ecology)

The proposed rule does not meet EPA's obligation to reduce GHG emissions from aircraft

EPA's proposed rule fails to meet the legal requirements of Section 231 (a)(2)(A) of the federal Clean Air Act (CAA) to create emissions standards for aircraft that reduce endangerment to public health and welfare.[7] The proposal does not address the statutory factors provided by Congress in setting aircraft emission standards, including aircrafts' contribution to dangerous air pollution, and the technological feasibility of emission contro1.[8] [EPA-HQ-OAR-2018-0276-0140-A1, p.2]

EPA must adopt standards that provide meaningful reductions in aircraft GHG emissions. Instead, the proposal simply sets standards at a level that is already met by existing aircraft fleets and current trends, resulting in no net reductions in emissions. This is inconsistent with EPA's statutory obligations. In Section 231(b) of the CAA, Congress specifically envisioned that the standards may require development and implementation of new technology in order to achieve needed emissions reductions.[9] This requires more, or at the very least consideration of more, than simply setting business as usual standards that are or will already be met with no development or implementation of new technology. EPA's failure to consider and adopt more stringent technology-forcing standards is an abdication of its statutory responsibility to do so and runs directly contrary to Congress's direction in the CAA. [EPA-HQ-OAR-2018-0276-0140-A1, pp.2-3]

Consistent with EPA's legal obligations under CAA Section 231 and the 2016 endangerment finding, EPA must reconsider its approach and adopt meaningful, effective, technology-forcing aircraft GHG emissions standards, rather than codifying business-as-usual. [EPA-HQ-OAR-2018-0276-0140-A1, p.5]

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[7] 42 U.S.C. § 7571.
[8] 42 U.S.C. §§ 7571(a)(1)(A)-(B), (2)(A); see Center for Biological Diversity, 794 F.Supp. at 160 (finding section 231(a)(2)(A) "cannot be understood without reference to the provisions around it")
[9] 42 U.S.C. § 7571(b) ("Any regulation prescribed under this section (and any revision thereof) shall take effect after such period as the Administrator finds necessary (after consultation with the Secretary of Transportation) to permit the development and application of the requisite technology")

Response:

Please see previous responses asserting that EPA's standards under CAA section 231 must meet specific protection, emissions reduction, or technological development factors.

Organization: Anonymous Public Comment 22

EPA misstates the obligations of the Chicago Convention as well as the ability to signatories to continue certification, even when they have not adopted all equivalent standards, as well as the role of Clean Air Act rules (promulgated by EPA) versus certification/compliance standards (promulgated by FAA) (See Comment A1: https://downloads.regulations.gov/EPA-HQ-OAR-2018-0276-0036/attachment_2.pdf; See comment A3, A14: https://downloads.regulations.gov/EPA-HQ-OAR-2018-0276-0036/attachment_1.pdf). [EPA-HQ-OAR-2018-0276-0171 p. 1]

FAA rulemaking could precede before and independently of any EPA rules under Section 231 of the Clean Air Act (See Comment A41: https://downloads.regulations.gov/EPA-HQ-OAR-2018-0276-0036/attachment_2.pdf). If EPA is incorporating costs or benefits of other, future rules, it should also account for future ICAO greenhouse gas standards which, as the National Academy notes, "will be periodically reviewed and tightened, necessitating an ongoing investment to reduce the net CO_2 emitted by aircraft" (https://www.nap.edu/read/23490/chapter/4). In addition, EPA failed to analyze alternative policies that could facilitate U.S. certifications, including diplomacy, voluntary adoption, FAA rulemaking without invocation of the Clean Air Act, or bilateral certification options. [EPA-HQ-OAR-2018-0276-0171 p. 1]

Response:

EPA is uncertain what the commenter intends in objecting to EPA's not analyzing alternatives "without invocation of the Clean Air Act," in the context of promulgating standards under the Clean Air Act.

18.2. GHG/Environmental Considerations/Environmental Justice

Comments:

Organization: 350 Seattle

Several industry speakers cited the impressive gains in fuel efficiency since the onset of commercial aviation, neglecting to mention the massive growth in aviation that cancels out any efficiency gains many times over. Figures coming from the industry itself cite a 32% increase in CO_2 emissions 2013-2018, with emissions on track to account for 25% of the global carbon budget by 2050[2]. Furthermore, climate impacts of aviation emissions have 2 - 4 times greater warming impact than on-the-ground emissions, due to non-carbon emissions and radiative forcing[3,4]. [EPA-HQ-OAR-2018-0276-0108-A1, p.1]

We need to challenge section IX.K. Failing to reduce aircraft emissions actually does have "disproportionately high and adverse human health or environmental effects on any population, including any minority or low-income population", due to the adverse health effects caused by aircraft emissions[5-11] and the high proportion of people of color and low-income residents who live near airports[12,13]. On a broader scale, climate change is already having a disproportionate effect on people of color and low-income communities[14-17]. [EPA-HQ-OAR-2018-0276-0108-A1, pp.1-2]

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[2] International Council on Clean Transportation https://theicct.org/sites/default/files/publications/ICCT_CO2-commercl-aviation-2018_20190918.pdf

[3] https://www.atmosfair.de/en/air_travel_and_climate/flugverkehr_und_klima/climate_impact_air_traffic/, based on https://www.ipcc.ch/site/assets/uploads/2018/02/ar4_syr_full_report.pdf).

[4] Lee et al. Aviation and global climate change in the 21st century. Atmospheric Environment 2009; 43: 3520–3537.

[5] Wing et al. Preterm Birth among Infants Exposed to in Utero Ultrafine Particles from Aircraft Emissions. Environmental Health Perspectives 2020; 128(4):047002.

[6] Hudda et al. Aviation-Related Impacts on Ultrafine Particle Number Concentrations Outside and Inside Residences near an Airport. Environmental Science & Technology 2018; 52 (4): 1765-1772.

[7] Grobler et al. Marginal climate and air quality costs of aviation emissions. Environmental Research Letters 2019;14:114031.

[8] Austin et al. Mobile ObserVations of Ultrafine Particles (MOV-UP) Study Final Report. University of Washington, December 2019. https://deohs.washington.edu/mov-up.

[9] See the fact sheet or full report at https://beaconhillseattlenoise.org/.

[10] Schlenker and Walker. Airports, air pollution, and contemporaneous health. Review of Economic Studies 2016; 83 (2): 768-809.

[11] Correia et al. Residential exposure to aircraft noise and hospital admissions for cardiovascular diseases: multiairport retrospective study." 8 October 2013. British Medical Journal 2013;347:f5561.

[12]https://www.doh.wa.gov/DataandStatisticalReports/WashingtonTrackingNetworkWTN/InformationbyLocation/WashingtonEnvironmentalHealthDisparitiesMap
[13] https://www.commerce.wa.gov/serving-communities/growth-management/growth-management-topics/seatac-airport-impact-study/
[14] Mikati et al. Disparities in Distribution of Particulate Matter Emission Sources by Race and Poverty Status. Am J Public Health. 2018 April; 108(4): 480–485.
[15] https://www.washingtonpost.com/climate-solutions/2020/06/29/climate-change-racism/
[16] https://www.nap.edu/catalog/25381/framing-the-challenge-of-urban-flooding-in-the-united-states
[17] Tessum et al. Inequity in consumption of goods and services adds to racial–ethnic disparities in air pollution exposure. PNAS March 26, 2019; 116 (13): 6001-6006.

Organization: Air Line Pilots Association's Air Safety Organization

[The following comments were submitted as testimony at the virtual public hearing on September 17, 2020.]

> The airline industry has reduced its impact on the environment while decreasing costs to passengers and employees alike to increased efficiencies. Because of the industry's effort, which includes proactive operational procedures performed by airline pilots to reduce fuel burn, airline's CO_2 emissions per seat miles have dropped an astounding 80 percent since the first jet aircraft and presently accounts for only 2 percent of human activity-caused global emissions.
>
> We all know there is more work to be done to reduce aircraft emissions. And the good news is, is that the airline industry is working with government and other stakeholders to increase the average aircraft fuel efficiency each year by 1.5 percent, cap net aviation CO_2 emissions starting this year, and reduce net aviation emissions by 50 percent by 2050 as compared to the 2005 levels. For that reason and many others, airline pilots are proud to be part of an industry that drives a truly global economy while taking aggressive proactive measures to reduce carbon emissions and fuel consumption.
>
> I would like to emphasize that improving aircraft engine technology is just one aspect of reducing greenhouse gas emissions, not the entire picture. The development of air traffic control technologies through the NextGen program, individual airport configuration, and expansion improvements which reduce ground delays, pilot operating techniques, and other measures can and do contribute to a lessening of engine emissions. The government should do everything practical to help reduce aircraft emissions via these improvements to the operating environment.

Organization: Airlines for America (A4A)

> The U.S. airlines are a critical engine of prosperity and progress in the national and international communities. Importantly, we recognize that continued progress depends on protecting our environment and strengthening the sustainability of our economies. The U.S. airlines acknowledge and embrace our responsibility to address climate change [EPA-HQ-OAR-2018-0276-0088-A1, p.1]

[The following comments were submitted as testimony at the virtual public hearing on September 17, 2020.]

> First, A4A and our members remain committed to limiting and reducing our carbon footprint and view the proposed GHG aircraft engine standards as an important contributor to our efforts.
>
> Second, A4A strongly supports the proposal to adopt the aircraft CO_2 certification standards as agreed by the International Civil Aviation Organization, ICAO, into U.S. law. The ICAO process for setting aircraft standards is rigorous and ensures that they are technically sound. Experts from the U.S. EPA and Federal Aviation Administration played leading roles in the six-year ICAO process leading to the adoption of the CO_2 standard. A4A and some nongovernmental organizations also participated as observers. Further, the ICAO criteria for adopting such standards align with the criteria under Section 231 of the Clean Air Act.

Organization: Anonymous Public Comment 1

The aviation industry contributes a significant amount to the climate change crisis through emissions of GHGs from air planes. All efforts must be made to reduce such emissions, since aviation will continue to increase through the years. [EPA-HQ-OAR-2018-0276-0079, p.1]

Organization: Anonymous Public Comment 19

Airplane manufacturers have increased the efficiency of fuel consumption about 1.5% per year over the past 30 years. While the increase in efficiency does lead to a decrease in emissions, this increase in efficiency is dwarfed by aviation industry projected doubling or more of airplane flights by 2050. (See chart on pg 2 of Environmental Defense Fund document https://www.edf.org/sites/default/files/linking-flights-forests-briefing-paper-technical-annex-april2016.pdf).

One need only look at the weather in the past few years to understand the effect of global warming on the global climate. As the earth heats up, there is more turbulence, energy, and intensity in the climate. The West coast of the US burned this summer, and this past winter Australia also burned; and the flooding and hurricanes this summer affected many countries as well as the US. [EPA-HQ-OAR-2018-0276-0146, p.1]

Organization: Anonymous Public Comment 2

It is clear that climate change is NOW. It's HERE. And we must be honest about the science. We must acknowledge that aviation is a significant contributor to GHG pollution and climate change. Although international aviation is not covered by the Paris Agreement, we must use science to establish policy and regulation to put aviation's pollution on a decreasing path that is compatible with the IPCC scenarios to limit global warming to 1.5-2.0 degrees C. [EPA-HQ-OAR-2018-0276-0101, p.1]

Please use your voice and your power in this EPA rule-making to tell the honest scientific truth about aviation's contributions to GHG emissions. Please tell us what policies would be needed at the EPA and ICAO so that aviation can be part of a future where global warming does not exceed 2.0 degrees C. [EPA-HQ-OAR-2018-0276-0101, p.1]

Aviation "accounts for around 2% of CO_2 emissions" today, but its impact on the climate is much larger because of radiative forcing. See Lee et. al. 2020: https://www.sciencedirect.com/science/article/pii/S1352231020305689 [EPA-HQ-OAR-2018-0276-0101, p.1]

Worse still, global aviation has tripled since 1990 and it is on track to triple again by 2050. Source: https://theicct.org/aviation [EPA-HQ-OAR-2018-0276-0101, p.1]

It would be lovely if new designs for airplane engines, fuels or batteries allowed global aviation to easily shift to a zero-carbon technology. Unfortunately, the technologies for green aviation are decades away from commercial viability. Carbon offsets and biofuels cannot make aviation clean. Only 2% of carbon offset projects have a high probability of resulting in additional emissions reduction, according to a study conducted for the European Commission: https://www.researchgate.net/publication/316216473_How_additional_is_the_Clean_Development_Mechanism_Analysis_of_the_application_of_current_tools_and_proposed_alternatives_Study_prepared_for_DG_CLIMA. [EPA-HQ-OAR-2018-0276-0101,p.1]

Bio-fuel is not scalable. Aviation fossil fuel use rises more every four hours (+10 million litres) than biofuels have in a decade (+7 million litres): https://www.nationalobserver.com/2020/01/07/analysis/co2-jet-fuel-soaring-4-times-faster-whatcan-save-day Bio-fuels also lead to deforestation that further perpetuates the positive feedback loop of climate change and warming. [EPA-HQ-OAR-2018-0276-0101, p.1]

In college I was trained as a mathematician, not a climate scientist like my father. In my 8 years as an elected official--a City Council Member in Urbana, Illinois--I saw the policy-making process as we conducted a GHG inventory and created a local climate action plan. I do not claim to be an expert, but science tells me now that we must reduce aviation to meet our climate goals. We must transition away from air transport and rethink how we move people and goods. We must help aviation workers transition to green jobs. We must also support impacted communities seeking environmental justice as oceans rise and super-storms increase. [EPA-HQ-OAR-2018-0276-0101, p.1]

Please be a positive voice for future generations during your involvement in this EPA rulemaking. Please be honest about aviation's contribution to climate change. Please create a revised rule that aligns aviation pollution, airplane and engine regulations with a 2.0-degree C warming scenario and no hotter. If the ICAO standard is not sufficient, please be honest and follow the science. Please tell the American people what would be needed at the EPA and ICAO--and more broadly what would be needed in our individual transportation choices and in our public policies that build new airport capacity and subsidize the airline industry--what would be needed in this rule-making and beyond so that aviation can be part of a future where global warming does not exceed 2.0 degrees C. Please tell us how to reconcile the science and policy so that future generations of humans, animals and plants do not face extinction on this planet. [EPA-HQ-OAR-2018-0276-0101, p.1]

Organization: Anonymous Public Comment 6

The proposed rule regulating GHG emissions from subsonic jet airplane engines is supported by a multitude of evidence. [EPA-HQ-OAR-2018-0276-0120, p.1]

In particular, the harm that global warming causes is not limited to hurricanes and sea level rise, but also includes increased spread of tropical viruses and risk of pandemics due to warmer temperatures and loss of biodiversity. This has a very direct and immediate impact on human health, justifying the proposed rule to regulate GHG emissions from airplanes. [EPA-HQ-OAR-2018-0276-0120, p.1]

EPA should consider and note the impact that climate change and global warming has on pandemics and the spread of viruses during the course of this rulemaking and also the mitigating impact of the proposed rule. [EPA-HQ-OAR-2018-0276-0120, p.1]

Organization: Anonymous Public Comment 8

Commercial aviation accounts for about 2.6% of annual global CO_2 emissions roughly the same amount of climate pollution as Germany emits. Global aviation emissions increased by 44% over the last ten years as growing passenger traffic outpaced fuel efficiency improvements. Ahead of the coronavirus pandemic, emissions were set to triple again by 2050. Flights departing from airports in the United States and its territories were responsible for almost a full quarter of global passenger aviation related carbon dioxide emissions in 2018. [EPA-HQ-OAR-2018-0276-0125, p.1]

A 2018 report from the Intergovernmental Panel on Climate Change made clear that global industry sectors must decarbonize by mid-century to keep warming to 1.5C and avoid devastating climate damages. But emissions from the aviation sector alone are on pace to total approximately 56 billion tonnes of CO_2 from 2015-2050. This would constitute more than a quarter of the emissions consistent with keeping global temperature rise below 1.5C. [EPA-HQ-OAR-2018-0276-0125, p.1]

The ICAO standards will do nothing to alter the catastrophic growth trajectory of aviation pollution. They are years behind the existing technology curve, will not reduce emissions from new planes beyond business as usual, and do not apply to any in-service aircraft. A recent report found that the average plane delivered in 2019 already did better than ICAO's standard for 2028. [EPA-HQ-OAR-2018-0276-0125, p.1]

I am a young person staring into the likely catastrophe that is the rest of my lifetime under the crisis of climate change. We still have a chance to seize something better and it is imperative that we do so immediately. The failures of these standards will directly impact my ability to actualize a healthy life and pursue liberty and happiness. [EPA-HQ-OAR-2018-0276-0125, p.1]

Organization: Boeing Company (Boeing)

[The following comments were submitted as testimony at the virtual public hearing on September 17, 2020.]

Boeing is also actively engaged in helping the industry reduce carbon emissions in a timely manner. We are taking action in four different areas which enable the industry to reduce emissions: airplane technology, operational efficiencies and air traffic management infrastructure upgrades, sustainable aviation fuels, and a global carbon-offsetting program for international civil aviation.

Organization: California Air Resources Board (CARB)

California regularly experiences the burden of aircraft emissions, both because it is particularly vulnerable to air quality and climate challenges, and because it is home to two of the nation's 10 busiest airports by passengers and three of the 11 busiest by cargo weight.[3] According to 2019 Federal Aviation Administration (FAA) data, the State's total commercial passenger trips represented 12.9 percent of U.S. commercial passengers, and airports in the state handled 11.1 percent of all U.S. cargo.[4] These statistics reflect California's status as the fifth-largest economy in the world, as well as a major tourism destination. In 2017, these flights emitted more GHGs than California's energy use for the residential and commercial sectors combined.[5] Aircraft also emit significant criteria and hazardous air pollutants that impede attainment of air quality standards and disproportionately affect disadvantaged and low-income communities nearest the airports.6 [EPA-HQ-OAR-2018-0276-0169-A1, p.2]

d. EPA should consider measures to reduce GHG emissions and copollutants from landing and takeoff, taxi, and APUs.

Aviation is a large and growing source of criteria emissions in California, making it more challenging for the State and local air districts to meet the National Ambient Air Quality Standards (NAAQS). The air quality challenges across California, and especially in the South Coast Air Basin, necessitate federal control of large source categories for which states and localities are preempted from establishing distinct standards, including aircraft engine emissions.[45] EPA's failure to consider these measures, given their likely co-benefits for NAAQS attainment and public health, highlights the arbitrariness of EPA's proposal.

Statewide, more than 28 million Californians live in areas that exceed the federal health-based ozone and fine particulate (PM2.5) standards. Today, in the South Coast Air Basin, over 12 million people are exposed to elevated ozone and PM2.5 air pollution. The most significant air quality challenge in the Basin is to reduce nitrogen oxide (NOx) emissions sufficiently to meet the upcoming ozone standard deadlines. Based on the emissions inventory and modeling results, 522 tons per day (tpd) of total Basin NOx emissions in 2012 are projected to drop to 255 tpd and 214 tpd in the 8-hour ozone attainment years of 2023 and 2031 respectively, due to continued implementation of already adopted regulatory actions.[46] The analysis suggests that total Basin emissions of NOx must be reduced to approximately 141 tpd in 2023 and 96 tpd in 2031 to attain the 8-hour ozone standards.[47] This represents an additional 45 percent reduction in NOx in 2023, and an additional 55 percent NOx reduction beyond 2031 levels. In the South Coast Air Basin, aircraft presently contribute about 16.2 tpd of NOx emissions and are forecasted to contribute 20.5 tpd of NOx emissions in 2031.[48] This is more than 20 percent of the South Coast Air Basin NOx carrying capacity of 96 tpd[49] and would make aircraft the third-largest source of NOx emissions in the Air Basin.[50]

As shown in Figure 2, the communities located nearest large airports bear the brunt of the near-ground and ground emissions. In California, communities within 10 miles of international airports are also disproportionately low-income and people of color.[51] Many low-income and disadvantaged communities experience criteria pollutant levels that significantly exceed the NAAQS, as well as exposure to hazardous air pollutants, which can have immediate and long-term detrimental health effects.[52] Recent evidence associates air pollution exposure burdens in disadvantaged communities with higher COVID-19 cases and poor health outcomes.[53] This research underscores what air quality experts have stated for decades: improved air quality is essential to supporting the long-term health of individuals, the economy, and communities.[54] Strong federal action on aviation GHGs that reduces criteria pollutants will also further the ultimate goals of the Clean Air Act to protect public health by alleviating negative health impacts associated with aircraft emissions that disproportionately impact low-income, minority, and disadvantaged communities in California. EPA has stated its commitment to addressing the environmental and public health concerns of minority, low-income, and tribal and indigenous communities[55]; amending this rulemaking as recommended herein is an opportunity to implement that commitment. [EPA-HQ-OAR-2018-0276-0169-A1, pp.10-13]

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[3] FAA, Passenger Boarding (Enplanement) and All-Cargo Data for U.S. Airports, updated Sept. 29, 2020, available at https://www.faa.gov/airports/planning_capacity/ passenger_allcargo_stats/passenger/ (ranking Los Angeles International as #2 and San Francisco International as #7 by passengers, and Los Angeles International as #5, Ontario International as #10, and Metropolitan Oakland International as #11 by cargo weight).

[4] Ibid. California's airports processed 120,652,743 of 935,693,377 calendar year 2019 enplanements and 20,151,532,213 of 181,574,937,105 calendar year 2019 landed pounds at U.S. airports.

[5] In 2017, California's intrastate, interstate, and international flights emitted about 48.5 million metric tons (MMT) of carbon dioxide equivalent (CO_2e), while residential and commercial energy use generated about 41 MMT CO_2e. CARB, California Greenhouse Gas Emission Inventory for 2000 to 2017 (2019 edition), available at https://ww2.arb.ca.gov/ghg-inventorydata. The 2019 California GHG inventory includes only emissions from intrastate flights, which represented 1.1 percent of included statewide emissions in 2017. CARB, California Greenhouse Gas Emissions for 2000 to 2017: Trends of Emissions and other Indicators (2019 edition), at 6-7, available at https://ww3.arb.ca.gov/cc/inventory/pubs/reports/2000_2017/ ghg_inventory_trends_00-17.pdf.

[6] See CARB, 2020 Mobile Source Strategy: Workshop Discussion Draft (Sept. 30, 2020), p. 101 et seq., available at https://ww2.arb.ca.gov/sites/default/files/2020-09/Workshop_Discussion_Draft_2020_Mobile_Source_Strategy.pdf; South Coast Air Quality Management District (SCAQMD), Draft Aircraft Emissions Inventory (Aug. 2016), available at http://www.aqmd.gov/docs/default-source/planning/fbmsm-docs/aircraft-emissions-inventoryfor-the-south-coast-air-quality-management-district.pdf. These emissions are discussed in detail in Section I.d. below.

[45] Clean Air Act § 233, 42 U.S.C. § 7573.

[46] CEPAM 2016 SIP – Standard Emission Tool (v1.05), updated July 18, 2018, available at https://www.arb.ca.gov/app/emsinv/fcemssumcat/fcemssumcat2016.php.

[47] SCAQMD Air Quality Management Plan (2016), available at https://www.aqmd.gov/docs/default-source/clean-air-plans/air-quality-managementplans/ 2016-air-quality-management-plan/final-2016-aqmp/final2016aqmp.pdf?sfvrsn=15.

[48] CEPAM 2016 SIP – Standard Emission Tool (v1.05), updated July 18, 2018, available at https://www.arb.ca.gov/app/emsinv/fcemssumcat/fcemssumcat2016.php.

[49] CARB, 2020 Mobile Source Strategy: Workshop Discussion Draft (Sept. 30, 2020), at 101 et seq., available at https://ww2.arb.ca.gov/sites/default/files/2020-09/Workshop_Discussion_ Draft_2020_Mobile_Source_Strategy.pdf.

[50] See CARB, CEPAM 2016 SIP – Standard Emission Tool (v1.05), last updated July 18, 2018, available at https://www.arb.ca.gov/app/emsinv/fcemssumcat/fcemssumcat2016.php. In 2030, aircraft are projected to emit 20.045 tons of per day (tpd) of NOx, behind only off-road equipment (29.919 tpd) and heavy heavy duty diesel trucks (29.798 tpd). Ibid.

[51] Julian D. Marshall, "Environmental inequality: air pollution exposures in California's South Coast Air Basin," Atmos. Environ. 42:5499-5503 (Feb. 4, 2008), https://doi.org/10.1016/ j.atmosenv.2008.02.005; Julian D. Marshall et al., "Prioritizing Environmental Justice and Equality: Diesel Emissions in Southern California," Envtl. Sci. Tech. 48:4063-4068 (Feb. 21, 2014), available at https://doi.org/10.1021/es405167f; Jason G. Su et al., "Inequalities in cumulative environmental burdens among three urbanized counties in California," Environment Int'l 40:79-87 (Jan.

3, 2012), available at https://superfund.berkeley.edu/pdf/402.pdf; Jason G. Su et al., “An index for assessing demographic inequalities in cumulative environmental hazards with application to Los Angeles, California,” Envtl. Sci. Tech. 43:7626-7634 (Sept. 21, 2009), available at https://doi.org/10.1021/es901041p; Wonsik Choi et al., Neighborhood-Scale Air Quality Impacts of Emissions From Motor Vehicles and Aircraft, 80 ATMOSPHERIC ENV'T 310, 316 (2013), DOI:10.1016/j.atmosenv.2013.07.043; Joshua Apte, “A Tool to Prioritize Sources for Reducing High PM2.5 Exposures in Environmental Justice Communities in California” (Nov. 2019), available at https://ww3.arb.ca.gov/research/single-project.php?row_id=67021.

[52] E.g., American Lung Association, Disparities in the Impact of Air Pollution, updated April 20, 2020, https://www.lung.org/clean-air/outdoors/who-is-at-risk/disparities; Y.-Y. Meng et al., “Are frequent asthma symptoms among low-income individuals related to heavy traffic near homes, vulnerabilities, or both?,” 18:343-350 Annals of Epidemiology (2008); RB Gunier et al., “Traffic density in California: socioeconomic and ethnic differences among potentially exposed children,” Journal of Exposure Science and Environmental Epidemiology (2003), 13(3): pp. 240-246; A. Carlson, “The Clean Air Act’s Blind Spot: Microclimates and Hotspot Pollution,” 65 UCLA L. Rev. 1036 (2018); R.J. Delfino et al., “Asthma Symptoms in Hispanic Children and Daily Ambient Exposures to Toxic and Criteria Air Pollutants,” Environmental Health Perspectives vol. 111 number 4 (April 2003); W.J. Gauderman et al., “The effect of air pollution on lung development from 10 to 18 years of age,” New England Journal of Medicine 351(11): 1057-1067 (2004), Erratum in: New England Journal of Medicine 2005 352(12):1276.

[53] Xiao Wu et al., “Exposure to Air Pollution and COVID-19 mortality in the United States: A Nationwide Cross-Sectional Study,” available at https://www.medrxiv.org/content/ 10.1101/2020.04.05.20054502v2; X. Wu et al., “Air pollution and COVID-19 mortality in the United States: Strengths and limitations of an ecological regression analysis,” Science Advances, 6, p.eabd4049 (2020).

[54] E.g., W.J. Gauderman et al., “Association of improved air quality with lung development in children” New England Journal of Medicine 372(10):905-913 (2015); K. Berhane et al., “Association of changes in air quality with bronchitic symptoms in children in California, 1993- 2012,” Journal of the American Medical Association, 315(14):1491-1501 (2016).

[55] EPA, Memorandum on EPA’s Environmental Justice and Community Revitalization Priorities (Feb. 23, 2018) available at https://www.epa.gov/sites/production/files/2018- 02/documents/epa_ej_memo_02.23.2018.pdf.

Organization: California Attorney General's Office and the California Air Resources Board (CARB) et al.

II. CLIMATE CHANGE AND THE STATES

Climate change resulting from GHG emissions poses an existential threat to public health and welfare in the United States. The contribution of the aviation sector to these emissions, along with the lack of an adequate system at the State or industry levels to control these emissions, necessitates that EPA set aggressive national standards under section 231.

As EPA and other federal agencies recently affirmed, severe and irreversible public health and economic harms from climate change caused by GHG emissions are already being experienced in the United States, with dire consequences for the Commenting States. Economic, societal, and public health harms across the globe are projected to worsen if GHG emissions are not drastically reduced in the next decade. The U.S. emits over a quarter of global aviation GHG emissions, which are projected to increase in the coming decades. While States are proactively combating GHG emissions (including from their major airports), they are generally preempted from establishing distinct standards for aircraft emissions and rely on EPA to adopt effective industry standards.

Considering these facts, EPA’s Clean Air Act obligations, and the multiple feasible options to reduce aircraft GHG emissions, EPA can and must adopt effective standards to substantially reduce these emissions, mitigate existing climate harms, and avoid the worst economic and public health outcomes of an unmitigated climate crisis.

A. Recent climate science confirms the need to aggressively reduce GHG emissions.

After EPA’s 2016 Endangerment Finding, NASA confirmed 2016 was the warmest year on record, and 2020 may break even that all-time record.3 Collectively, the past six years, from 2014 to 2019, are the warmest years in the modern record.4 In the Endangerment Finding, EPA found robust and compelling scientific evidence to conclude—four years ago—that "current atmospheric GHG concentrations are now at elevated and essentially unprecedented levels primarily as a result of both historic and current anthropogenic emissions," and "[s]uch concentrations are the primary driver of observed changes in Earth's climate system, namely 3 Thompson, Andrea, "Will 2020 Be the Hottest Year on Record?", Scientific American (Aug. 14, 2020), increased global average temperatures that drive climate impacts like widespread melting of snow and ice and rising global average sea level." 81 Fed. Reg. at 54,444, 54,451. Current climate science has only bolstered this consensus: Earth's climate system is rapidly changing due to human activity and demands an ambitious, all-sectors reduction of GHG emissions in order to avert the gravest impacts to economies, ecosystems, and lives in the United States.

In 2017 and 2018, the U.S. Global Change Research Program released the Fourth National Climate Assessment ("Fourth Assessment") in two volumes, which reviews the current state of climate change science, and details ongoing and projected future physical impacts of global warming.[5] Coordinated by lead authors across thirteen federal agencies, including EPA, the Fourth Assessment represents the work of over 300 governmental and non-governmental experts; it was externally peer-reviewed by a committee of the National Academy of Sciences, Engineering and Medicine, and underwent several rounds of technical and policy review by its member agencies.[6] In short, it is the federal government's authoritative analysis of climate science and the impacts of climate change on the United States. One key conclusion is stark, but hopeful: by shifting from a high-emissions scenario to a low-emissions scenario, "[b]y the end of this century, thousands of American lives could be saved and hundreds of billions of dollars in health-related economic benefits gained each year."[7]

The Earth's climate is rapidly changing. As the Endangerment Finding stated, emissions of carbon dioxide (CO_2), the main greenhouse gas emitted by aircraft, "are currently altering the atmosphere's composition and will continue to alter Earth's climate for thousands of years." 81 Fed. Reg. at 54,445. Earth's atmosphere now contains a higher concentration of CO_2 than it has in the past three million years.[8] In 2017, the atmospheric CO_2 concentration was 400 parts per million (ppm); in 2018, those levels exceeded 410 ppm for the first time, then reached 411 ppm in May 2018. The global growth rate of Earth's atmospheric CO_2 level is accelerating: in the 1980s, it averaged 1.6 ppm per year and in the 1990s, 1.5 ppm per year, but increased to 2.2 ppm per year during the last decade.[9]

Elevated concentrations of atmospheric CO_2 have, in turn, driven historically high global temperatures. Global annual average temperature increased by 1.8°F (1.0°C) from 1901-2016, the Fourth Assessment concluded: "This period is now the warmest in the history of modern civilization."[10] Melting ice sheets and glaciers, caused by the increases in temperatures, have accelerated global mean sea level rise faster during the last century than in any previous century in at least 2,800 years, contributing to daily tidal flooding increases in over 25 Atlantic and Gulf Coast cities.[11] Reduced snow cover threatens regional water supplies,[12] while ocean acidification endangers marine aquaculture and major ecosystems.[13] In fact, researchers project oceans will become more acidic than they have been in the last 14 million years due to the amount of atmospheric CO_2 they have absorbed to date.[14]

As the science behind attribution of extreme storms to anthropogenic climate change continues to improve, climate models generally show that the planet's warming increases the frequency of the most intense hurricanes.[15] Future hurricanes will have stronger maximum winds, move more slowly, and drop more precipitation, according to a modeling analysis by U.S. government scientists of 22 recent hurricanes.[16]

Human activities, especially GHG emissions, are responsible for global climate change. The Fourth Assessment confirmed the established science that human-caused GHG emissions are primarily responsible for the 1.8ºF in observed warming from 1901 to 2016, concluding: "observational evidence does not support any credible natural explanations for this amount of warming; instead, the evidence consistently points to human activities, especially emissions of greenhouse or heat-trapping gases, as the dominant cause."[17] This is an even stronger confidence level than that cited in the 2016 Endangerment Finding. 81 Fed. Reg. at 54,444.

Since 2015, the National Academies of Sciences, Engineering, and Medicine have assessed the likelihood that individual extreme weather events are attributable to climate change is increasing.[18] This likelihood is "greatest for those extreme events that are related to an aspect of temperature, such as the observed long-term warming of the regional or global climate, where there is little doubt that human activities have caused an observed change."[19]

For the past seven years, the journal of the American Meteorological Society (AMS) has published an annual special supplement describing studies evaluating the connection (or lack of connection) between specific extreme weather events and anthropogenic climate change. In previous AMS reports, 89 studies of extreme weather events found that climate change had increased the likelihood of the event occurring.[20] In the 2017 AMS report, for the first time, the authors found several of the extreme weather events occurring in 2016 would not have been "possible without the influence of human caused climate change."[21] These extreme events included: (1) record-breaking global temperatures, (2) record-breaking regional temperatures over the Asian continent, and (3) the anomalous warm water temperatures in Alaska's Bering Sea. These events are beyond the bounds of the "natural" climate and would not have occurred absent the ongoing anthropogenic alteration of Earth's climate.

Next, two independent research teams, including one from the U.S. Department of Energy's Lawrence Berkeley National Laboratory, recently released studies identifying a clear anthropogenic climate signal in the torrential precipitation that inundated Houston during Hurricane Harvey, reporting the precipitation was 15 to 19 percent more intense due to climate change.[22,23] It is estimated that Hurricane Harvey was the second costliest natural disaster on record in U.S. history, resulting in $125 billion in total damages.[24] Similar studies indicate the intensity and frequency of such events have increased since 1901, especially in the northeastern United States.[25]

Reducing GHG emissions will avert the gravest impacts to economies, ecosystems, and lives. As EPA found in 2016, "the public health of current generations is endangered and … the threat to public health for both current and future generations will mount over time as GHGs continue to accumulate in the atmosphere and result in ever greater rates of climate change." 81 Fed. Reg. at 54,452. Recent climate science only confirm this strong link between continued increases in GHG emissions and more extreme climate impacts.

As described by the Intergovernmental Panel on Climate Change (IPCC), climate change projections explore multiple paths of various GHG emissions levels. In a future where major sources of GHGs are not addressed, climate change will result in hundreds of millions of people being displaced, millions dying, and trillions of dollars in economic harm to the global economy.[26] But projections based on lower emissions levels show mitigated harm to ecosystems and human health, economies, agriculture, and infrastructure, relative to high-emission scenarios. As EPA and its sister agencies conclude in the Fourth Assessment, by 2100 "thousands of American lives could be saved and hundreds of billions of dollars in health-related economic benefits gained each year under a pathway of lower GHG emissions."[27]

Research since EPA's 2016 Endangerment Finding confirms the enormous relative benefits of a low-emissions scenario. The Fourth Assessment's first volume (2017) projected that, under relatively low-emissions scenarios, global temperatures increase by 0.5-1.3°F by the end of the 21st century, and under high-emissions scenarios, by 4.7-8.6°F.[28] However, temperature changes are expected to be higher for the contiguous United States than the global average. Increases of 2.5°F are projected for 2021-2050 relative to the average from 1976-2005 in all Representative Concentration Pathway (RCP) emission scenarios, implying that recent record-setting years may be "common" in the next few decades. Much larger rises are projected by end of century, as high as 5.8°-11.9°F for the highest emission scenario.[29] According to the IPCC's October 2018 report, global warming is likely to reach

1.5°C between 2030 and 2052 if emissions continue to increase at the current rate.[30] The World Meteorological Organization recently indicated a high likelihood that one or more months between 2020 and 2024 will be at least 1.5°C warmer than preindustrial levels, and a 20% chance that one of those years may hit the 1.5°C threshold.[31]

The difference in global temperature rises under lower- or higher-emissions scenarios translates to billions of dollars in human costs and incalculable damage to the environment. The year 2017 was the most expensive on record, with national climate response costs of $306 billion.[32] In addition, 2018 marked the eighth consecutive year with eight or more billion-dollar climate disasters, including Hurricane Michael ($25 billion), Hurricane Florence ($24 billion), and the complex of western wildfires ($24 billion);[33] 2019 followed with 14 separate billiondollar weather and climate disaster events across the United States.[34]

If emissions continue to grow at historic rates, the Fourth Assessment finds “annual losses in some economic sectors are projected to reach hundreds of billions of dollars by the end of the century—more than the current gross domestic product (GDP) of many U.S. states.”[35] A study of agricultural crop response to climate change indicates that, while insect pests currently consume 5 to 20 percent of major grain crops (such as wheat, rice, and corn), models show yield lost to insects will increase by 10 to 25 percent per degree Celsius of warming.[36] The IPCC projects major damage to marine ecosystems such as coral reefs, which are projected to decline 70 to 90 percent at 1.5°C of warming, while effectively disappearing worldwide at 2°C warming.[37] Under current emissions levels, self-reinforcing climate system feedbacks, including the die-off of boreal forests, Arctic sea ice loss, and the release of methane from permafrost, risk creating a “Hothouse Earth” effect, where warming continues even if GHG emissions are eventually reduced. Some of these feedbacks may not be reversible, even over the long term.[38] [EPA-HQ-OAR-2018-0276-0176-A1, pp.2-8]

B. Climate change impacts to the Commenting States

The Commenting States are home to over 100 million people. We are already suffering the deleterious impacts of global climate change today, which, as described above, are expected to escalate without sharp reductions in GHG emissions. Our residents have lost property, been displaced from homes, endured respiratory illness and other health impacts, and even been killed as a result of severe weather events exacerbated by climate change. Rising average temperatures, shrinking mountain snowpack, warmer storms, wildfires, and higher sea levels are affecting our economy, infrastructure, and public services. These impacts require long-term, resourceintensive adaptation planning and costly disaster response by all levels of government and the private sector. The recent Fourth Assessment projects more extreme-weather impacts for every region of the U.S., including major damage to agriculture, coastal industries, utility grids, transportation networks, air quality, and human health, from coastal flooding, heat waves, drought, and wildfires, as well as from the spread of tree-killing and disease-carrying pests.

• Heat waves. Over the past fifty years, record-setting temperatures and intense heat waves have spiked in most regions of the U.S.[42] On September 6, 2020, Los Angeles County experienced its highest ever recorded temperature of 121°F.[43] If emissions continue at their present high rate, the increase in extreme heat events is projected by 2090 to cause 2,000 additional premature deaths per year in the Midwest, and 1,300 per year in the Northeast.[44] Between the middle and end of the century, Chicago could experience five days per year (low-emissions scenarios) or 25 days per year (high-emissions scenarios) with conditions similar to the 1995 heat wave that caused 800 deaths in the city.[45] In Washington, D.C., heat emergency days (when the heat index exceeds 95°F) could more than double, from the current 30 days per year to 70 days per year (low-emissions scenario) or 105 days per year (high-emissions scenario) by the 2080s.[46] In New York City, the average number of days when the maximum temperature exceeds 90°F may increase from 18 days (1971-2000 baseline) to between 32 to 57 days by the 2050s.[47]

• Wildfires. The number of large forest fires has significantly increased over the past three decades, with one model finding human-driven climate change responsible for doubling the area burned by forest fires over 1984-2015.[48] The Northwest's ongoing wildfires—with over five million acres burned across California, Oregon, and Washington, already exceed the previous worst recorded wildfire season in history (2015, at 1.6 million acres burned).[49] In August and September 2020, six of the twenty largest wildfires in California's history were burning, destroying towns and causing smoke and ash to fill the skies up and down the state for weeks. The air quality has remained at unhealthy levels for weeks, such that public health experts have advised residents to stay indoors in many counties across the state.[50] During September 2020, in fact, these wildfires gave Portland, Oregon had the worst air quality of any major city in the world, and some smaller Oregon cities often had even worse air quality than Portland.[51] Wildfires are increasing in number, duration, and destruction—in large part due to droughts and rising temperatures caused by climate change—causing significant annual economic and public health damage across California and the entire western U.S.[52] According to California's Fourth Climate Assessment (August 2018),[53] "large wildfires (greater than 25,000 acres) could become 50 percent more frequent by end of century if emissions are not reduced." More years will see extremely high areas burned, even compared to the historically destructive wildfires of 2017 and 2018; by 2099, California wildfires could burn up to 178 percent more acres per year than current averages.[54]

• Severe storms. In 2012, Hurricane Sandy caused at least 53 deaths in New York and 34 deaths in New Jersey,[55] leading to more than $40 billion of damage in New York and more than $25 billion of damage in New Jersey.[56] Hurricane Irene and Tropical Storm Lee caused estimated damages of over $1.6 billion in New York in 2011.[57] In August 2020, a severe "derecho" storm devastated the Midwest with hurricane-level winds and 20 tornados, including 15 in the Chicago warning area.[58] Climate change is projected to increase the frequency, intensity, and destructive impact of such extreme storms as sea levels rise and global temperatures increase.[59]

• Flooding and erosion. Coastal flooding and erosion, exacerbated by sea-level rise, increasingly plagues the States, even outside of major storms systems. 81 Fed. Reg. at 54,455. Studies estimate that between one and two thirds of Southern California beaches may completely erode by 2100 without large-scale human interventions. Statewide damages could reach nearly $17.9 billion from inundation of residential and commercial buildings.[60] In New York City, tide-gauge observations show that rates of relative sea level rise are significantly greater than the global mean, ranging from 0.9 to 1.5 inches per decade.[61] The 12 inches of sea level rise that the New York City area has experienced in the past century exacerbated the flooding caused by Hurricane Sandy by about 25 square miles, damaging the homes of an additional 80,000 people in the New York City area alone.[62] Swiss Re, a reinsurance and insurance company, has estimated that expected annual economic losses in New York City alone from rising sea levels and more intense storms may increase to $4.4 billion by the 2050s.[63] In Maryland, catastrophic rainfall and flooding in May 2018 saw the Patapsco River rise nearly 17 feet in under three hours, while flash floods turned Ellicott City's Main Street into a river over ten-feet deep.[64] On the Great Lakes, Lake Ontario reached record high-water levels in 2017 and 2019, causing significant damage to properties in New York's lakefront communities.[65]

• Diseases and pests. In the Northeast, warmer temperatures contribute to the spread of tick-borne diseases like Lyme disease.[66] In the Southwest, climate change has contributed to increased forest pest infestations, a major cause of tree death. In California, dramatic bark beetle infestations—driven by warming winters and drought—have created unprecedented conifer die-offs, especially in the parts of the southern Sierra Nevada, where tree mortality is nearly 100 percent.[67]

• Droughts. Chronic, long-duration droughts are increasingly likely under highemissions scenarios.[68] The 2011-2016 California drought, exacerbated by extreme warmth and reduced Sierra Nevada snowpack,[69] led to losses of over 10,000 jobs and the fallowing of 540,000 acres, at a cost of $900 million in gross crop revenue in 2015.[70] In the Northwest, 2015's record high temperatures led to a "snow drought," in which low snowpack and a dry spring created shortages in irrigation, hydropower, and human consumption and caused widespread fish die-offs. Under high-emissions scenarios, the Northwest's warming winters are projected to cause more precipitation to fall as rain instead of snow, leading to flooding and landslides in the winter and reduced streamflows in spring and summer.[71]

• Threats to water quality. Climate change increasingly threatens states that rely on snowpack for their drinking water. Snowpack in Washington's Cascade Mountains has already decreased by 25 percent since the mid-20th century, and is anticipated to decrease by 38 to 46 percent (relative to 1916-2006) by the 2040s.[72] In California, due to its unique hydrology and statewide water infrastructure, which is heavily reliant on snowpack for irrigation and drinking water alike, the projected loss of 60 percent of Sierra Nevada snowpack will have devastating impacts on its cities, agriculture, and diverse ecosystems.[73]

• Threats to air quality. As EPA found in 2016, "climate change is expected to increase ozone pollution over broad areas of the country, including large metropolitan population centers, and thereby increase the risks of respiratory infection, aggravation of asthma, and premature death." 81 Fed. Reg. at 54,452.[74] Currently, more than 100 million U.S. residents live in communities where pollution exceeds health-based air quality standards.[75] Because warmer temperatures promote ozone formation, climate change undermines State and local efforts to reduce emissions of ozone precursors; this "climate penalty" presents a particular challenge for California, which has seven of the ten most polluted U.S. cities for ozone.[76] In the Midwest, increased groundlevel ozone concentrations are projected to result in an additional 200-550 premature deaths per year by 2050, while lengthening pollen seasons will adversely impact children with asthma and respiratory diseases.[77] In the Northwest and Southwest, ozone and wildfire smoke are projected to increase cardiovascular and respiratory diseases.[78]

• Threats to utility and transportation networks. As EPA found in 2009 and reaffirmed in 2016, sea level rise and other extreme climate impacts threaten the U.S.'s key societal infrastructure such as energy, water, and transportation. 81 Fed. Reg. at 54,457. The U.S. has over 60,000 miles of roads and bridges in coastal floodplains, all of which are vulnerable to increasing extreme storms and sea-level rise. On the East Coast alone, flooding has increased transportation disruptions by 85 percent from 2010, to 100 million vehicle-hours of delay.[79] The Metropolitan Transit Authority, which manages rail and subway transportation infrastructure in the New York City metropolitan area, has budgeted and spent hundreds of millions of dollars for restoration from Hurricane Sandy damage and resilience measures to prepare for future flooding.[80] Under a high-emissions scenario, EPA itself projects $400 million more in annual service costs for Midwestern bridges and $3.3 billion in annual damages to roads by 2050.[81]

• Threats to agriculture and timber. In the Midwest, increases in warm-season humidity and precipitation "have eroded soils, created favorable conditions for pests and pathogens, and degraded the quality of stored grain."[82] Illinois faces up to 77 percent average yield loss across all crops by the end of the century.[83] In Washington, under a moderate emissions scenario, the range for Douglas fir—a major timber tree—is expected to decline 32 percent by the 2060s.[84] In New York, heat stress is projected to decrease milk production by 30 to 60 percent per cow by the end of the century unless costly cooling systems are put in place.[85] In California, which produces over half the nation's specialty crops, agriculture is projected to experience lower crop yields due to extreme heat waves, heat stress and increased water needs of crops and livestock.[86]

• Threats to marine industries. The 2015 snow drought in Washington led to the largest harmful algal bloom recorded on the West Coast, closing fisheries along the entire Northwest coast.[87] Lobster catches have largely moved northward out of New York waters and, while additional research is needed, warming waters may have been a contributing factor in a 2019 die-off of bay scallops in Peconic Bay, New York.[88] Ocean acidification from elevated CO_2—predicted to occur especially rapidly along the West Coast—impacts shellfish aquaculture, which represents roughly half of West Coast fisheries revenue.[89]

• Threats to regional ecosystems. In the Northeast, "decreasing seasonality" is already harming tourism, farming, and forestry.[90] Up to 83 percent of tidal habitats, such as salt marshes and tidal flats, in the Northeast and Mid-Atlantic may be at risk from future severe inundation.[91] Iconic California plant and animal species face severe habitat shifts and destruction due to climate change, including the Joshua tree (up to 90 percent loss of habitat), the elephant seal, desert tortoise, and bighorn sheep.[92]

As EPA found in 2016, in addition to harming our residents generally, climate change particularly affects indigenous peoples' health through reduced access to traditional foods, decreased water quality, and increased exposure to health and safety hazards. 81 Fed. Reg. at 54,454. Tribal lands and communities experience unique harms from climate impacts. The rural locations and lack of infrastructure, public facilities, and adequate community services mean droughts and extreme heat pose higher risks to their public and economic health. California has determined that, given their fixed location and the administrative and legal difficulty of relocation under federal and state law, climate impacts pose special risks to California's tribes.[93]

The threats of climate change are stark. Framed in the reverse, however, these projections show the enormous opportunity that regulatory agencies like EPA have to save lives, ecosystems, and industries through sensible emissions controls. By shifting to a low-emissions scenario, EPA and its sister agencies have determined that "[b]y the end of this century, thousands of American lives could be saved and hundreds of billions of dollars in health-related economic benefits gained each year."[94]

C. Aircraft contributions to greenhouse gas emissions

Aviation emissions are a significant source of the world's total GHG emissions, and the United States is the single largest emitter. In 2016, EPA found "the collective GHG emissions from … U.S. [] aircraft clearly contribute to endangering GHG pollution." 81 Fed. Reg. at 54,461. Subsequent data and trends have only confirmed EPA's contribution finding. Globally, in 2018 aviation produced 2.4 percent of total energy-related CO_2 emissions,[95] and in 2020, produced 12 percent of GHG emissions from all transportation sources.[96] Within the United States, in 2017 aviation accounted for 3 percent of total domestic CO_2 emissions, and over 12 percent of total U.S. transportation-related CO_2 emissions.[97] Further, the United States is responsible for burning roughly a quarter of all global aviation fuel, over six times the amount consumed by the next highest nation.[98] As EPA noted in 2016, GHG emissions from U.S. aircraft alone rank higher than total GHG emissions from more than 150 entire countries. 81 Fed. Reg. at 54,468.

Aviation was projected to grow at a rapid rate in studies conducted before the COVID-19 pandemic crisis arose in early 2020. Globally, by 2050, commercial aircraft emissions were estimated to triple under these projected growth patterns.[99] GHG emissions from U.S. aircraft covered by the Proposed Rule were projected to grow by 43 percent over the next two decades.[100] Though the aviation industry is experiencing diminished use now due to the COVID- 19 crisis, the eventual return of normal economic activity anticipates a return to these projected growth patterns given the dependence of global tourism and business on air travel. The World Meteorological Organization has found that the estimated high-water mark of GHG emission reductions of 17 percent, caused by global lockdowns early in 2020, have now fallen away.101 [EPA-HQ-OAR-2018-0276-0176-A1, pp.8-16]

The large share and projected growth of aviation GHG emissions necessitates immediate reduction to mitigate climate risks.[102] Despite contributing over a quarter of the share of global aviation emissions, the U.S. aircraft sector is the single largest unregulated GHG emissions source in the domestic transportation sectors. 81 Fed. Reg. at 54,463. Aviation economic markets are not designed to voluntarily induce the needed reductions of GHGs to avoid these devastating impacts. Therefore, to meet its legal obligations and reduce climate risks posed to the national population, EPA must adopt national requirements to reduce GHGs from aviation to support this aggressive efficiency in the industry and avoid the projected catastrophic outcomes for the Commenting States.

The Commenting States are particularly interested in reducing aircraft GHG emissions, because our large travel economies also result in associated emissions. Tourism, business travel, and import/export trades are all major industries, and individuals flying to and from the Commenting States for tourism and business and the movement of goods through international airports produce associated GHG emissions that we largely cannot reduce without federal regulation.[103] The Commenting States are therefore invested in supporting GHG reductions from aviation to mitigate both the significant climate impacts from these sectors directly felt by our residents, as well as aviation's globalized impacts.[EPA-HQ-OAR-2018-0276-0176-A1, pp.16-17]

Aircraft also emit substantial criteria and hazardous air pollutants. Residents living within 10 miles of airports are exposed to large amounts of these harmful pollutants through emissions from aircraft landing and takeoff operations. Those areas disproportionately include disadvantaged minority and low-income communities.[104] Criteria and hazardous air pollutants are known to cause premature death, aggravation of respiratory and cardiovascular disorders, and decreased lung function, among other harms. Though the Commenting States have obligations under the Clean Air Act to meet and maintain National Ambient Air Quality Standards (NAAQS) and reduce criteria pollutants, they are generally preempted from establishing distinct standards for aircraft as sources of these pollutants. See 42 U.S.C. § 7573. In California's South Coast Air Basin, for example, aircraft will be the third-largest source of NOx emissions by 2030.105 Reducing GHG emissions can reduce these harmful co-pollutants, and thereby reduce the associated public health impacts. [EPA-HQ-OAR-2018-0276-0176-A1, p.17]

The following additional defects further establish EPA's action here as arbitrary and capricious:

EPA has failed to consider co-benefits of GHG regulation. Stricter GHG emissions standards will likely decrease NOx and other harmful criteria and hazardous air emissions from aircraft engines, many of which have air quality impacts in the Commenting States and impact NAAQS attainment. For example, EPA has in prior rulemakings set out in detail the harmful health and environmental effects of NOx, a precursor to ozone, and particulate matter, and tied aircraft emission standards for NOx to States' attainment of NAAQS for ozone and PM. By failing to regulate GHGs beyond business-as-usual, EPA places more pressure on States' implementation plans (SIP) to control other sources of criteria pollutants in order to attain and maintain NAAQS. Nowhere does EPA even consider this aspect of its ineffective GHG standard.

EPA has arbitrarily dismissed environmental justice impacts. Per Executive Order 12898, as well as Title VI of the Civil Rights Act of 1964, EPA must consider how the Proposed Rule would impact disadvantaged communities.[152] Minority and low-income communities are disproportionately located within 10 miles of international airports, including in the Commenting States, and are thereby disproportionately impacted by criteria pollutant and toxic air contaminant emissions exposures associated with takeoff and landings of passenger aircraft.[153] This despite evidence that those lower income households benefit less from aviation services themselves.[154]

Further, climate change from GHG emissions will continue to impose disproportionate impacts on these communities. More efficient and lower-polluting aircraft are therefore important to the health and well-being of minority and low-income communities. EPA has failed to consider the evidence that these disproportionate impacts would continue under this rulemaking, and worsen with projected increases in aviation GHG emissions. It has also failed to analyze the benefits of setting a standard for covered aircraft that would reduce these impacts on disadvantaged communities by causing real and incremental reductions of GHG emissions, which in turn reduce the associated criteria and hazardous air pollutants from aircraft. Instead, EPA inaccurately concludes that the Proposed Rule "provides similar levels of environmental protection for all affected populations without having any disproportionately high and adverse human health or environmental effects on any population, including any minority or low-income population." 85 Fed. Reg. at 51,590. This conclusion is not supported by the evidence and, as such, EPA has failed to meet its burden under the Clean Air Act and Administrative Procedures Act, as well as Executive Order 12898 and Title VI of the Civil Rights Act of 1964. This failure only confirms the arbitrary and capricious manner in which EPA has approached this rulemaking. [EPA-HQ-OAR-2018-0276-0176-A1, pp.34-35]

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[7] Fourth Assessment, Vol. II: Report-in-Brief, at 102.
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[9] NOAA, "Another Climate Milestone on Mauna Loa" (Jun. 7, 2018), https://research.noaa.gov/article/ArtMID/587/ArticleID/2362/Another-climate-milestone-falls-at-NOAA%E2%80%99s-Mauna-Loa-observatory
[10] Fourth Assessment, Vol. I, at 10, 13, 17 (Exec. Summ.), 39, 40 (Ch. 1), 78, 80-84 (Ch. 2); compare 81 Fed. Reg. at 54,445 (finding "U.S. average temperature has increased by 1.3 °F to 1.9 °F since record keeping began in 1895; most of this increase has occurred since about 1970. The most recent decade was the nation's warmest on record.").
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[12] Fourth Assessment, Vol. I, at 10 (Exec. Summ.), 239-240 (Ch. 8).
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Organization: Campbell, Trevor

In her Final Rule for Finding That Greenhouse Gas Emissions From Aircraft Cause or Contribute to Air Pollution That May Reasonably Be Anticipated To Endanger Public Health and Welfare, the EPA Administrator at the time, Gina McCarthy, found that aircraft emit a significant amount of greenhouse gases, about 3% of total U.S. emissions.[1] In the description for the proposed rule, the agency makes note that they do not expect any GHG emission reductions from implementation of the rule as aircraft manufacturers have already developed and incorporated technologies that make aircraft compliant with the proposed standards.[2] Therefore, the proposed rule does little to change the status quo or reduce the carbon footprint that the U.S. air transportation industry has on the environment. [EPA-HQ-OAR-2018-0276-0173-A1 p. 1-2]

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Organization: Center for Biological Diversity, Earthjustice, on behalf of the Sierra Club and Friends of the Earth, and the Natural Resources Defense Council (NRDC)

I. Aircraft Contribute Significantly to Climate Change and Harm Human Health and Welfare.

A. Climate change is one of the greatest challenges facing the United States and the world.

Global warming is occurring on an unprecedented scale as a result of human activities.[3] The combustion of fossil fuels since the Industrial Revolution is the most prominent force driving climate change.[4] The United States government, and EPA in particular, have repeatedly recognized that this anthropogenic climate change is causing widespread, severe harms across the country, requiring immediate and substantial greenhouse gas emissions reductions.[5] The impacts of more frequent and intense extreme weather events, intensifying droughts, hazardous air quality associated with wildfire and ozone pollution, rising water temperatures, ocean acidification, and sea level rise "are already being felt in communities across the country."[6]

Conclusive scientific evidence undergirds these conclusions. The five-year period from 2016–2020 is expected to be the warmest on record with an average global mean surface temperature of 1.1°C above the pre-industrial level, arctic sea-ice continues its long-term downward trend, global mean sea-levels are rising, and communities across the globe are experiencing major impacts from extreme weather and climate events.[7] A 2018 report from the Intergovernmental Panel on Climate Change made clear that global industry sectors must decarbonize by mid-century to keep warming to 1.5°C and avoid devastating climate damages.[8] If global temperatures rise above this level and approach 2°C, the impacts will become catastrophic. Impacts will include, but will not be limited to, longer and more deadly heatwaves, droughts, and flooding; increased risk of multi-meter sea level rise; widespread species extinctions; enhanced thawing of permafrost and the associated release of the super-polluting greenhouse gas methane; increased ozone-related respiratory illnesses and premature deaths; the proliferation of mosquito-borne diseases like malaria and dengue fever; and up to several hundred million more people exposed to climate-related harms and susceptible to poverty by 2050.[9] These impacts fall disproportionately on low-income communities and communities of color. Limited resources make these populations "more vulnerable to ongoing climate-related threats, less able to adapt to anticipated changes, and less able to recover. . . ."[10] The IPCC report concludes that pathways to limit warming to 1.5°C with little or no overshoot require "a rapid phase out" of carbon dioxide (CO_2) emissions and "deep emissions reductions in other GHGs and climate forcers."[11]

To limit warming to 1.5°C, global CO_2 emissions must be cut in half by 2030—ten years from now—and reach near zero by 2050,[12] with faster reductions needed in the U.S.[13] Thus, to avoid the devastating climate change-driven damages that would come with exceeding 1.5°C warming, we must implement deep greenhouse gas emissions reductions without delay across all sectors, including aviation.

The costs of overshooting the 1.5°C to 2°C temperature rise targets set by the Paris Climate Agreement are in many ways so overwhelming and widespread that they defy quantification. In addition, it is not possible to accurately quantify costs that might be associated with large-scale shifts in the climate system, known as tipping points, and the compound effects of simultaneous extreme climate events. Nonetheless, according to the Fourth National Climate Assessment, the number of extreme weather events per year costing more than one billion dollars per event has increased significantly since 1980, with total costs exceeding $1.1 trillion.[14] The National Oceanic and Atmospheric Administration estimated that, between 2015 and April 2018, 44 billion-dollar weather and climate disasters struck the United States, producing nearly $400 billion in damages.[15] The 2017 Atlantic Hurricane season alone is estimated to have caused more than $250 billion in damages and hundreds of deaths throughout the U.S. Caribbean, Southeast, and Southern Great Plains.[16] By the end of the century, the Fourth National Climate Assessment, of which EPA was a co-author, estimates that warming on our current trajectory would cost the U.S. economy hundreds of billions of dollars each year and up to ten percent of U.S. gross domestic product due to damages including lost crop yields, lost labor, increased disease incidence, property loss from sea level rise, and extreme weather damage.[17]

B. Aviation is among the fastest-growing contributors to climate change.

Aviation adds CO_2 and smaller amounts of nitrous oxide, a potent greenhouse gas, into our atmosphere.[18] When these pollutants are emitted from aircraft, they have a larger impact on climate, as aviation emissions "occur in the climatically sensitive upper troposphere and lower stratosphere where they may have a disproportionate impact on climate."[19] Moreover, due to contrails and aviation-induced cirrus cloud formation, "aviation has a larger impact on radiative forcing" than that caused by CO_2 emissions alone.[20]

Aviation is one of the fastest-growing sources of greenhouse gas emissions.[21] Flights departing from airports in the United States and its territories were responsible for almost a full quarter of global aviation's passenger transport-related carbon dioxide emissions in 2018.[22] Globally, aviation was responsible for 2.4 percent of energy-related total carbon dioxide emissions in 2018, and 3.5 percent of anthropogenic effective radiative forcing after accounting for nitrogen oxides, black carbon, and aviation-induced cloudiness.[23] Due to the radiative forcing effect of pollutants emitted at altitude, those emissions are estimated to account for about five percent of warming.[24]

Over the last ten years, aviation emissions increased by 44 percent, as growing passenger and cargo traffic outpaced efficiency improvements.[25] Emissions are expected to triple again by 2050 under a business-as-usual scenario.[26] The aviation sector is on pace to emit approximately 56 billion tonnes of CO_2 from 2015-2050. This would constitute more than a quarter of the total emissions consistent with a global carbon budget that keeps temperature rise below 1.5°C.[27]

The United States is by far the largest aviation carbon polluter. In 2015, EPA estimated that emissions from U.S. aircraft "are about 7 times higher than aircraft greenhouse gas emissions from China," which is ranked second in the world for its aircraft emissions.[28] Maintaining this business-as-usual path will cause additional greenhouse gas pollution that we cannot afford.

Aviation is also responsible for the emission of criteria and hazardous pollutants that directly harm the health of residents living close to airports, who disproportionately come from disadvantaged and minority communities.[29] The ill effects of this pollution, exacerbated by aircraft take-off and landing operations, include premature death, respiratory and cardiovascular disorders and other serious health effects.[30] Failing to rein in aviation greenhouse gas emissions also leaves these emissions unabated. [EPA-HQ-OAR-2018-0276-0150-A1, pp.2-5]

D. Greenhouse Gas reductions from aircraft are readily achievable and EPA must set standards that avert climate catastrophe.

There is no doubt that airplane pollution can be dramatically reduced. For example, recent reports have documented the 51% fuel efficiency performance gap between the worst- and best-performing transatlantic air carriers,[190] have noted that the rate of fuel burn reduction for new aircraft could be accelerated up to 2.2% per year through 2034, surpassing the 1.3% per year achieved historically,[191] and have described the increasing availability of hybrid and all-electric technology.[192]

In the case of CO_2, the "degree of control required" to address the "contribution of [aircraft] to deterioration of air quality" [193] is high. EPA has the ability to be much more aggressive in pressing for the development of improved technology by, for example, implementing a declining fleetwide average standard that allows airlines to reduce their emissions by increasing fuel efficiency through operational changes and design improvements, decreasing demand growth, electrifying aircraft, or some combination of these options. To avoid catastrophic climate change, EPA must implement standards that far exceeds ICAO's standards in both stringency and scope. [EPA-HQ-OAR-2018-0276-0150-A1, p.27]

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[27] Pidcock, R., et al. Aviation could consume a quarter of 1.5C carbon budget by 2050, Carbon Brief (Aug., 2016), https://www.carbonbrief.org/aviation-consume-quarter-carbon-budget; see also Öko-Institut, Emission Reduction Targets for International Aviation and Shipping (2015) at 28, https://www.europarl.europa.eu/RegData/etudes/STUD/2015/569964/IPOL_STU(2015)569964_EN.pdf.
[28] Proposed Finding That Greenhouse Gas Emissions From Aircraft Cause or Contribute to Air Pollution That May Reasonably Be Anticipated To Endanger Public Health and Welfare and Advance Notice of Proposed Rulemaking, 80 Fed. Reg. 37,758, 37,788 (July 1, 2015) (emphasis added). In total, greenhouse gas emissions from U.S. "covered" aircraft are "about 6 times" more than corresponding emissions from China. Id.
[29] Hudda, Neelakshi et al., Emissions from an International Airport Increase Particle Number Concentrations 4-fold at 10km Downwind, 48 Environ. Sci. Technol. 6628 (May 29, 2014), https://pubs.acs.org/doi/full/10.1021/es5001566.
[30] Manisalidis, Ioannis et al., Environmental and Health Impacts of Air Pollution: A Review, 8 Frontiers in Public Health 14 (Feb. 20, 2020) ("Manisalidis 2020"), available at https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7044178/#.
[190] Kwan, Irene & Dan Rutherford, Transatlantic Airline Fuel Efficiency Ranking, 2014, International Council on Clean Transportation (Nov 2015), http://www.theicct.org/sites/default/files/publications/ICCT_transatlantic-airlineranking- 2014.pdf at 9.
[191] Kharina, Anastasia et al., Cost assessment of near and mid-term technologies to improve new aircraft fuel efficiency, International Council on Clean Transportation (2016), https://theicct.org/sites/default/files/publications/ICCT%20aircraft%20fuel%20efficiency%20cost%20assessment_final_09272016.pdf. Although average fuel burn reductions have been 1.3% per year since the late1960s, there have been decades where fuel burn reduction has been as high as 2.8% annually. Fuel burn efficiency can be improved through cost-effective technologies as well as operational and air-traffic management improvements. Zheng 2020, supra n.25 at 9-10.
[192] Roland Berger, Electrically Propelled Aircraft Developments Exceed 200 for the First Time, https://www.rolandberger.com/en/Point-of-View/Electric-propulsion-is-finally-on-the-map.html (2020); see also Fleming, John, Flight Path: A Trajectory for U.S. Aviation to Meet Global Climate Goals, Center for Biological Diversity (Oct. 2020) (outlining a multi-prong strategy for addressing aviation emissions with the stringency and scope warranted by the climate crisis).
[193] National Air Quality Standards Act of 1970, Report of the Committee on Public Works United States Senate together with Individual Views to Accompany S. 4358 at 23-24, 91st Cong., 2nd Session, Report No. 91-1196.

Organization: Center for Biological Diversity, et al.

As the attached report details, EPA's proposed aircraft emissions standard would allow the U.S. aviation industry to emit nearly 5 billion tons of CO_2 between 2020 and 2040, including nearly 250 million tons of CO_2 in 2040 alone. This level of pollution is incompatible with a pathway to keep global warming below 1.5°C rise over pre-industrial levels—the temperature rise beyond which the most catastrophic effects of climate change are projected to occur. In order to avert climate disaster, the United States must reduce its emissions across all sectors, including aviation, to near zero by 2040. [EPA-HQ-OAR-2018-0276-0154-A1, p.1]

Aviation emissions can be dramatically reduced to approach the near-zero emissions levels required before mid-century. The report outlines a multi-prong strategy of improving fuel efficiency by at least 3.5% annually, electrifying all short-haul flights by 2040 using 100% battery-electric aircraft, and electrifying all long-haul flights by 2045 with allowances for turboelectric and hybrid-electric aircraft. To fully decarbonize the aviation sector, the United States must strive to fully electrify all flights and compensate for any delays by promoting nonpolluting transportation alternatives and other measures. [EPA-HQ-OAR-2018-0276-0154-A1, p.1]

By adopting these strategies, U.S. emissions would be 75% to 80% less in 2040 than under the EPA's proposed standard, and 90% to 100% less (near zero) in 2045, depending on the proportion of partially electric to all-electric aircraft in the future fleet. [EPA-HQ-OAR-2018-0276-0154-A1, p.1]

This report adds to the growing body of evidence demonstrating that, with technology forcing standards, we can cut aviation greenhouse gas pollution quickly and effectively. Recent studies have documented the 26% fuel efficiency performance gap between the worst- and best performing domestic air carriers,[1] have noted that the rate of fuel burn reduction for new aircraft can be accelerated up to 2.2% per year through 2034, surpassing the 1.3% per year achieved

historically,[2] and have described the improvements in fuel efficiency that can be achieved through operational and air-traffic management improvements.[3] Electrification is also advancing rapidly: manufacturers across the world are developing dozens of hybrid and fully electric aircraft that will be ready to test and certify in the next decade,[4] with the first fully electric commercial aircraft test flight completed in Canada in 2019,[5] and Norway committed to electrifying all short-haul flights by 2040.[6] [EPA-HQ-OAR-2018-0276-0154-A1, p.1-2]

Commercial Aviation Is Increasingly Fueling the Climate Emergency and the ICAO Standard will do Nothing to Slow that Trend

We are in a climate emergency. Status quo operation of the aviation industry is incompatible with global efforts to avoid the worst impacts of climate change.

Commercial aviation accounts for about 2.6% of annual global CO_2 emissions—roughly the same amount of climate pollution as Germany emits. Global aviation emissions increased by 44% over the last ten years as growing passenger traffic outpaced fuel efficiency improvements. Ahead of the coronavirus pandemic, emissions were set to triple again by 2050. Flights departing from airports in the United States and its territories were responsible for almost a full quarter of global passenger aviation related carbon dioxide emissions in 2018.

A 2018 report from the Intergovernmental Panel on Climate Change made clear that global industry sectors must decarbonize by mid-century to keep warming to 1.5°C and avoid devastating climate damages. But emissions from the aviation sector alone are on pace to total approximately 56 billion tonnes of CO_2 from 2015-2050. This would constitute more than a quarter of the emissions consistent with keeping global temperature rise below 1.5°C.

The ICAO standards will do nothing to alter the catastrophic growth trajectory of aviation pollution. They are years behind the existing technology curve, will not reduce emissions from new planes beyond business as usual, and do not apply to any in-service aircraft. A recent report found that the average plane delivered in 2019 already did better than ICAO's standard for 2028.

ICAO and aviation executives falsely claim that the rule will somehow achieve "carbon neutrality" using carbon offsets and biofuels. These are false solutions. Carbon offsets schemes do not reduce greenhouse gas emissions and toxic co-pollutants from airplanes that disproportionately harm low-income communities of color. Offset projects can also have many other adverse consequences, including violating the human rights of local communities and Indigenous peoples in the Global South. Biofuels by and large have not proven to be carbon-neutral or sustainable. For example, some jet biofuels derived from palm feedstocks actually increase overall emissions when accounting for all factors of production including land-use change.

Aviation Pollution Can and Must Be Reduced Dramatically

The EPA tries to justify the Proposed Rule by claiming it will "promote international harmonization" and "avoid placing U.S. manufacturers at a competitive disadvantage." But under the Clean Air Act, these vague rationales cannot replace EPA's obligation to protect public health and welfare by reducing and preventing pollution. The climate emergency and Clean Air Act mandates require that the EPA set a strong, technology-forcing standard. Given the limited time left to sharply reduce greenhouse gas emissions, EPA cannot lawfully allow aircraft to continue to emit on a business-as-usual course as proposed.

To effectively reduce greenhouse gas emissions from the aviation sector, EPA should set a declining fleetwide average standard that: (1) applies to aircraft in operation, not just to new aircraft; (2) allows for reducing emissions through both airframe design and operational improvements; and (3) includes a ratchet mechanism to reduce emissions over time and achieve zero emissions by 2045 or sooner.

We support a multi-prong strategy of improving fuel efficiency by at least 3.5% annually, electrifying all short-haul flights by 2040, and electrifying all long-haul flights by 2045. Doing so is possible and necessary to approach the near-zero emissions levels required to keep global warming below 1.5°C.

To prevent runaway climate chaos, the federal government should deploy all tools available to drive full decarbonization of the aviation sector, while also investing in sustainable, just, and equitable transportation alternatives.

Modernizing and decarbonizing the aviation industry is necessary if it is to survive in a carbon-constrained world. Strong, technology-forcing standards will drive these needed changes and create good, family-sustaining jobs in the aviation sector. Our organizations support additional government action to protect aviation workers during the COVID-19 pandemic and as needed to ensure a just transition to a clean energy future. The Proposed Rule, by contrast, not only threatens to lock in climate chaos, it also endangers aviation workers' future by hampering the industry's ability to survive and thrive in a rapidly changing world. [EPA-HQ-OAR-2018-0276-0147-A1, pp.1-3]

[The following comments were submitted as testimony at the virtual public hearing on September 17, 2020.]

As I sit here today, I am living in a world forever changed by fossil fuel pollution. The climate damage from one degree of warming is out my window and all around me, as it is for millions of Californians and Americans. We are in a climate emergency.

Efforts to quickly eliminate carbon pollution are essential to avoid even worse devastation. Science tells us that we must reduce carbon emissions by about half by 2030 and reach near zero in the next two to three decades to limit global warming to 1.5 degrees Celsius. All transportation, including aviation, must be carbonized to reach these targets.

Aviation executives have too long evaded every attempt to make the industry reduce its fair share of pollution. Aviation emissions have tried escaping in the wrong direction. Over the last 10 years, emissions grew by 44 percent due to increased travel and only slight improvements in fuel efficiency.

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[1] Zheng, X., Graver, B. and Rutherford, D., U.S. domestic airline fuel efficiency ranking, 2017-2018, International Council on Clean Transportation (2019), https://theicct.org/sites/default/files/publications/Domestic_Air_Efficiency_Ranking_2018_20190912_2.pdf.

[2] Kharina, A., Rutherford, D., and Zeinali, M., Cost assessment of near and mid-term technologies to improve new aircraft fuel efficiency, International Council on Clean Transportation (2016), https://theicct.org/sites/default/files/publications/ICCT%20aircraft%20fuel%20efficiency%20cost%20assessment_final_09272016.pdf. Although average fuel burn reductions have been 1.3% per year since 1960, there have been decades where fuel burn reduction has been as high as 2.8% annually. Fuel burn efficiency can be improved through cost-effective technologies as well as operational and air-traffic management improvements. Zheng, Sola & Dan Rutherford, Fuel burn of new commercial jet aircraft: 1960 to 2019, International Council on Clean Transportation (2020) at 9-10, https://theicct.org/publications/fuel-burn-new-comm-aircraft-1960-2019-sept2020.

[3] Rutherford, D., Standards to promote airline fuel efficiency, International Council on Clean Transportation (2020), https://theicct.org/sites/default/files/publications/Airline-fuel-efficiency-standard-2020.pdf.

[4] Roland Berger, Electrically Propelled Aircraft Developments Exceed 200 for the First Time (2020), https://www.rolandberger.com/en/Point-of-View/Electric-propulsion-is-finally-on-the-map.html.
[5] Guardian staff, World's first fully electric commercial aircraft takes flight in Canada, The Guardian, (December 10, 2019), https://www.theguardian.com/world/2019/dec/11/worlds-first-fully-electric-commercial-aircraft-takesflight-in-canada.
[6] Dowling, S., Norway's plan for a fleet of electric planes, BBC Future (August 22, 2018), https://www.bbc.com/future/article/20180814-norways-plan-for-a-fleet-of-electric-planes.

Organization: Ceres BICEP (Business for Innovative Climate and Energy Policy) Network

We recognize the risks posed by climate change, and that it is critical that we accelerate our efforts now to reduce emissions from the aviation sector. [EPA-HQ-OAR-2018-0276-0165-A1, p.2]

Organization: Chesapeake Bay Foundation, Inc. (CBF)

I. Greenhouse Gas Emissions from Aircraft Are Harmful to the Chesapeake Bay.

A. Climate Change and the Chesapeake Bay

The Chesapeake Bay is the nation's largest estuary, supporting vibrant commercial fishing and tourism industries. The Bay is negatively impacted by the effects of climate change including sea-level rise, warming temperatures, extreme weather, and ocean acidification.[2] [EPA-HQ-OAR-2018-0276-0093-A1, p.2]

Within 20 years, nearly 170 United States communities will be chronically inundated with flooding[3] and more than 70% of these communities will be in Louisiana and Maryland: the "canaries in the coal mine" for sea level rise.[4] Sea level rise threatens to inundate small coastal communities and major cities alike in the Chesapeake Bay region. In Maryland alone, it threatens to flood over 61,000 homes by 2100, valued at $19 billion.[5] Entire previously inhabited islands are now underwater in the Chesapeake Bay, with more likely to follow if GHG emissions do not decrease substantially.[6] Indeed, CBF recently had to close down its Fox Island Environmental Education Program, located on Fox Island in Virginia, because land loss has made the center unsafe.[7] Likewise, in Hampton Roads/Norfolk, Virginia, sea level rise poses significant risk to the public and military infrastructure and operations.[8] [EPA-HQ-OAR-2018-0276-0093-A1, p.2]

Wetlands are also threatened by sea level rise. These important filters reduce the level of pollutants entering the Bay[9] and protect coastal communities from storm surge and erosion.[10] Wetlands inundated with saltwater from sea level rise, however, cannot provide the same water quality and habitat benefits as healthy wetlands.[11] They are typically some of the first areas to be exposed to chronic flooding and while they can migrate in response to changes in water levels provided they have the space and time to do so,[12] the pace of sea level rise and changes in land use in coastal communities have weakened the ability of wetlands to migrate.[13] In addition, forested buffers along creeks, tidal rivers, and the Bay are also impacted by seal level rise as saltwater seeps into the soil, killing trees and creating "ghost forests."[14] [EPA-HQ-OAR-2018-0276-0093-A1, p.3]

Warming waters—which have already been recorded in 92% of the Bay—deplete the level of available oxygen in the Bay.[15] This will have major repercussions as the Bay already struggles with dead zones of hypoxic water from nitrogen and phosphorus pollution (these nutrients fuel algal blooms, creating hypoxic and anoxic areas in the Bay).[16] Warming ocean temperatures will only exacerbate the dead zone in the Bay because warmer water molecules hold less oxygen than colder water molecules.[17] [EPA-HQ-OAR-2018-0276-0093-A1, p.3]

Average U.S. precipitation has increased since the 1990s, and the frequency and intensity of heavy precipitation events is increasing due to climate change.[18] Increased scouring and runoff from more intense rain events carry significantly higher loads of nitrogen, phosphorous, and sediment into the Bay's tributaries. [EPA-HQ-OAR-2018-0276-0093-A1, p.3]

Finally, GHG emissions cause ocean waters to acidify. Our oceans are a sink for atmospheric carbon, absorbing about a quarter of the carbon dioxide (CO_2) released into the atmosphere each year.[19] This absorption is not without consequence: excess CO_2 is changing the saltwater chemistry.[20] A chemical reaction occurs between CO_2, water, and carbonate ions that reduces seawater pH depleting the concentration of carbonate ions and calcium carbonate minerals.[21] This negatively affects calcifying species by impairing their shell making ability. Ocean acidification threatens the growth and reproduction of oysters, clams, and other creatures with calcium shells.[22] The Chesapeake Bay blue crab population may be particularly susceptible to acidification because larval crabs spend a portion of their life offshore in the ocean. Blue crabs are a particularly important commercial species in the region's multi-billion-dollar seafood industry.[23] [EPA-HQ-OAR-2018-0276-0093-A1 pp.3-4]

Taken together, the effects of GHG emissions will impact the complex ecosystem—including water quality and habitat—needed for species survival in the Bay region. Indeed, these impacts are identified and reflected through various sections of the Chesapeake Bay Watershed Agreement, an interstate compact,[24] to which the United States is a signatory.[25] The Agreement recognizes that climate change will have an impact on Bay ecosystems. One of its goals is to identify climate resiliency, with an outcome of monitoring and assessing "the trends and likely impact of changing climate and sea level conditions on the Chesapeake Bay ecosystem, including the effectiveness of restoration and protection policies, programs, and projects."[26] EPA's Proposed Rule, if finalized and implemented, will only exacerbate this ever-increasing problem. [EPA-HQ-OAR-2018-0276-0093-A1, p.4]

B. Air Travel Trends and Projections.

Air travel is growing at a rapid pace. So, too, are GHG emissions from the aircraft needed to meet this increasing demand. Between 1940 and 2018, airplanes emitted 32.6 billion metric tons of CO_2, which is approximately equal to the amount of total global CO_2 emitted in 2010.[27] One source explained that, in 2015, "[i]f the global aviation sector were treated as a nation, it would have been the sixth largest source of carbon dioxide (CO_2) emissions from energy consumption in 2015, emitting more than Germany."[28] As of 2019, the International Civil Aviation Organization (ICAO) projected aviation business-as-usual activity to cause emissions to roughly triple by 2050—a prediction that the International Council on Clean Transportation found falls short of reality.[29] Even with the COVID-19 pandemic causing a sharp decrease in commercial flights in 2020, the International Air Transport Association (IATA) forecasts a "strong recovery" with passenger growth over the next two decades between 3.2% and 5.3% from 2019 levels.[30] [EPA-HQ-OAR-2018-0276-0093-A1, p.4]

In the United States—the world's top emitter of aircraft GHGs—airplanes released 24% of global passenger transport-related CO_2 in 2018.[31] Domestic flights are responsible for two-thirds of those emissions, while international flight emissions make up the remaining third.[32] Together, the United States served an average of approximately 27,431 flights per day, or 10,012,300 total flights in 2018, which reflected a 2.6% increase from 2017 annual flights.[33] [EPA-HQ-OAR-2018-0276-0093-A1, p.5]

Due to their global warming effects, GHGs impact the Bay no matter where in the world they are emitted. However, when confronting air quality issues, CBF takes special interest in curbing local emissions—those that come from sources within the Bay airshed.[34] The Bay airshed is 570,000 square miles, roughly nine times the size of the watershed.[35] It extends north into Quebec, south into South Carolina, and as far west as parts of Indiana and Kentucky. Based on Federal Aviation Administration (FAA) 2019 preliminary passenger enplanement data, there are nearly 70 commercial service airports in the Bay airshed, including 6 large hubs, 7 medium hubs, 14 small hubs, 32 non-hubs, and 9 non-primary commercial service airports.[36] These airports saw approximately 149,215,408 enplanements (commercial passenger boardings) in 2019, which represents a 5% increase from the previous year, and a 13% increase from 2016.[37] With air travel on the rise, it is essential that EPA impose strong emissions limits to avoid a corresponding upsurge in GHG emissions. [EPA-HQ-OAR-2018-0276-0093-A1, p.5]

III. CBF Opposes the Proposed Airplane GHG Emissions Standards and Test Procedures Rule Because This Rule Is Legally Inadequate and Does Nothing but Formalize a Business-as-usual Scenario.

C. The Proposed Rule Makes No Mention of Potential NOx Impacts From the GHG Standards.

The Proposed Rule neglects to address potential NOx impacts or benefits as a result of the proposed standards. Along with GHGs and other pollutants, aircraft engines emit NOx. While NOx emissions from aircraft are regulated under separate standards, it is unclear whether the proposed standards would impact NOx emissions—either positively or negatively—as well as GHGs. Section 4.4 of the Technical Support Document explains that modeling was done to examine fuel usage during "all phases of flight from gate to gate."[51] EPA should address the NOx implications of the GHG standards during each of these phases and explain its conclusions as part of this rulemaking. Negative NOx impacts raise concerns for the Chesapeake Bay, which is impaired under the Clean Water Act for excess nitrogen, and for CBF members and their neighbors who live near airports and could be disproportionately affected by higher concentrations of NOx emissions. [52] [EPA-HQ-OAR-2018-0276-0093-A1 p.8]

D. The Proposed Rule Fails to Analyze Potential Environmental Justice Impacts on Communities Living Near Airports

Finally, EPA must fully assess potential environmental justice impacts on minority communities who may be disproportionately affected by the Proposed Rule. As the Fourth Circuit Court of Appeals recently noted in the context of a Virginia State Air Pollution Control Board environmental justice analysis, "environmental justice is not merely a box to be checked."[53] Here, EPA's Proposed Rule merely checks the box by including only two sentences stating that the Agency does not believe the Proposed Rule presents disproportionate environmental and health impacts because the standards offer "similar levels of environmental protection" for everyone.[54] [EPA-HQ-OAR-2018-0276-0093-A1, p.8]

According to EPA's own EJSCREEN tool (which is intended only to be a starting point for an environmental justice analysis), communities living near airports may have higher rates of respiratory illness than other communities. EJSCREEN also indicates that in many circumstances these communities contain higher than average populations of low-income and minority residents.[55] Particularly if there are NOx impacts, these communities may be disproportionately affected by the Proposed Rule. [EPA-HQ-OAR-2018-0276-0093-A1 p.8]

Further, it is well known that climate change creates disproportionate impacts on low-income communities and communities of color.[56] A complete environmental justice analysis under Executive Order 12898 would also include an analysis of these potential impacts as a result of EPA's decision to impose only status quo standards. Even if after conducting these analyses the Agency finds that there are no disproportionate impacts, it must still explain its analysis in more than a cursory fashion and support its conclusions. [EPA-HQ-OAR-2018-0276-0093-A1, p.9]

IV. Conclusion

For the reasons explained above, CBF has serious concerns with the GHG standards in the Proposed Rule. These standards do nothing to address climate change, and under the Chesapeake Bay Watershed Agreement, EPA has an obligation to consider climate impacts to the Bay.[57] In creating standards without measurable impacts, EPA has abdicated its obligation to protect and enhance air quality under the CAA, and to protect the public from the harm that EPA itself found to result from aircraft GHG emissions. The future of the Chesapeake Bay ecosystem and the millions of people who depend on it need EPA to set a strong foundation in these historic aircraft standards to address this soaring source of GHG emissions. [EPA-HQ-OAR-2018-0276-0093-A1, p.9]

[2] EPA, Chesapeake Bay Program, Climate Change, https://www.chesapeakebay.net/issues/climate_change
[3] Erika Spanger-Siegfried, et. al, When Rising Seas Hit Home: Hard Choices Ahead for Hundreds of US Coastal Communities, Union of Concerned Scientists 2, 2017.
[4] Id.
[5] Catherine Rentz, Rising sea levels threaten $19 billion in real estate across Maryland, study says, The Baltimore Sun, Oct. 28, 2017, http://www.baltimoresun.com/news/maryland/investigations/bsmd-suninvestigates-sea-level-20171026-story.html.
[6] Erik Ortiz, How to Save A Sinking Island, NBC NEWS, November 13, 2017, https://www.nbcnews.com/specials/deal-island; David Fahrenthold, Last house on sinking Chesapeake Bay island collapses, Washington Post, October 26, 2010, http://www.washingtonpost.com/wpdyn/content/article/2010/10/24/AR2010102402996.html; Jon Gertner, Should the United States Save Tangier Island From Oblivion?, New York Times Magazine, July 6, 2016, https://www.nytimes.com/2016/07/10/magazine/should-the-united-states-save-tangier-island-fromoblivion.html.
[7] A 1773 land survey of Fox Island documented 426 acres, in 2019 only 34 acres remain. Tamara Ward, Going, Going, Gone: Rising Seas Drown Island Center, E&E News, November 18, 2019, https://www.eenews.net/greenwire/2019/11/18/stories/1061539807
[8] "Sea level rise at just one site can have a significant impact on [both military policy and] strategy. Hampton Roads, Virginia, dubbed 'the greatest concentration of military might in the world' for former Secretary of Defense Leon Panetta, is by itself an invaluable operational and strategic hub for both the United States and its allies. It . . . is the backbone of the U.S. Atlantic Fleet. It is also a low-lying site and very exposed to seal level rise and storm surge. If significant portions of the Hampton Roads infrastructure are regularly inundated, as is projected under a number of scenarios for the years 2023-2100, the impediment to force deployments for critical Atlantic, Mediterranean and Pacific war-fighting and humanitarian operations—many of which are tied to core strategic goals of the United States—would be significant." The Center for Climate and Security, Military Expert Panel Report: Sea Level Rise and the U.S. Military's Missions, 23-24, 2016, https://climateandsecurity.files.wordpress.comen/2016/09-center-for-climate-and-security-military-expert-panel-report2.pdf.
[9] Chesapeake Bay Program, Wetlands, https://www.chesapeakebay.net/issues/wetlands
[10] Id.
[11] Joseph Kurt and Victor Unnone, Climate Change and the Chesapeake Bay Total Maximum Daily Load: Policy Priorities and Options, Virginia Coastal Policy Center, 4, 2016.
[12] Erika Spanger-Siegfried, et. al, When Rising Seas Hit Home: Hard Choices Ahead for Hundreds of US Coastal Communities, Union of Concerned Scientists, 10, 2017.
[13] Id.
[14] Id. See also John Upton, 'Ghost Forests' Appear as Rising Seas Kill Trees, Climate Central, Sept. 15, 2016, http://www.climatecentral.org/news/ghost-forests-appear-as-rising-tides-kill-trees-20701.
[15] See Army Corps of Engineers and City of Norfolk Draft Integrated City of Norfolk Coastal Storm Risk Management Feasibility Study/Environmental Impact Statement, October 2017, http://www.nao.usace.army.mil/NCSRM/.
[16] EPA, Chesapeake Bay Program, The Dead Zone, https://www.chesapeakebay.net/state/dead_zone.
[17] Chris Mooney, Global warming could deplete the oceans' oxygen – with severe consequences, Washington Post, April 28, 2016, https://www.washingtonpost.com/news/energyenvironment/wp/2016/04/28/global-warming-could-deplete-the-oceans-oxygen-levels-with-severeconsequences/?utm_term=.9c3333011616.
[18] U.S. Global Change Research Program, Climate Science Special Report: Fourth National Climate Assessment, 19, 20 (2017).
[19] NOAA Pacific Marine Environmental Laboratory Carbon Program, Ocean Acidification: The Other Carbon Dioxide Problem, https://www.pmel.noaa.gov/co2/story/Ocean+Acidification.
[20] NOAA Pacific Marine Environmental Laboratory Carbon Program, What is Ocean Acidification?, https://www.pmel.noaa.gov/co2/story/What+is+Ocean+Acidification%3F.
[21] Id.
[22] Sarah M. Giltz and Caz M. Taylor, Reduced Growth and Survival in the Larval Blue Crab Callinectes sapidus Under Predicted Ocean Acidification, 36, J. Shellfish Research, 481 (2017).
[23] Chesapeake Bay Foundation, The Economic Importance of the Bay, http://www.cbf.org/issues/whatwe-have-to-lose/economic-importance-of-the-bay/.
[24] One of the purposes of the Chesapeake Bay Restoration Act of 2000 was to "expand and strengthen cooperative efforts to restore and protect the Chesapeake Bay; and to achieve the goals established in the Chesapeake Bay Agreement." 33 U.S.C. § 1267. The Chesapeake Bay Agreement is an interstate compact as Congress developed and

authorized the joint state action. See Cuyler v. Adams, 449 U.S. 433; 101 S. Ct. 703 (1981); Seattle Master Builders Assoc. v. Pacific Northwest Electric Power & Conservation Planning Council, 786 F.2d 1359 (9th Cir. 1986).
[25] Chesapeake Bay Watershed Agreement, 2014, https://www.chesapeakebay.net/documents/FINAL_Ches_Bay_Watershed_Agreement.withsignatures-HIres.pdf.
[26] Id. at 14.
[27] Maxine Joselow, Landmark Study Reveals Effects of Flying on the Climate, E&E News Reporter (Sept. 8, 2020), https://www.eenews.net/climatewire/2020/09/08/stories/1063713067?utm_medium=email&utm_source=eenews%3Aclimatewire&utm_campaign=edition%2BiZ%2B%2FftFV%2B2LxUfHtN5bxJQ%3D%3D.
[28] Brandon Graver, Ph.D., et al., CO_2 Emissions From Commercial Aviation, 2018, International Council on Clean Transportation 2 (Sept. 2019), https://theicct.org/publications/co2-emissions-commercial-aviation-2018.
[29] The International Council on Clean Transportation (ICCT) concluded that commercial aviation operations (including passenger transport and freight) worldwide produced 918 million metric tons of CO_2 in 2018, which represents a 32% increase in CO_2 emissions over the last five years (70% higher than ICAO's growth rate projections). Id. at 1.
[30] IATA 20-Year Air Passenger Forecast (May 2020), https://www.iata.org/contentassets/e938e150c0f547449c1093239597cc18/pax-forecast-infographic-2020-final.pdf.
[31] Id. at 1, 6-7.
[32] Id.
[33] 2018 Traffic Data for U.S [sic] Airlines and Foreign Airlines U.S. Flights, Dept. of Transportation Bureau of Transportation Statistics (Mar. 21, 2019), https://www.bts.dot.gov/newsroom/2018-traffic-data-us-airlines-and-foreign-airlines-us-flights.
[34] CBF is also acutely interested in reducing NOx pollution from the Bay airshed, as approximately one third of the Bay's total nitrogen load comes from air pollution. EPA, Chesapeake Bay TMDL, Air Pollution in the Chesapeake Bay Watershed, https://www.epa.gov/chesapeake-bay-tmdl/air-pollution-chesapeake-bay-watershed. See infra Section III.C.
[35] Air Polllution, Chesapeake Bay Foundation, https://www.cbf.org/issues/air-pollution/ (last visited Sept. 21, 2020).
[36] Attachment A: Map of Commercial Service Airports in the Chesapeake Bay Airshed. See also Calendar Year 2019 Preliminary Revenue Enplanements at All Airports, FAA (July 1, 2020), https://www.faa.gov/airports/planning_capacity/passenger_allcargo_stats/passenger/media/preliminary-cy19-all-enplanements.pdf.
[37] Attachment B: U.S. Commercial Service Airports in the Chesapeake Bay Airshed. See also Calendar Year 2019 Preliminary Revenue Enplanements at All Airports, supra note 36; Commercial Service Airports (Rank Order) Based on Calendar Year 2016 Enplanements, FAA (Oct. 5, 2017); https://www.faa.gov/airports/planning_capacity/passenger_allcargo_stats/passenger/media/cy16-commercial-service-enplanements.pdf.
[51] EPA, Draft Airplane Greenhouse Gas Standards Technical Support Document (TSD) 4.4 (July 2020), https://beta.regulations.gov/document/EPA-HQ-OAR-2018-0276-0024.
[52] NOx emissions enter the atmosphere and either combines with sunlight to form ozone (O3) or remains as one or more forms of nitrogen that can be deposited in wet (via precipitation) or dry forms hundreds of miles away on land or directly into waterbodies. When it finds its way into the Bay, this excess nitrogen causes algae blooms that consume oxygen when they die. Less dissolved oxygen in the water harms benthic organisms, oysters, fish, and blue crabs—all of which are immensely important to the economy and culture of the Bay region. In 2010, EPA issued a total maximum daily load (TMDL) for the Bay region and set a cap on NOx from air deposition at 15.7 million pounds. EPA, Chesapeake Bay Total Maximum Daily Load for Nitrogen, Phosphorous and Sediment, December 29, 2010, https://www.epa.gov/chesapeake-by-tmdl/chesapeake-by-tmdl-document. EPA itself "committed to reducing nitrogen deposition to the Bay and its surrounding waters by a total of 3.7 million pounds between 2009 and 2025." EPA, The importance of clean air to clean water in the Chesapeake Bay, https://www.epa.gov/sites/production/files/2015-06/documents/cb_airwater_fact_sheet_jan2015.pdf.
[53] Friends of Buckingham v. State Air Pollution Control Board., 941 F.3d 68, 92 (4th Cir. 2020).
[54] Proposed Rule, 85 FR at 51,590.
[55] Attachment C: EPA EJSCREEN Snapshots of Commercial Airport Communities in the Chesapeake Bay Airshed.
[56] EPA, Chesapeake Bay Program, Teaching Environmental Justice Across the Chesapeake Bay Watershed, https://www.chesapeakebay.net/news/blog/teaching_environmental_justice_across_the_chesapeake_bay_watershed
[57] Chesapeake Bay Watershed Agreement, supra note 25, at 14.

Organization: Eastie Farm

[The following comments were submitted as testimony at the virtual public hearing on September 17, 2020.]

I would like to speak from the specific perspective of our local community, which is an EJ and lately a CJ community as well, EJ as in environmental justice, CJ as in climate justice. And the noise pollution, the air pollution, the traffic, all of that affect the people who live the closest to the airport and as the airport increases its business, as it does, more airlines, more noise, and more air pollution, and more traffic for the people who live the closest. It just turns out that this is mostly a working-class immigrant neighborhood. This is not particularly the neighborhood that, the people that benefit from having the airport. The entire region benefits from having the airport, but the cost is borne particularly by the people who are in the vicinity.

Due to my association with Belle Isle Marsh and because this spring due to COVID, there was some silence that we experienced, meaning the noise from the airport was less. We saw more of the birds that we used to see earlier. There were cardinals, blue jays, sparrows, and many kinds of birds visiting our homes. It was a beautiful experience of being human and being in this world, which is stolen from us when we have to endure the busyness that comes with urban life. For some people, it may be a choice as to where to live, and for many, it isn't.

On the climate justice front, if you look up East Boston, you will see that it is a peninsula. And even its land connections to the rest of the mainland are laden with containers of oil, other petrol chemical products, and jet fuel, things like that, so presenting a danger should there be a flood and a fire if we tried to evacuate.

And COVID-related risk has also particularly increased due to air pollution. That is a point to remember for us. It has been cited in a recent Harvard study. And the study is called a "A National Study on Long-Term Exposure to Air Pollution and COVID-19 Mortality in the United States." And it states that even an increase of one microgram per cubic meter of particulate matter 2.5 is associated with 8 percent increase in the COVID-19 death rate. So everything that happens, it just happens a lot more in a community that is already super vulnerable. That is something to keep in mind. And that is the thrust of my task here, is whatever measure is taken in greenhouse gas reduction, everything else has to be done, first and foremost, with the people who are most affected who least contributed to these causes and who are the least able to do anything about it in mind. So that is the EJ and CJ communities, and we should keep them in mind in designing our programs and how we implement the programs that are designed. There are many ways to be very aggressive with mitigating these risks with filters, air filters, in schools and in residences that have the most vulnerable people, maybe even all residences because why wait for people to get a disease before trying to help them? Why not prevent it? And relocations of some of the air traffic to places that put fewer people at risk and, of course, decarbonization as much as we can as early as we can.

Organization: Environmental Defense Fund

Moreover, fuel-related emissions at airports disproportionately affect local communities as well as workers within the airport envelope; these effects arise from the impact of aviation's fuel-related emissions on local air quality. [EPA-HQ-OAR-2018-0276-0158-A1, p.2] In making its decision on level of stringency, EPA must weigh the health and environmental benefits, including the benefits of avoided climate damages as well as the co-benefits of improved local air quality; in fact, it would be arbitrary for EPA to fail to do so.[5] [EPA-HQ-OAR-2018-0276-0158-A1, p.2]

IV. Aviation is a Significant Source of Climate Pollution

The aviation industry is a significant source of CO_2 and other well-mixed gases that constitute the pollutant EPA has defined as GHGs[42]. In aggregate, as recently as 2011 aviation emissions accounted for nearly as much CO_2 as Germany, and, if treated as a country, would have ranked ninth in total emissions worldwide.[43] [EPA-HQ-OAR-2018-0276-0158-A1, p.9]

Immediately prior to the disruption of the Covid-19 pandemic, the global aviation fleet was expected to grow dramatically in the coming years, from a current passenger fleet of approximately 20,800 civil aircraft globally to approximately 44,800 aircraft by 2038.[44] North American airlines alone were predicted to acquire over 3,500 new aircraft in that timeframe, as airlines replace some of the oldest fleets of aircraft in the world.[45] Demand for air travel services has remained strong, even in the face of major disruption such as the 9/11 attacks, and is predicted to rebound despite the temporary disruption of the Covid-19 pandemic.[46] That demand has stark environmental impacts, as aviation emissions from international flights have dramatically increased in recent years; approximately fifty percent of all global aviation emissions between 1940 and 2018 were emitted in the last twenty years. [47] [EPA-HQ-OAR-2018-0276-0158-A1, p.9]

The U.S. is responsible for burning nearly half of all global aviation fuel, far more than any other single nation.[48] Prior to disruptions caused by the Covid-19 pandemic, emissions from flights into and out of the United States were predicted to almost double by 2040 compared to 2019 levels.[49] Aircraft account for a significant portion – nine percent – of the U.S. transportation sector's GHG emissions,[50] as well as twelve percent of global CO_2 emissions,[51] and remain the largest unregulated sector of U.S. transportation emissions.[52] In the face of current demand and forecasts for air travel services, establishment of robust emissions standards is critically important, as experience shows that, even as airlines face increased fuel prices, emissions have not decreased, and cannot be expected to decrease, solely as a result of market trends.[EPA-HQ-OAR-2018-0276-0158-A1, p.9-10]

V. Climate Change Causes Risks to the Safety of Aviation and Causes Emissions from Aviation to Increase

Climate change brings significant risks for the aviation industry. While a rulemaking for GHG emissions from aircraft should consider the full spectrum of the impacts of climate change, impacts to aviation itself have particular relevance under Section 231 of the Clean Air Act. In setting the standards for aircraft engines, EPA is required to consult with the Administrator of the Federal Aviation Administration ("FAA"),[53] whom Congress has mandated "shall promote safe flight of civil aircraft in air commerce."[54] The statute also prohibits changing "emission standards if such change would significantly increase noise and adversely affect safety."[55] Because aviation safety concerns are a central obligation of the FAA, climate-related threats to aviation safety deserve particular attention. [EPA-HQ-OAR-2018-0276-0158-A1, p.10]

The climate risks to aviation are both significant and broad. Higher temperatures will reduce air density, reducing lift and contributing to flight cancellations or more restricted payloads, especially at high-altitude airports.[56] Intense heat can cause runways to buckle.[57] Increased precipitation and sea level rise can submerge runways, disrupting air travel or forcing temporary airport closures.[58] More intense tropical storms can damage or temporarily close airports.[59] Increased wildfires in drought-susceptible regions will reduce visibility and can close airports.[60] In far northern locations, such as Alaska, where air transport use is disproportionately high, warming temperatures will have a deleterious impact on airstrips built on permafrost, and may undermine runway foundations.[61] All of these risks create significant safety concerns for the aviation sector and its regulators. [EPA-HQ-OAR-2018-0276-0158-A1, p.10-11]

Airlines are acutely aware of the risks they face from climate change. In a recent annual report, Delta Airlines warned investors that:

[I]ncreases in the frequency, severity or duration of thunderstorms, hurricanes, typhoons or other severe weather events, including from changes in the global climate, could result in increases in delays and cancellations, turbulence-related injuries and fuel consumption to avoid such weather, any of which could result in loss of revenue and higher costs.[62] [EPA-HQ-OAR-2018-0276-0158-A1, p.11]

These impacts create a vicious circle: increased fuel consumption due to climate impacts further increases aviation's contribution to climate change and the impacts of emissions from aviation on human health. [EPA-HQ-OAR-2018-0276-0158-A1, p.11]

Climate change has made, and will continue to make, hurricanes more intense.[63] Combined with higher sea levels, such storms may cause damage over larger areas. The most recent National Climate Assessment (NCA) notes that sea level rise and storm surge pose a serious threat to coastal airports,[64] and the previous NCA specified that 13 of the nation's 47 busiest airports – one in four of these airports – have at least one runway that is low enough to be inundated by a moderate-to-high storm surge.[65] These risks have already been realized - Hurricane Sandy caused over 20,000 flight cancellations at eight US airports over six days,[66] or about half the flights that were scheduled to have been operated at those airports over those six days. Some estimates placed the cost to the airline industry at $190 million.[67] [EPA-HQ-OAR-2018-0276-0158-A1, p.11]

A single storm can easily cripple multiple airports. Hurricane Sandy almost completely shut down airports at Newark, LaGuardia, JFK, Philadelphia, and Washington, DC for two days, and severely reduced their capacity for another four days.[68] A storm surge that causes flight cancellations at Oakland International may also cause cancellations at San Francisco International, and storm activity in or near the coast of southern Florida could impact airports in Miami, Tampa Bay, Fort Lauderdale, and San Juan simultaneously. Such incidents could strand hundreds to thousands of passengers, with significant costs to airlines, airports, and the travelling public. [EPA-HQ-OAR-2018-0276-0158-A1, p.12]

Hurricane Sandy was not the first storm to cause such damages, nor was it the last. In 2005, Hurricane Katrina significantly damaged Louis Armstrong New Orleans International Airport ($15.2 million in damages, 17 days of closure) and Gulfport-Biloxi International Airport ($44 million in damages, 12 days of closure); some smaller airports were closed for over a month. In 2017, Hurricanes Harvey and Irma each caused over 12,000 flight cancellations,[69] and the disruptions from hurricane Harvey alone were predicted to cost affected airlines over $350 million.[70] While many factors contribute to these costs, they provide one indicator of the scale of the risks posed to the aviation sector. [EPA-HQ-OAR-2018-0276-0158-A1, p.12]

Strong winds can also cause airport closures as happened in Philadelphia during Hurricane Sandy.[71] As a result, it is not just low-lying, flood-prone airports that are vulnerable. [EPA-HQ-OAR-2018-0276-0158-A1, p.12]

Climate change poses other types of risks to aviation. The IPCC cautions against the impact on aviation of a warmer climate, saying that, "Hotter air is less dense. In summer months, especially at airports located at high altitudes, this may result in limitations for freight capacity, safety, and weather-related delays, unless runways are lengthened."[72] [EPA-HQ-OAR-2018-0276-0158-A1, p.12]

The IPCC described these problems further:

Increased storminess at airports, particularly those located in coastal regions, may increase the number of weather related delays and cancellations and increase maintenance and repair costs. Clear-air turbulence will increase in the Atlantic corridor leading to longer and bumpier trips. The impact of climate change on airport pavement is very similar to paved roads. The effect of temperature and increased precipitation intensity on airports imposes a risk to the entire facility if pavements are not adapted to these increases.[73] [EPA-HQ-OAR-2018-0276-0158-A1, p.13]

Increasing carbon dioxide concentrations in the atmosphere are expected to increase the frequency and intensity of turbulence, which is already responsible for costing airlines tens of millions of dollars and injuring (occasionally fatally) hundreds of passengers each year.[74] Increased temperatures, flooding and extreme weather events arising from climate change threaten the health of airport and airline workers, damage airport runways and other critical air traffic control equipment, overwhelm storm water systems, impair airplane performance, increase the risk of vehicle crashes, and, as a result, disrupt traffic, restrict public transportation, and threaten human lives and local economies.[75] [EPA-HQ-OAR-2018-0276-0158-A1, p.13]

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[5] EDF joins separately-submitted comments of the Institute for Policy Integrity detailing how EPA in preparing the instant proposal, has arbitrarily relied on problematic estimates of the social costs of carbon and nitrous oxide that fail to take account of the benefits that more stringent standards would provide.
[42] 40 C.F.R. § 86.1818-12(a); see also 80 Fed. Reg. 37773
[43] 80 Fed. Reg. 37788.
[44] Airbus, Global Market Forecast, 2019-2038, available at https://www.airbus.com/aircraft/market/global-market-forecast.html (last visited Sept. 9, 2020).
[45] Id.
[46] WSP, Up in the Air: Resilience Amidst Uncertainty in the Aviation Sector, available at https://www.wsp.com/en-GL/insights/ca-up-in-the-air (last visited Sept. 9, 2020). See also Int'l Air Transp. Ass'n; Hader, Thomson, & Lipowsky supra.
[47] Lee et al., supra.
[48] Jet Fuel Consumption – Country Rankings, https://www.theglobaleconomy.com/rankings/jet_fuel_consumption/ (last visited Sept. 9, 2020).
[49] EDF calculation, based on FAA Aerospace Forecast: Fiscal Years 2020-2040 (FAA 2020), https://www.faa.gov/data_research/aviation/aerospace_forecasts/media/FY2020-40_FAA_Aerospace_Forecast.pdf.
[50] Office of Transp. & Air Quality, Envtl. Prot. Agency, Fast Facts: U.S. Transportation Sector Greenhouse Gas Emissions 1990-2018 (2020).
[51] Air Transport Action Group, Facts & Figures, https://www.atag.org/facts-figures.html (last visited Sept. 9, 2020).
[52] 80 Fed. Reg. 37762.
[53] See 42 U.S.C. § 7571(a)(2)(B)(i).
[54] 49 U.S.C. § 44701(a).
[55] 42 U.S.C. § 7571(a)(2)(B)(ii)..
[56] National Research Council, Potential Impacts of Climate Change on U.S. Transportation, 2008 at 88 ("NRC Impacts"); see also National Research Council, Adapting to the Impacts of Climate Change, 2011 at 48 ("NRC Adaptation").
[57] NRC Impacts at 88.
[58] NRC Impacts at 91-92; NRC Adaptation at 83.
[59] NRC Impacts at 92
[60] Id. at Annex 3-1.
[61] NRC Impacts at 88; NRC Adaptation at 99.
[62] Delta Air Lines. Form 10-K (Annual Report), February 12, 2020, at 15. https://www.annualreports.com/HostedData/AnnualReports/PDF/NYSE_DAL_2019.pdf.
[63] See, e.g., 80 Fed. Reg. 37774.
[64] U.S. Global Climate Change Research Program, Fourth National Climate Assessment, 486 (2018).
[65] U.S. Global Climate Change Research Program, National Climate Assessment, 134 (2014).
66 Flight Cancellations: Superstorm Sandy Cancels Thousands of Flights, Closes Airports (Updates), HuffPost (Nov. 3, 2012, 10:48 AM), https://www.huffpost.com/entry/flight-cancellations-superstorm-sandy_n_2044102.
[67] Terry Maxon, Analyst Puts Hurricane Sandy Losses at Close to $200 Million for Airlines, Dallas Morning News, Nov. 2, 2012, available at https://www.dallasnews.com/business/airlines/2012/11/02/analyst-puts-hurricane-sandy-losses-at-close-to-200-million-for-airlines/ (last visited Sept. 11, 2020).
[68] EDF analysis of flight data from FAA Air Traffic Activity System (ATADS). ATADS can be access at http://aspm.faa.gov/opsnet/sys/Main.asp.
[69] Hugo Martin, Harvey Causes Airlines to Delay or Cancel More Than 12,000 Flights, L.A. Times, Aug 28, 2017, available at: https://www.latimes.com/business/la-fi-harvey-flights-canceled-20170828-story.html (last visited Sept. 9, 2020); Ben Mutzbaugh, Hurricane Irma: Flight Cancellations top 12,500; Even More Expected, USA Today, Sept. 10, 2017, available at: https://www.usatoday.com/story/travel/flights/todayinthesky/2017/09/10/hurricane-irma-airlines-cancellations-pile-up-florida-ahead-landfall/650592001/ (last visited Sept. 11, 2020).

[70] Benjamin Zhang, Hurricane Harvey Could Cost United Airlines More Than $265 Million, Business Insider, Aug. 30, 2017, available at: https://www.businessinsider.com/hurricane-harvey-cost-united-airlines-265-million-2017-8. (last visited Sept. 11, 2020).
[71] AON Benfield. Hurricane Sandy Event Recap Report: Impact Forecasting, 2013. http://thoughtleadership.aonbenfield.com/Documents/20130514_if_hurricane_sandy_event_recap.pdf.
[72] Douglas Arent , Richard S.J. Tol, Eberhard Faust, Joseph P. Hella, Surender Kumar, Kenneth M. Strzepek, Ferenc L. Toth, et al. "Chapter 10: Key Economic Sectors and Services." In IPCC Working Group II Assessment Report 5, 2013, p.18 http://ipcc-wg2.gov/AR5/images/uploads/WGIIAR5-Chap10_FGDall.pdf.
[73] Id. (internal citations removed).
[74] Paul D. Williams and Manoj M. Joshi, "Intensification of Winter Transatlantic Aviation Turbulence in Response to Climate Change," 7 Nature Climate Change , 644 (2013).
[75] Transportation Research Board of the National Academies, Airport Climate Adaptation and Resilience: A Synthesis of Airport Practice (Washington, D.C.: Transportation Research Board, 2012), available at http://onlinepubs.trb.org/onlinepubs/acrp/acrp_syn_033.pdf at 1; U.S. Department of Transportation, U.S. Department of Transportation Climate Adaptation Plan 2014: Ensuring Transportation Infrastructure and System Resilience, 2014, available at

Organization: Gannon, Brian

[The following comments were submitted as testimony at the virtual public hearing on September 17, 2020.]

I am a father of two children here. I have two daughters, three and five years old. We often smell the airport, the exhaust from the airport, the rubber from the tires on the runway. I am very concerned about the health of my children here in East Boston.

You know, we know from recent studies that there is definitely an increase in childhood asthma, COPD in adults, and we have lost many neighbors to cancer and other respiratory illnesses and more recently lost quite a few to COVID that are definitely related to some of the impacts of the airport.

We also have seven schools within about a mile of the airport. I mean, if you haven't been to Boston or Logan Airport, I mean, really, the airport wraps around the community, which has been here for, you know, a very long time. And, you know, often I have to tell my children, you know, when they want to go out and play and get some energy out or exercise, that they can't because it is just too toxic outside. I mean, we smell the airport when the wind is blowing in this direction. So often I have to either tear them off of the swing sets and bring them back home or keep them home based on that impact.

Now, in the meantime, you know, since, we have gotten these studies about COPD and asthma. So there is definitely some evidence. Even though the air quality monitoring here is very limited and it is not counting, as Wig had mentioned, some of the different aspects of that pollution that are going to impact my children's health, we have lost many neighbors who have actually moved away as a result of this pollution as well. But in the meantime, we have had massive expansion at Logan Airport. So currently they are increasing their international terminal lead. They are increasing parking there. So, really, without really mitigating or acting on the current impacts to our neighborhood, they have continued to expand. And I would like to see, you know, that stop.

Organization: Hahnel, Tanya

[The following comments were submitted as testimony at the virtual public hearing on September 17, 2020.]

I also want to echo that just measuring CO_2 in an age when we know that there are other pollutants affecting our health and welfare is unacceptable. In East Boston, we have been asking for the EPA to measure fine particulate matter and other pollutants, other than CO_2, for over the better part of a decade. So the fact that this regulation is not taking advantage of the opportunity to do so ?? you know, that is all we are asking for, is tracking so that we can start to have data. And we have actually taken matters into our own hands in East Boston. We are starting to measure fine particulate matter and other pollutants on our back porches with air-quality, you know, tools on our own as residents. So the fact that the EPA can't step up and, you know, do what ordinary environmental justice grassroots organizations and residents are doing out of their own pockets, I mean, that is just appalling to me, quite frankly, because we see in East Boston the effects.

My child goes to the East Boston Neighborhood Health Center. And they have a higher incidence of childhood asthma and, you know, adults', you know, lung issues than anyplace else in Massachusetts. Between Chelsea and East Boston, you know, we have health effects that are clearly linked to the airport. And we have had the highest rates of COVID-19 of anywhere in the state far and away: Revere, Chelsea, and East Boston. And it is really not ?? it doesn't take a genius to figure out that lung issues are related to living around the airport. So these are real health issues.

Organization: Hollander, Ann

My question was going to be about Ultra-Fine Particles (UFPs). UFPs are a significant type of emissions from aircraft, and a growing body of evidence suggests that they have significant public health consequences. UFPs are so small that they actually cross into the blood from the lungs and are carried throughout the body. Why doesn't the EPA investigate how UFPs are impacting public health, esp. the health of communities near airports? [EPA-HQ-OAR-2018-0276-0085-A1, p.1]

Organization: Lerch, David

The proposed airplane engine GHG emission rules are supported by a multitude of evidence. [EPA-HQ-OAR-2018-0276-0121, p.1]

Global warming and climate change not only cause increased hurricanes and sea level rise, but also increase the spread of tropical viruses and pandemics due to increased warming and loss of

biodiversity. This has a direct and immediate impact on human health. [EPA-HQ-OAR-2018-0276-0121, p.1]

During this rulemaking, EPA should note and consider the impact that climate change has on the spread of viruses and pandemics, and the mitigating impact of the proposed rule. [EPA-HQ-OAR-2018-0276-0121, p.1]

Organization: Mira's Garden

[The following comments were submitted as testimony at the virtual public hearing on September 17, 2020.]

I have a child who is nine and a boy who is two, a girl who is nine. And it's scary how similar his experience is to mine. I am deeply concerned about the health implications of my children and of the environment that we are giving children all over the world.

I called my not-for-profit Mira's Garden because she had a community garden that was given to her through the City of SeaTac that is right underneath where the airplanes land. There are playing fields, schools in areas that are not zoned for residential, but it is okay to have a garden, it is okay to have playing fields.

We had our vegetables tested by the University of Arizona and found that they were too toxic to eat. So, even though my daughter loved her garden, I had to tell her that she could not eat the fruit and vegetables grown there. And the next year, we did not, obviously, grow a garden there.

The answer should not be moving people. The majority of people around this airport cannot afford to move. Like Boston, we are for the most part poor. We are in the poorest part of King County. They cannot move. There needs to be a limit, not just in terms of emissions but in terms of quantity around airports. So there needs to be a qualitative and quantitative shift.

There needs to be a toxic limit to each region and to each airport. That needs to be the standard from which we also limit the number of flights in and out of every airport.

Organization: National Association of Clean Air Agencies

III. NACAA's Recommendations

Fifth, there is also the potential here for garnering additional, important reductions in nitrogen oxide (NOx) emissions from aircraft. EPA should analyze this potential and take steps to maximize aircraft NOx reductions. [EPA-HQ-OAR-2018-0276-0177-A1, p,4]

Organization: National Association of Manufacturers

Manufacturers Prioritize Sustainable Practices and Build Healthy Communities

Manufacturers embrace our responsibility to protect our planet, to advance justice and to build a sustainable and strong economy. We owe this to the people and communities we serve, to our customers across the globe and to the millions of men and women who make things in America. To accomplish this goal, manufacturers are calling for smart regulations that protect the environment, guarantee safe workplaces, create jobs, drive innovation and ensure a better quality of life that leaves no one behind. Accordingly, environmental laws and regulations should be designed with the utmost care to ensure that they are effective in achieving their desired objectives while simultaneously avoiding unnecessary adverse social and economic impacts. Building a healthier and more sustainable world for all of us is what manufacturers support.

As pioneers that make modern life possible through their tireless investment and innovation, manufacturers have become leaders in environmental stewardship and their strong track record is based on the bold steps they have taken to conserve critical resources, protect biodiversity, limit waste and produce safe products and solutions so others in the economy can do the same. Importantly, manufacturers have sharply reduced their air emissions and are developing solutions to further decrease emissions from their own operations, as well as enabling reductions in our customer industries and consumer end users. As a result, the manufacturing sector is a clean and efficient operation that is technology driven and dedicated to the planet and its people. [EPA-HQ-OAR-2018-0276-0149-A1, p.2]

Manufacturers Support Strong Protections for Clean Air

Combating the impacts of climate change is a top environmental policy issue for the global community and across industrial sectors. Manufacturers are committed to being part of the solution and encourage all other sectors of the American economy to join this effort. Environmental regulations – especially clean air standards – should be designed to ensure that they maximize results for at-risk communities while minimizing negative societal impacts. This is the type of logical, commonsense approach that manufacturers have long called for.

The EPA's proposal to establish GHG emission standards and test procedures for airplanes used in commercial aviation and large business jets would lead to even greater reductions in hazardous air pollutants and set an important precedent in the fight against climate change. Specifically, "[t]he standards proposed in this rule are the equivalent of the ICAO standards, consistent with U.S. efforts to secure the highest practicable the highest practicable degree of uniformity in aviation regulations and standards. [EPA-HQ-OAR-2018-0276-0149-A1, p.2]

[The following comments were submitted as testimony at the virtual public hearing on September 17, 2020.]

EPA's proposal to establish greenhouse gas emissions standards and test procedures for airplanes used in commercial aviation and large business jets would lead to even greater reductions in hazardous air pollutants and set an important precedent in our critical fight against climate change. Given our strong commitment to clean air, we support this thoughtful proposal.

To accomplish these goals, manufacturers will continue keeping their promise to minimize our environmental footprint, reduce emissions, and conserve critical resources because it's the right thing to do.

Organization: National Business Aviation Association (NBAA)

Business Aviation's Commitment to the Environment

Business aviation is consistently at the forefront of aviation technology in a manner that is both innovative and environmentally responsible. NBAA and our Member companies have long supported local, regional, and global efforts to address aircraft emissions. In 2009 business aviation manufacturers and service providers, represented by the General Aviation Manufacturers Association (GAMA), and business jet operators, represented by the International Business Aviation Council (IBAC), jointly announced the Business Aviation Commitment on Climate Change.[1] This aggressive program is designed to address the industry's carbon emissions by meeting the three following targets:

#1: Improving fuel efficiency 2% per year from 2010 until 2020

#2: Achieving carbon-neutral growth from 2020

#3: Reducing CO_2 emissions 50% by 2050 relative to 2005

A 2015 review of the progress indicated that we were on track to achieve the first of these three goals; improved fuel efficiency by 2% per year from 2010 to 2020. As a member of IBAC, NBAA is active in the Committee on Aviation Environmental Protection (CAEP) work. This includes the efforts that lead to the adoption of airplane carbon dioxide (CO_2) standards by ICAO in 2017. [EPA-HQ-OAR-2018-0276-0091-A1, p.1]

The business aviation community remains committed to improving our sector's environmental performance though a variety of operational, technical and policy measures. [EPA-HQ-OAR-2018-0276-0091-A1, p.2]

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[1] IBAC/GAMA Business Aviation Commitment on Climate Change: https://ibac.org/wp-content/uploads/2016/07/GAMAIBAC_Environment_Brochure.pdf

Organization: National Tribal Air Association

While climate change affects all life on this planet, Tribal people and their cultures are particularly vulnerable and are affected disproportionately due to social determinants of health.4 Tribal communities have a unique relationship with the natural environment, including subsistence practices and place-based cultural and economic reliance. Tribal communities are particularly at risk from more frequent or intense heavy downpours, floods, heat waves, wildfires, and droughts, as well as higher sea levels and storm surges. Climate change is already disrupting ecosystems upon which Tribal communities are dependent.[5] It is of the utmost importance for survival of Tribes and the entire planet that the EPA act strongly to reduce GHG emissions and fight climate change. [EPA-HQ-OAR-2018-0276-0179-A1, p.2-3]

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[5] Senate Democrats' Special Committee on the Climate Crisis, The Case for Climate Action Building A Clean Economy For The American People, at 135 (Aug. 25, 2020), https://www.schatz.senate.gov/imo/media/doc/SCCC_Climate_Crisis_Report.pdf; NTAA, Executive Summary of NTAA's Response to U.S. Senate Letter and White Paper on the Effects of Climate Change in Tribal Communities and Climate Action for Tribes, (Sept. 13, 2019), https://7vv.611.myftpupload.com/wp-

content/uploads/2019/12/NTAA-Executive-Summary-and-White-Paper-Response-to-Senate-Request-for-CC-Policy-Recommendations.pdf.

Organization: Office of the Comptroller of New York City, et al.

We acknowledge that the industry is facing daunting challenges during the current pandemic. Nevertheless, as a significant and growing source of emissions, and given the likelihood of increased costs due to extreme weather, the aviation sector faces an even greater risk from climate change. Aviation emissions are growing quickly; they are about 70% higher than in 2005,[2] and, according to ICAO, could grow by over 300% more. Further, aviation emissions per capita in the U.S. are about eight times the global average (and three times the European average),[3] and the majority of major U.S. airlines recently failed to meet their common goal for fuel efficiency improvements in the last decade.[4] In contrast to the U.S., the EU has instituted a carbon price on domestic and intra-EU flights, and several European countries are incentivizing clean aviation technologies. Accordingly, it is critical that EPA adopt GHG emission standards that, in concert with supplemental policies, will ensure domestic emission reductions consistent with net zero emissions by 2050. [EPA-HQ-OAR-2018-0276-0166-A1, pp.1-2]

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[2] https://ec.europa.eu/clima/policies/transport/aviation_en

[3] https://theicct.org/blog/staff/whats-the-plan-sam-aviation-emissions

[4] https://theicct.org/blog/staff/us-air-carriers-miss-first-climate-goal-sept2020

Organization: Quiet Skies Coalition

Missing from the rule, among others known and even unknown, are other nitrogen and sulfur, black carbon and methane releases. Nitrogen and water vapor for instance, released in the upper atmosphere have a much higher rate, up to four times the impact, of ground level warming emissions. Nitrogen, sulfur and methane releases are highest at airports when compared to other major sources of pollution in their respective areas, whether county or region. In fact, overall emissions at major airports, which are exempt from regulation, are probably higher than any other pollution sources in their respective states. [EPA-HQ-OAR-2018-0276-0081-A1, p.2]

[The following comments were submitted as testimony at the virtual public hearing on September 17, 2020.]

And this is a major problem for local communities as well because environmental justice-eligible low-income and people of color move into these areas due to the low cost of property. And sometimes they are leaving environments which are much worse than what they are experiencing with accumulative impacts of noise and emissions on them daily. Many of these people rely on resource categories that are never considered in environmental justice and greenhouse gas emission contexts by airport operators.

So the emergency and the dire situation that EPA is allowing to continue by not regulating sites and not controlling sources of pollution of this type puts a huge population at risk, of grave risk, of injury and disease and mortality and morbidity rates that are much higher than average.

And we also know now about the ultrafine particulate pollution which is blanketing hundreds of thousands of people in our area. That is also not being controlled by EPA. EPA needs to propose a rulemaking on ultrafine particulate pollution to help control this problem.

I will also add that the National Ambient Air Quality Standards compliance monitoring never comes near the airport. So we have the potential to be violating a number of different National Ambient Air Quality Standards for NO_2.

And, by the way, the NOx emissions that you are including in this rulemaking does not include the suite of the different nitrogen compounds, which are much more climate-intensive than the carbon dioxide emissions.

Organization: Salim, Nadia

[The following comments were submitted as testimony at the virtual public hearing on September 17, 2020.]

I have heard a lot of testimony here this morning about protecting industry economic interests. However, the work of the EPA is not to protect the industries that require that we take calculated risks with our environment in order to be profitable. The work of the EPA is to protect the environment itself.

Organization: South Coast Air Quality Management District (South Coast AQMD)

Over 80% of our NOx emissions are from mobile sources – sources that we as a local air agency have limited authority to control. Aircraft emissions account for a significant and growing portion of the NOx emissions in the South Coast Air Basin, growing from 3% in 2012 to 6% in 2023 and 9% in 2031. They are expected to have an even greater share of NOx emissions in 2037 – the year by which we must attain the 2015 ozone NAAQS – due to the lack of sufficiently stringent aircraft emission standards and the projected growth in aircraft operations. [EPA-HQ-OAR-2018-0276-0144-A1, p.1]

EPA Should Adopt More Stringent NOx Aircraft Engine Emission Standards Because of the technology-following nature of the aircraft engine standards by ICAO and EPA, the latest NOx CAEP/8 standards do not represent the most recent state of technology in reducing NOx emissions. In fact, based on the latest engine certification data, a number of recently certified engines are well below the CAEP/8 NOx standards.[4] Furthermore, there are aircraft engine manufacturers that are developing cleaner technologies capable of achieving significant reductions beyond the CAEP 8 NOx standards. Under the Federal Aviation Administration's (FAA's) Continuous Lower Energy Emission Noise (CLEEN) II Program, FAA has awarded contracts to a number of companies to accelerate the development of new aircraft and engine technologies to help reduce noise, emissions and fuel consumption. Among these companies, Rolls-Royce[5] and Honeywell[6] have been working on low emission combustion technologies that can potentially reduce NOx emissions by 65% and over 50% below the CAEP/8 standard, respectively. Given the availability and prospect of cleaner NOx technologies that are achieved and being demonstrated, we recommend that EPA consider these technologies and use them as a basis to establish more stringent NOx aircraft engine emission standards. [EPA-HQ-OAR-2018-0276-0144-A1, p.2]

EPA Should Evaluate and Promote Sustainable Aviation Fuel to Reduce NOx

Utilization of sustainable aviation fuel (SAF) or renewable jet fuel is another viable option to support sustainable aviation growth. SAF is considered as a "drop-in" fuel that meets or exceeds current jet fuel specifications and can be directly substituted without any changes in aircraft frames, engines, or fuel distribution systems. SAF has been verified to provide significant GHG benefits over conventional fuels with lower emissions in criteria pollutants including NOx and PM. According to the U.S. Department of Energy[8], there are currently six SAF production pathways certified under the ASTM standard with blend levels approved up to 50%. An increasing number of airlines, including United, have shown interest in these renewable fuels and have also participated in demonstrations using these fuels. We recommend that EPA sponsor and conduct additional studies to validate the emissions benefits associated with renewable jet fuels, streamline the certification process and provide incentives to expand commercial availability and production capacity of sustainable aviation fuels. [EPA-HQ-OAR-2018-0276-0144-A1, p.3]

[4] European Aviation Environmental Report (2019). https://ec.europa.eu/transport/sites/transport/files/2019-aviation-environmental-report.pdf
[5] Rolls Royce CLEEN II Technology Presentation (May 2020). https://www.faa.gov/about/office_org/headquarters_offices/apl/research/aircraft_technology/cleen/2020_may_consortium/media/rolls-royce-c_0520.pdf
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[8] U.S. DOE Alternative Fuels Data Center website: https://afdc.energy.gov/fuels/emerging_hydrocarbon.html

Organization: Uribe, Daniela and Molnar, Timothy

• Stricter Stringent Standards Ameliorate Environmental Injustices

• Standards Should Include Ultrafine Particulate Matter [EPA-HQ-OAR-2018-0276-0156-A1, p.2]

Environmental Justice Concerns Necessitate Heightened Emissions Standards According to its Proposed Rule, the E.P.A. is not of the belief that this action has "disproportionately high and adverse human health or environmental effects on minority populations, low-income populations and/or indigenous populations."[8] A deeper look into this issue, however, reveals broad scale disagreement with this opinion from the scientific community. The following analysis demonstrates this point in further detail.

The aforementioned impacts of climate change are anticipated to manifest with disproportionate severity.[9] Marginalized communities, low-income populations, indigenous groups, children, racial minorities, and the elderly are among the groups expected to face heightened risk.[10] This phenomenon can broadly be understood to fall under the umbrella of "environmental justice" – a term defined by the U.S. Environmental Protection Agency ("EPA" or "The Agency") as:

[t]he fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no population, due to policy or economic disempowerment, is forced to bear a disproportionate share of the negative human health or environmental impacts of pollution or environmental consequences resulting from industrial, municipal, and commercial operations or the execution of federal, state, local and tribal programs and policies.[11]

"Environmental justice," as conceptualized by the E.P.A, is not a vaporous buzzword. Rather, it derives substance from Executive Order 12898 Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations ("E.O. 12898").

Issued by President Clinton in 1994, E.O. 12898 compels federal agencies, such as the E.P.A., to

1 "identify and address the disproportionately high and adverse human health or environmental effects of their actions on minority and low-income populations, to the greatest extent practicable and permitted by law.

2 develop a strategy for implementing environmental justice.

3 promote nondiscrimination in federal programs that affect human health and the environment, as well as provide minority and low-income communities access to public information and public participation."

Analysis of the first two of these three provisions follows.

1. Identify Disproportionate Effects on Minorities

Therefore, in considering how best to control air pollution from airplanes and airplane engines, The Agency is directed to first "identify … the disproportionately … adverse human health or environmental effects on minority and low-income populations." To this end, a brief discussion of the link between aircraft-generated pollution and human/environment impact is warranted.

Of the six greenhouse gases included in the Administrator's definition of "air pollutant" referenced in 231(a)(2)(A) of the Clean Air Act, carbon dioxide is the GHG that comprises the majority of emissions from the aircraft implicated by the proposed rule (that is, subsonic jets with maximum takeoff mass of more than 5,700 kilograms and subsonic turboprop planes with maximum takeoff mass in excess of 8,618 kilograms).[12] It is well recognized that carbon dioxide is a major contributor to human-induced climate change.[13] And the impacts of climate change disproportionately effect minority and low-income populations. The fifth Assessment Report from the Intergovernmental Panel on Climate Change concludes that "climate change-induced warming in the Arctic and resultant changes in environment (e.g., permafrost thaw, effects on traditional, food source) have significant observed and projected impacts on the heath and well-being of Arctic residents, especially indigenous peoples."[14] Moreover, these populations are at particular risk based on their "strong dependence on the environment for food, culture, and way of life; their political and economic marginalization; existing social, health, and poverty disparities; as well as their frequent close proximity to exposed locations along ocean, lake, or river shorelines."[15]

Having identified a non-exhaustive list of disproportionate impacts of aircraft-based emissions on these marginalized groups, E.O. 12898 next directs the E.P.A. to "address [these] … to the greatest extent practicable and permitted by law." While it is not immediately clear what is meant by the greatest extent practicable and permitted by law, the D.C. Circuit Court of Appeals offers the E.P.A. an "unusually broad degree of discretion… to adopt aircraft engine emission standards."[16] Applying a broad degree of discretion to the construction of the meaning of "address[ing] the disproportionately high and adverse human health or environmental effects on minority and low-income populations, to the greatest extent practicable and permitted by law" offers the E.P.A. considerable latitude in substantively strengthening the regulation of air pollution from airplanes and airplane engines.

And while The Agency is quick to adopt the minimalist regulations proffered by ICAO, authority for strengthening these regulations is conspicuously granted under the 1944 Chicago Convention. Specifically member States (of which the U.S. is a party) "may adopt national standards that are more or less stringent than those agreed upon by ICAO."[17,18]

2. Implement Environmental Justice

As mentioned above, the E.P.A. must "develop … environmental … regulations" that incorporate "fair treatment … of all people regardless of race, color, national origin, or income". And The Agency concedes in its 2016 Finding That Greenhouse Gas Emissions From Aircraft Cause or Contribute to Air Pollution That May Reasonably Be Anticipated To Endanger Public Health and Welfare that "[i]n general, climate change impacts related to welfare are expected to be unevenly distributed across different regions of the United States and are expected to have a greater impact on certain populations, such as indigenous peoples and the poor."[19] It follows then, that Agency regulation on climate-change causing activities (which it admits unevenly impact people of different color and income), must seek to incorporate fair treatment. And since the IPCC has unequivocally stated that greenhouse gas emissions, such as those emitted from airplanes and airplane engines, contribute to climate change,[20] it must follow that Agency regulation of aircraft-based emissions be developed in such a way as to ameliorate unfair treatment of these marginalized groups. Practically, this implies the development of airplane emission regulations that result in maximal reduction of greenhouse gas emissions.

Yet, as the Agency ably points out in its Proposed Rule, this implication of maximal GHG reductions from airplanes must square with Executive Order 13771 Reducing Regulation and Controlling Regulatory Costs – section 1 of which dictates that regulatory action "must take into account benefits and costs, both quantitative and qualitative". And while there is considerable latitude in the interpretation of the construction of "tak[ing] into account benefits and costs," it seems clear that promulgating standards that fail to require additional action on the part of airplane manufacturers has considered only the costs to manufacturers and not the benefits that accompany action on climate change. Thus, complying with Executive Orders 13771 and 12898 requires the EPA to set more aspirational greenhouse gas emissions reductions for the airline industry. In setting these standards, The Agency should not only consider carbon dioxide and nitrous oxide, but also the impact of ultrafine particulate matter. This is the examined in more detail in the following section.

Standards Should Include Particulate Matter and Other Pollutants

We believe it is imperative that The Agency consider additional air pollutants That May Reasonably Be Anticipated To Endanger Public Health and Welfare, as per the Endangerment Finding.

As stated in the proposed rule, section 231(a)(2)(A) of the Clean Air Act directs the EPA to propose engine emission standards for any air pollutant that causes or contributes to air pollution that may negatively affect public health. As will be discussed below, ultra-fine particulate matter (UFPM) is such a pollutant.

Furthermore, the ICAO's recent promulgation of new standards for non-volatile Particulate Matter (nvPM) should serve as an impetus for the Agency to consider and promulgate its own ambitious PM standards that, at minimum, comply with those of the ICAO.

Additionally, the decision to limit the scope of airplane pollution impact on climate change to only CO_2 and N_2O is based on an incomplete and outdated understanding of complex climate change processes as will be discussed below.

By not considering other pollutants, the EPA's proposed rule fails to:

1 Protect the health of communities exposed to ultra-fine particulate matter.

2 Address the sizable impact of emissions from other airplane-generated pollutants on complex climate change processes.

3 Offer technology-forcing standards that encourage the development of alternative aviation fuels and other low-carbon solutions.

We expand on each of these three issues below.

1. Ultrafine Particulate Matter Poses a Significant Risk to Human Health. By failing to consider particulate matter in its proposed standards, the EPA is failing to protect the health of communities living and working near airports.

Particulate Matter is a mix of very small particles that can be made up of various components ranging from acids to soil and dust. According to the EPA, "the size of particles is directly linked to their potential for causing health problems. EPA is concerned about particles that are 10 micrometers in diameter or smaller because those are the particles that generally pass through the throat and nose and enter the lungs. Once inhaled, these particles can affect the heart and lungs and cause serious health effects."[21] Ultrafine Particulate Matter (UFPM) is a category of particulate matter. It refers to particulate matter with a diameter of 0.1 μm (100 nm) or smaller.[22] While exposure to all particulate matter below 10 micrometers has been deemed hazardous to human health[23], UFPM is particularly worrisome because these extremely small particles can reach far into the lungs and penetrate cells, therefore affecting both the respiratory and cardiovascular systems.[24]

Aviation is a significant source of UFPM due to engine emissions and airport operations.[25,26] As a result, communities working and living near airports are exposed to elevated levels of UFPM.[27,28,29] Consequently, the ICAO has been studying particulate matter emissions -- including UFPM-- in an effort to fulfill its environmental directive, which includes reducing the impact of aviation on local air quality. After over a decade of studies and technical and economic assessments, the ICAO approved non-volatile particulate matter (nvPM) standards for the new Standards and Recommended Practices (SARPs) at the ICAO Council in March 2020:

"Contained in Volume II to Annex 16 of the Chicago Convention (Environmental Protection), the new nvPM standard's development was supported by a comprehensive cost-benefit analysis which took into account its technical feasibility, economic reasonableness, environmental benefits, and interdependencies with other environmental factors."[30]

The Agency's responsibility under section 231(a)(2)(A) of the Clean Air Act obligates the Agency to promulgate its own standards for PM generated from the aviation sector. Such standards should meet or exceed those of the ICAO and should pay special attention to ultrafine particulate matter in order to protect the health of those working and living close to airports.

2. The impacts of airplane emissions on climate change go beyond those caused by CO_2. By failing to consider other pollutants, the EPA is failing to address the sizable impact of other airplane emissions on complex climate change processes.

While preparing to submit this comment, we reached out to experts in aviation and climate science to better understand the complex relationship between various air pollutants from airplane emissions and climate change. We learned that while the non-CO_2 effects of aviation on climate change have been difficult to assess in the past, there has been tremendous progress in our collective understanding of the complex processes that affect both the global warming and cooling associated with airplane emissions.[31, 32] For example, the work of Lee et al. offers a comprehensive look at the role of aviation on anthropogenic climate forcing for 2000-2018. This study highlights the numerous significant effects of airplane emissions on the climate beyond CO_2 emissions. Namely, particulate matter (PM), or soot, from airplanes contributes to the process of contrail formation. Contrails result in the cirrus cloudiness that we now understand to be a source of significant radiative forcing that is expected to increase substantially with increasing air traffic globally.[33]

According to Lee et al. the impact of aviation on climate change is much broader than can be assessed by looking at CO_2 emissions alone:

"Global aviation operations contribute to anthropogenic climate change via a complex set of processes that lead to a net surface warming. Of importance are aviation emissions of carbon dioxide (CO_2), nitrogen oxides (NOx), water vapor, soot and sulfate aerosols, and increased cloudiness due to contrail formation…

CO_2-warming-equivalent emissions based on global warming potentials (GWP* method) indicate that aviation emissions are currently warming the climate at approximately three times the rate of that associated with aviation CO_2 emissions alone."[34]

There is a range of solutions that would be available to airline companies to reduce the impact of non-CO_2 emissions such as PM. In addition to using alternative fuels, which will be discussed in a later section, the short lifetime of cirrus clouds means that operational changes in air traffic management, routing, and other non-technical interventions would lead to important reductions in climate change impact at a low cost:

"Contrail cirrus are central for mitigation efforts due to their short lifetimes by, for example, varying flight level, path or timing, using alternative fuels, new engine designs or other technological advances. Both their large climate impact and their suitability for mitigation underline the importance of investigating contrail cirrus for future air traffic scenarios."[35]

While it is beyond the scope of this comment and our own expertise to remark on the specifics of climatic processes in relation to airplane emissions, it is clear that limiting "greenhouse gas standards" to CO_2 emissions alone leads to an incomplete and ineffective rule. The proposed rule fails to mitigate greenhouse gas emissions that are expected to impact human health. This contradicts the directive established by the Endangerment Finding.

3. Establishing standards for additional pollutants would incentivize investment in research and development of new technologies. By failing to consider any pollutants besides CO_2, the EPA is failing to set technology-forcing standards.

Given the D.C. Circuit's 2007 NACAA ruling cited by the EPA in this rule “that section 231 of the CAA confers an unusually broad degree of discretion on the EPA in establishing airplane engine emission standards” (emphasis our own), it is both disappointing and irresponsible that the EPA is not using such discretion to promulgate more ambitious standards.

By the Agency’s own calculations, no CO_2 emissions reductions are projected to occur under the proposed rule. This failure was discussed earlier in this comment and has been echoed by many other entities providing comment on this rule. This marks a missed opportunity to take meaningful action to combat climate change.

Additionally, the Agency’s proposed rule fails to incentivize the development of new technologies that hold potential for lowering the emissions of air pollutants that endanger the health of the public and contribute to climate change, including CO_2 ultra-fine particulate matter, and NOx.

There has been a great deal of research in recent years to understand the benefits and viability of alternative aviation fuel sources. Alternative fuels have numerous advantages, including the potential to emit significantly less particulate matter than conventional fuels.[36] As we have discussed earlier, lowering particulate matter emissions would have positive impacts on both human health and climate change.

Numerous initiatives funded by federal agencies and the private sector are currently studying ways to make the domestic aviation sector more efficient and resilient. For example, the FAA Center of Excellence for Alternative Jet Fuels and the Environment (ASCENT) focuses on “meeting the environmental and energy goals of the Next Generation Air Transportation system, including reducing noise, improving air quality, reducing climate impacts, and energy efficiency.”[37]

Aviation companies benefit from the research and innovation necessary to meet industry standards. This is one of the reasons they invest in such advancements, both in-house and through public-private research partnerships. As a result, many government-sponsored research initiatives work closely with the private sector. Establishing standards for various forms of air pollutants would give entities like ASCENT the ability to accelerate progress. It would compel them to expand the scope of their research to comply with regulations. And it would become a priority item for their private sector partners.

The private sector is already funding the development of more efficient aircraft. And, presumably, they would be motivated to continue to do so in order to remain compliant with heightened standards. Furthermore, as previously mentioned, new standards of compliance are on the horizon. The ICAO’s new non-volatile particulate matter (nvPM) Standards and Recommended Practices (SARPs) will set international standards that global companies will have to meet. The European Commission is already investing in biofuels for aviation through its European Advanced Biofuels Flightpath program, which sets ambitious goals for alternative fuel use in aviation. As other countries move to innovate and comply with global standards (as well as the Paris Agreement), the U.S. would be wise to keep pace. By anticipating upcoming standards and incentivizing innovation today, the American aviation industry will continue to be competitive around the world into the future.

According to the House Select Committee on the Climate Crisis Action Plan, sustainable aviation fuels are currently “eligible for the biodiesel and renewable diesel tax credit in Section 40A of the tax code. On December 20, 2019, President Trump signed the Consolidated Appropriations Act, 2020, into law. This bill retroactively extended the tax credit, which had expired, through 2022.”[38] Extending these credits beyond 2022 will be important to ensure that American aviation industry is able to meet global standards and climate goals. We believe the Federal government would be more compelled to extend such credits and fund additional research if it helps domestic aviation remain competitive in the face of new standards.

Additional legislation introduced in the House and Senate also aims to address the environmental and human health challenges related to aviation. The EPA ought to ensure that its rules support a technology-forcing agenda that positions the industry to remain a leader in international aviation. This will ensure the U.S. aviation sector is well-positioned to meet the global standards and treaties on the horizon. Giving U.S. industries the guidance and support to not merely react to, but rather anticipate, the need to innovate, will create a competitive advantage for the U.S. aviation sector while protecting the health of Americans. [EPA-HQ-OAR-2018-0276-0156-A1, pp.4-13]

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Organization: Washington State Department of Ecology (Ecology)

The proposed rule conflicts with EPA's environmental justice requirements

Per Executive Order 12898 (59 FR 7629), federal agencies are required to analyze and remedy impacts to environmental justice communities when establishing regulations. This proposal, despite having clear environmental justice implications, both ignores this requirement and would actively exacerbate environmental injustice and widen disparities in access to clean air in our society. A reduction in aircraft GHGs would inherently provide both climate-related and air quality benefits for vulnerable populations near airports. [EPA-HQ-OAR-2018-0276-0140-A1, p.3]

Vulnerable communities, including communities of color, native and indigenous, and low-income populations, already bear the brunt of air pollution and climate change impacts and experience disproportionately poor health as a result. According to the Federal Aviation Administration (FAA), it is not uncommon for low-income populations to live near large, busy airports.[10] This is true for the area around Washington's busiest airport, Seattle-Tacoma International. EPA's Environmental Justice Screening and Mapping Tool (EJSCREEN) shows EJ Indexes above the 90th percentile for almost every indicator, including air quality, cancer risk, and respiratory health for the areas adjacent to and surrounding this large and busy airport. This population is also above the 90th percentile for minority and linguistically isolated, and above the 80th percentile for low-income.[11] A Washington State Board of Health environmental justice report found significantly higher rates of lung, oral, and pharyngeal cancer within one mile of the airport compared to the rest of the State.[12] One Seattle neighborhood lives in close proximity to two airports and high traffic roadways, and they experience higher rates of cardiovascular, respiratory, and other health issues. EPA awarded this community an environmental justice grant to address these air and noise pollution concerns.[13,14] [EPA-HQ-OAR-2018-0276-0140-A1, pp.3-4]

It is both duplicitous and unethical for EPA to then promulgate standards that perpetuate and exacerbate harms to the same environmental justice communities it purports to protect. By foregoing an opportunity to create meaningful emissions reductions in aircraft GHGs, EPA is choosing to set standards that will lead to continued and increased air pollution in communities adjacent to and near airports. [EPA-HQ-OAR-2018-0276-0140-A1, p.4]

The path this proposal must take is clear. EPA must identify and address the disproportionately high and adverse human health and environmental effects on minority and low-income populations when establishing aircraft emissions standards. As with previous rules promulgated by this administration, EPA ignores these requirements, as the rule does nothing to address the likely impacts to communities with environmental justice concerns. This rule, as proposed, would be particularly harmful to vulnerable communities as it would actually increase impacts to vulnerable communities and deny them the benefits of aircraft operating with new, cleaner technologies. [EPA-HQ-OAR-2018-0276-0140-A1, p.4]

Specifically, the rule should:

- Set standards that not only reduce GHG emissions, but maximize aircraft nitrogen oxides (N0x) reductions.

- Identify and address disproportionately high and adverse human health effects on minority and low-income populations. [EPA-HQ-OAR-2018-0276-0140-A1, p.5]

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[10] Federal Aviation Administration. (2018). "Overview of Office of Airports Engagement on Environmental Justice (EJ) Issues). https://www.faa.gov/about/office_org/headquarters_offices/acr/eeo_training/past_conferences/airport_civil_rights_training_ninth_national_2018_conference/media/Title_VI_Overview_of_OAE_on_EnvironJustice.pdf **** "
[11] Environmental Protection Agency. Environmental Justice Screening and Mapping Tool https://ejscreen.epa.gov/mapper/index.html?wherestr=seattle
[12] Washington State Committee on Environmental Justice. (2001). "Final Report, State Board of Health Priority: Environmental Justice." https://www.digitalarchives.wa.gov/do/F09387854B3FFB31174507C2F873DC56.pdf
[13] Environmental Protection Agency. Database of Environmental Justice Grants. https://www.epa.gov/environmentaljustice/environmentaI-justice-grants#washington
[14] Environmental Protection Agency. (2016). "News Release: EPA Awards Environmental Justice Grant to El Centro de la Raza of Seattle, Washington." https://archive.epa.gov/epa/newsreleases/epa-awards-environmental-justice-gra nt-el-centro-de-la -raza-seattle-washington.html

Organization: Washington State House of Representatives

1. Please create standards to the CO_2 emissions for the industry that pushes it forward. The impact of climate change is being felt on the West Coast with the raging forest fires. Over 5 million acres have burned in California, Washington and Oregon. Our air quality has been very unhealthy to hazardous for the last week. Sadly, we anticipate that these types of forest fires with be an ongoing trend for our summer months. As you can imagine, our community is now struggling with airport pollution, COVID and forest fire smoke. ALL of these exposures lead to increased inflammation and disease. Higher standards will stir innovation and stretch beyond the status quo. We need to have the industry to begin working on possible solutions to reduce Jet A pollution such as biodiesel, filtration systems, and the introduction of electric airplanes. [EPA-HQ-OAR-2018-0276-0086-A1, p.1]

2. Please expand the standards for other exhausts beyond CO_2 to include UFP. I've included the UW ultrafine participle study that looked at the pollution footprint surrounding SeaTac airport. Significant plumes of UFP, which are highest during landings, are released and remained concentrated as they

reach the ground. Due to their size they can distinguish UFP from Jet A fuel from other forms of pollution such as road traffic. As a next step, UW is going to be monitoring levels inside starting with our schools. During conversations with Boston Logan airport, we learned that they discovered high levels of UFP indoors. Fortunately, they have shown that some HEPA filtration systems can greatly reduce the levels of UFP. Below in this email is the link to the UW Phase I UFP Study. Also attached is a paper that reviews research articles pertaining to UFP conducted by our state department of health. [EPA-HQ-OAR-2018-0276-0086-A1, p.1]

3. Please partner with the FAA to encourage the monitoring and mitigation of air quality issues in airport communities. Currently the FAA requires airports to complete a PART 150 report every 10 years on noise issues and mitigation. Please encourage them to expand this report to noise and air quality issues. The noise packages in our community should include air quality packages such as HEPA filtration systems. [EPA-HQ-OAR-2018-0276-0086-A1, p.1]

I want to express my gratitude for your process to seek community feedback as you move forward on these critical standards to begin to combat aircraft pollution. Let us build a better future for our children. [EPA-HQ-OAR-2018-0276-0086-A1, p.1]

[The following comments were submitted as testimony at the virtual public hearing on September 17, 2020.]

And so I wanted to have a chance just to tell you that climate change is real for so many of us and that we really want to encourage you to use whatever powers you have to make the biggest impact you can at this point in time.

Organization: Zamore, Wig

[The following comments were submitted as testimony at the virtual public hearing on September 17, 2020.]

I would like to point out, as you may realize, there is a quite comprehensive paper on aviation and climate impact, first author Lee, but, really, a who's who of global aviation experts, emissions experts in atmospheric environment. It is just down the street. It is not preprint. It has been reviewed. But it is July 30th, 2020. And I would call your attention specifically there to focus on the global warming potential 20 columns because if you want to make quick progress with climate impacts of aviation, I think it is important to start with the 20-year analyses. And, as others have mentioned, NOx is having a massive impact, not directly but through the other things that it impacts, equal to or exceeding CO_2 in shorter-term analyses. So that has been known for a while. And it was notable in Logan Airport's recent ESPR that NOx from aviation is growing very, very quickly.

We have kind of ignored noise here. EPA had some of its mandate taken away from it, but we have nobody paying attention to noise impacts. And the noise impacts of aviation are not just annoyance-based, but they also operate through, including annoyance, the innate immune system. And so, in addition to an offset of aviation climate impacts, this is a very wealthy industry. I would also suggest that EPA and the environmental epidemiology community need to understand the drivers of immune inflammation, which are largely the NLRP3 inflammasome. Of the 20 human inflammasomes, 19 are pathogen-generated. Only one, NLRP3, drives inflammation that is integrated in humans and all other animals by the NLRP3 inflammasome. It is a target of all the big pharma and biotech companies. And because it integrates those effects of noise as well as air pollution as well as things like COVID-19, ignoring it, which almost 99.9 percent of the environmental epidemiology community does not know anything about NLRP3 because it is advanced cell biology and genetics. But there is a group that does, the occupational scientists that have looked at asbestoses and silicosis over the years, including Brooke Mossman at UVM in Vermont. They do understand this well because they glommed onto this research almost 20 years ago.

Response:

Most of the commenters under this topic urge EPA to go beyond the proposed adoption of GHG standards that match ICAO's CO2 standards and establish regulations that would reduce emissions, not maintain current levels (i.e., beyond preventing backsliding by ensuring that all new type design and in-production airplanes are at least as fuel efficient as today's airplanes). Various commenters focus their concerns on the need to reduce one or more of the pollutants ($CO_{2,}$ NOx, particulate matter), and one commenter raises a concern about noise. Several commenters also advocate aviation fuel changes as a way to reduce emissions. (We also respond to fuel-related comments in Section 17 of this Response to Comments document, above.) Many of these commenters provide detailed support for their advocacy of the need for reduced emissions. Further, several commenters describe the benefits that reduced emissions of all types could have on vulnerable communities, and they urge EPA to consider these environmental justice concerns as a reason to seek to reduce airplane emissions.

As proposed, the EPA is adopting the GHG standards that match the international ICAO CO_2 standards. While some commenters may consider this action to be limited, adopting standards that match ICAO's standards is an appropriate action at this time based on the rationale described in Section IV.I.1 of the Preamble. As a result, we do not address in this rule the potential environmental or other impacts requiring reduced airplane emissions beyond adopting the ICAO CO_2 standards. ICAO/CAEP meets triennially, and in the future, we anticipate ICAO/CAEP considering more stringent airplane CO_2 standards. The EPA expects that the EPA and the FAA will work within ICAO/CAEP on these future international CO_2 emission standards.

Several commenters from the aircraft manufacturing and airline industries, in general supportive of EPA's proposed adoption of the ICAO standards, pointed to a range of voluntary technical and operational actions they have already taken, and in some cases plan to continue, that they believe result in reduced airplane emissions.

18.3. Other (including comments on the Statutes and Executive Orders section and transparency)

Comments:

Organization: Anonymous Public Comment 22

There are non-harmless, procedural defects for this proposed rule under Section 307(d) of the Clean Air Act:

EPA has failed to include all interagency comments and responses in the docket, as required under Section 307(d)(4)(B)(ii). This includes truncated comments and responses for multiple drafts of the agency's technical support document, including very important exchanges (See Comment A47 and A48R47: https://downloads.regulations.gov/EPA-HQ-OAR-2018-0276-0036/attachment_2.pdf). [EPA-HQ-OAR-2018-0276-0171, p. 1]

Organization: Boeing Company (Boeing)

Boeing also urges FAA to move quickly to put a U.S. certification program in place concurrently with or immediately following this rulemaking. Final action on this rulemaking in 2020 is of great importance to Boeing and its airline customers, and we hope that EPA and FAA can both act to put new emission regulations and certification procedures in place during the current calendar year. [EPA-HQ-OAR-2018-0276-0181-A2, p.4]

EPA's proposed rule also addresses necessary procedural requirements. For compliance with Executive Order (EO) 12866, EPA need not attribute any costs to compliance with the ICAO standard and this proposed rule (i.e., since U.S. commercial aerospace manufacturers must comply with the ICAO standard adopted internationally, whether or not EPA adopts a domestic standard, in order to sell their products in or serve foreign markets).[215] In addition, the proposed rule complies with EO 13771 because, given the requirement to comply with the ICAO standard whether or not a domestic standard is promulgated, and the cost savings for U.S. domestic manufacturers that will be able to certify their airplanes to the ICAO standard with the FAA rather than foreign certifying organizations, the total costs of the proposed regulation are less than zero (i.e., the proposed regulation would result in a savings for aircraft manufacturers compared to the status quo) . For the same reasons, this rule should also qualify as a deregulatory action under Executive Order 13771 ("Reducing Regulation and Controlling Regulatory Costs"). [EPA-HQ-OAR-2018-0276-0181-A2,pp.47-48]

Proposed 40 C.F.R. Part 1030 – Technical Corrections

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[215] See 77 Fed. Reg. 36,342 (June 18, 2012) (Section 231 rulemaking implementing ICAO NOx standard) ("[T]here is no significant further direct cost to the manufacturers created by EPA's adopting the [ICAO] requirements into U.S. regulations.").

Organization: California Attorney General's Office and the California Air Resources Board (CARB) et al.

D. States' efforts to combat greenhouse gas emissions

The Commenting States have pursued more than two decades of litigation and regulatory efforts to limit GHG emissions. For instance, a lawsuit by certain States to compel EPA to limit GHG emissions from motor vehicles led the Supreme Court to rule that EPA was obliged "to regulate emissions of the deleterious pollutant" if it found that the emissions endanger public health or welfare. Massachusetts v. EPA, 549 U.S. 497, 528-29, 533 (2007). EPA subsequently found in 2009 and 2016 that GHG emissions from motor vehicles and aircrafts, respectively, endanger public health and welfare by causing more intense, frequent, and long-lasting heat waves; worse smog in cities; longer and more severe droughts; more intense storms, hurricanes, and floods; the spread of disease; and a rise in sea levels.[106]

Many states have already acted to reduce CO_2 emissions from sources within their borders. For example, through the Regional Greenhouse Gas Initiative, States limit power plant emissions under a trading program.[107] California, Illinois, New York, Oregon, and Washington impose CO_2 emission limits on new fossil-fueled power plants that are even more stringent than EPA's standards under section 111(b) of the Clean Air Act.

In California, the Global Warming Solutions Act of 2006 mandated statewide reductions in GHG emissions to 1990 levels by 2020; in 2016, the Legislature took the additional step of mandating that statewide emissions be reduced to 40 percent below 1990 levels by the end of 2030.[108] CARB's landmark low-carbon fuel standard (LCFS) decreases the carbon intensity of California's transportation fuel pool and provides an increasing range of low-carbon and renewable alternative fuels. In 2018, CARB approved amendments that strengthen the LCFS regulation's carbon intensity benchmarks through 2030 in-line with California's 2030 GHG target and add new crediting opportunities that promote lower-carbon alternative jet fuels.[109] Oregon's Clean Fuels regulations similarly require reduction of the carbon intensity of transportation fuels, in line with the State's overall target of reducing carbon emissions by 75 percent from 1990 levels by 2050.[110]

In New York, the recently enacted Climate Leadership and Community Protection Act (CLCPA) requires that statewide GHG emissions be reduced by 40 percent from 1990 levels by 2030, and by 85 percent from 1990 levels by 2050.[111] CLCPA's statewide GHG emissions limits are applicable to all GHG emissions sources, including the transportation sector, which currently accounts for approximately 36 percent of emissions in New York. Within the transportation sector, approximately

14 percent of statewide emissions are caused by the combustion of jet fuel in aircraft. Indeed, between 1990 and 2016, emissions from jet fuel in New York increased more than six times over, from 1.6 million metric tons to 10.3 million metric tons of CO_2 equivalent.[112]

In Massachusetts, the Global Warming Solutions Act of 2008 (GWSA) mandates reductions in statewide GHG emissions of at least 80 percent below 1990 levels by 2050.[113] Section 3(d) of the GWSA requires the Massachusetts Department of Environmental Protection (MassDEP) to promulgate regulations that set declining limits on GHG emissions from various sources and categories of sources. See Kain v. Mass. Dep't Envtl. Prot., 474 Mass. 278, 292 (2016). MassDEP has promulgated two such regulations for the transportation sector. See 310 C.M.R. § 60.05 ("GWSA Requirements for Transportation"); id. § 60.06 ("CO_2 Emission Limits for State Fleet Passenger Vehicles"). By executive order, Governor Charles Baker directed the development of further strategies to reduce emissions from the transportation sector.[114] Governor Baker established the Commission on the Future of Transportation in the Commonwealth to advise on how to ensure that transportation planning, forecasting, operations, and investments for 2020 through 2040 can best account for likely demographic, technological, climate, and other changes in future mobility and transportation behaviors, needs, and options.[115] Earlier this year, Governor Baker's administration established an updated statewide emission limit of net zero GHG emissions by 2050 under the GWSA.[116] [EPA-HQ-OAR-2018-0276-0176-A1, pp.17-19]

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[106] See generally 2016 Endangerment Finding, 81 Fed. Reg. 54,422; Endangerment and Cause or Contribute Findings for Greenhouse Gases Under Section 202(a) of the Clean Air Act, 74 Fed. Reg. 66,496, 66,497, 66,524-25, 66,532-33 (Dec. 15, 2009) (2009 Endangerment Finding).
[107] See, e.g., 25 C.M.R. §§ 13.00, et seq. (Massachusetts Department of Energy Resources CO2 Budget Trading Program Auction Regulations); 310 C.M.R. §§ 7.70, et seq.(Massachusetts Department of Environmental Protection CO2 Budget Trading Program).
[108] Cal. Health & Safety Code §§ 38550, 38566.
[109] Cal. Code Regs., tit. 17, §§ 95482, 95484 (as amended Sept. 27, 2018).
[110] Or. Rev. Stat. § 468A.205(1)(c); OAR 340, Division 253.
[111] N.Y. Envtl. Conserv. Law § 75-0107(1).
[112] NYSERDA, New York State Greenhouse Gas Inventory: 1990-2016 (July 2019), https://www.nyserda.ny.gov/About/Publications/EA-Reports-and-Studies/Greenhouse-Gas-Inventory.
[113] Mass. Gen. Laws ch. 21N, §§ 3(b), 4(a), 4(h); see also Mass. Exec. Office of Energy & Envtl. Affairs, 2015 Update: Massachusetts Clean Energy and Climate Plan for 2020 (Dec. 31, 2015).
[114] See Exec. Order No. 569, § 1.3 (Mass. 2016), https://www.mass.gov/executive-orders/no-569-establishing-an-integrated-climate-change-strategy-for-the-commonwealth.
[115] See Exec. Order No. 579, § 1 (Mass. 2018), https://www.mass.gov/executive-orders/no-579-establishing-the-commission-on-the-future-of-transportation-in-the.
[116] See Mass. Exec. Office of Energy & Envtl. Affairs, Determination of Statewide Emissions Limit for 2050 (Apr. 22, 2020), https://www.mass.gov/doc/final-signed-letter-of-determination-for-2050-emissions-limit/download.

Response:

The EPA acknowledges that some comment bubbles were truncated in one document from EO 12866 review that was placed in the docket. Those comment bubbles were inadvertently truncated when the document was converted to .pdf format. A version of the document with complete comment bubbles has now been created and placed in the docket.

The EPA acknowledges Boeing's request that the EPA finalize the rule by the end of 2020. The EPA understands the value in completing this action in a timely manner to provide both regulatory certainty to the impacted industry and international harmonization of airplane emissions requirements. The EPA notes that the comment requesting the same of the FAA is outside of the scope of this action. The EPA also acknowledges Boeing's assessment of the EPA's compliance with Executive Orders 12866 and 13771, and notes that no changes to the proposal were requested by the commenter.

The EPA acknowledges the commenting states' long history of litigation and regulatory efforts to limit GHG emissions, and notes that no specific request was made by the commenters.

18.4. Comments Outside the Scope of the NPRM

Comments:

Organization: Alternative Fuels & Chemicals Coalition (AFCC)

The EPA is proposing GHG emission standards applicable to certain classes of engines used by certain civil subsonic jet airplanes which has a mass greater than 5,700 kilograms and by certain civil larger subsonic propeller-driven airplanes with turboprop engines having a maximum takeoff mass greater than 8,618 kilograms. These proposed standards are equivalent to the airplane CO_2 standards adopted by the International Civil Aviation Organization (ICAO) in 2017 and would apply to both new type design airplanes and in-production airplanes. The standards proposed by EPA are equivalent to the ICAO standards. AFCC and its member companies urge EPA to consider all airplanes, civilian, business, military, whether new, having maximum takeoff mass limits, or having certain classes of engines to be considered under the same GHG emission standards. Since biogenic carbon dioxide from processing or use of agricultural crops under the Clean Air Act is well documented and not controversial due to the short cycle of agricultural crop growth, in which farmers and ranchers capture carbon from the atmosphere as “draw down” prior to the same carbon being returned to the atmosphere during processing or use of the biomass feedstock. [EPA-HQ-OAR-2018-0276-0180-A2, pp.1-2]

When regulating Clean Air Act emissions at stationary source facilities and other applications under the Clean Air Act, EPA must acknowledge the science of carbon cycles. Therefore, EPA should regulate only emissions that actually add excess greenhouse gasses to the atmosphere. This approach is supported by the extensive scientific literature and positions of government agencies that treat biogenic emissions from crop-based feedstocks as carbon neutral, de minimis or insignificant from a carbon accounting and regulatory perspective. Currently, EPA continues to be the only agency that regulates biogenic emissions without recognizing the applicable lifecycle science. [EPA-HQ-OAR-2018-0276-0180-A2, p.2]

The U.S. biobased economy is well positioned to capture a dominant share of global biobased economic growth and employment opportunities, and AFCC’s member companies are poised to invest billions of dollars in rural America. However, investment in the biobased economy is jeopardized by EPA policy statements that are inconsistent in its own regulatory approach in carbon accounting and refusal to recognize that U.S. farmers capture carbon while growing feedstocks and that the same biogenic carbon is organically released as part of the natural carbon lifecycle when crops are subsequently processed or used to produce renewable chemicals, biobased products, bioplastics, food, fiber, and biofuels.[EPA-HQ-OAR-2018-0276-0180-A2, p.2]

On August 15, 2016, EPA finalized its endangerment finding for greenhouse gas emissions from aircraft engines. At that time EPA was asked by several associations to distinguish between biogenic and fossil fuel emissions. In the final rule, EPA responded explicitly to these associations comments, but declined to recognize the life-cycle carbon footprint of biogenic emissions on the basis that CO_2 from biomass is chemically identical to CO_2 from crops. EPA’s legal position is that it is not required to consider the “source” of feedstocks (whether fossil or biomass) that result in emissions and that biogenic emission have the same effect on the atmosphere as fossil fuels. Specifically, EPA states its legal position in the Aircraft Rule inter alia that: “all CO_2 emissions, regardless of source, influence radiative forcing equally once it reaches the atmosphere and therefore there is no distinction between biogenic and non-biogenic CO_2 regarding the O_2 and other well-mixed GHGs within the definition of air pollution that is reasonably anticipated to endanger public health and welfare." In contrast, AFCC and its member companies position is that the Clean Air Act and EPA policy define "pollution" as emissions that contribute to elevated levels of greenhouse gas, and because biogenic emission are part of the natural baseline level of CO_2 in the atmosphere (indeed necessary for life on Earth), CO_2 from biogenic sources does not contribute to excess levels of CO_2. [EPA-HQ-OAR-2018-0276-0180-A2, p.2]

EPA's strategy to only look at CO_2 once it leaves a smokestack and not the source means that biofuels would not qualify as low-carbon under aircraft engine regulations. We submit that would undermine the U.S. participation in the ICAO global airline carbon reduction program. [EPA-HQ-OAR-2018-0276-0180-A2, p.3]

AFCC and its member urge EPA to consider the difference between biogenic carbon and fossil fuel carbon and consider the source for the emissions when participating in the ICAO global airline carbon reduction program. We look forward to having a discussion on this before final rule making is established. [EPA-HQ-OAR-2018-0276-0180-A2, p.3]

Organization: Anonymous Public Comment 9

Invest in high speed trains instead. [EPA-HQ-OAR-2018-0276-0126, p.1]

Organization: Anonymous Public Comment 19

The EPA also needs to set standards for old as well as new aircraft that include other air quality emissions such as fine particulate matter, and set lower standards for lead allowed in fuel for single engine planes. [EPA-HQ-OAR-2018-0276-0146, pp.1-2]

Organization: Baxter, Cindy

[The following comments were submitted as testimony at the virtual public hearing on September 17, 2020.]

The unique opportunity for the EPA and all of us, health is about community, but it is now about corporate. And it is also about investments. For this unique time, it allows the EPA to be brave and step up to some of the unique challenges that will keep us in a healthy environment from an investment perspective as companies recognize that green companies are good, profitable, and sound. This is an opportunity to bring America up to the forefront for all of us as investors, individuals, or institutional investors. Companies are recognizing that as they invest, as they look at services that they can offer, that green companies are innovative and allow a better view of what the population is looking for.

A recent Wall Street Journal article recognized the EPA proposal in order to stay internationally competitive. And a lot of today's testimony has revolved around that need to be competitive. It is not because it is just a good corporate goal, which, of course, the airline industry and affiliates have spoken to very aptly today. It is because the world demands it. And without demand, there won't be a supply. This is the opportunity to act aggressively.

As I mentioned, investment companies are recognizing that green companies enhance what is available to consumers, whether they are corporate consumers or individual consumers. Full profitability is enhanced in a positive sense. That is brand new. It is something we can compare to an 80 percent improvement of airline standards that really is no longer valid. It is an opportunity to act with assertiveness.

Companies like my employer encourage and promote environmental and sustainability adherence, not because they have to but because it is just good business sense. And there is a groundswell of us in the employee community who are interested in working for somebody who not only cares but is brave enough to act and invest well.

Organization: California Air Resources Board (CARB)

While NOx emissions standards do exist at the federal and international level for new aircraft, these standards do not reflect the current state of technology. As a result, emissions from these categories have not decreased at the same pace as those for other mobile sources in California,[57] or at the pace needed to protect Californians. Achieving the magnitude of emission reductions necessary from this category requires strong federal action.[58] [[EPA-HQ-OAR-2018-0276-0169, p.13]]

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[57] CARB, Mobile Source Strategy (May 2016), available at https://ww3.arb.ca.gov/planning/sip/2016sip/2016mobsrc.pdf.

[58] The other technologies and measures described in this supplemental comment generally would also reduce NOx and other criteria and hazardous air emissions from aircraft. FAA's CLEEN program also develops and demonstrates technologies and measures designed to achieve NOx reductions from landing and takeoff, along with reductions related to fuel efficiency. FAA, Continuous Lower Energy, Emissions, and Noise (CLEEN) Program, updated June 19, 2020, https://www.faa.gov/about/office_org/headquarters_offices/apl/research/aircraft_technology/cleen/.

Organization: Center for Biological Diversity, et al.

[The following comments were submitted as testimony at the virtual public hearing on September 17, 2020.]

Ahead of the coronavirus pandemic, emissions are set to triple again by 2050. On the subject of the pandemic, I would like to express my organization's concern for and solidarity with the workers in the aviation industry. Necessary modernization and emissions reduction will allow the industry to survive and evolve, protecting jobs. The decades-long campaign against pollution reduction has done nothing to protect workers during the COVID downturn.

Organization: Davis, Lauren and Nguyen, Johnnie Q.

We recognize the importance of setting GHG emission standards for airplanes in the United States and we seek to balance that step with demanding a quality protection of our Nation's air quality and public health. [EPA-HQ-OAR-2018-0276-0145-A1, p.6]

Organization: Gannon, Brian

[The following comments were submitted as testimony at the virtual public hearing on September 17, 2020.]

But I think one of the challenges that we have is that here because of the way that the Clean Air Act ?? I mean, it really doesn't commit and promise us to have, you know, safe air for our children and for our families. It seems to really be limited as far as airplanes are concerned. So, you know, there may be regulation on a single engine, but it doesn't seem to take into account that when you have, you know, hundreds of those engines running, you know, from this airport at this proximity, the impact is really great. And I would like to see more done to really regulate that and really, you know, act on that so that we can feel safe.

If that were a factory, if Logan Airport were a factory or some industrial location, it would have been shut down by now. And it is unfair that we are exposed to this level of toxins without any recourse or representation to really help us kind of keep that at bay.

Organization: International Council on Clean Transportation (ICCT)

Future standards should incorporate flexibility mechanisms for greater effectiveness.

A large body of research indicates that pass/fail certification standards fail to promote vehicle fuel efficiency. More flexible standards, for example allowing manufacturers to meet the standard on average across all aircraft delivered in a year (averaging) or over time (banking), can support more cost-effective and ambitious standards. These flexibility mechanisms allow standards to be set based upon the performance of the best rather than the worst aircraft. ICAO's pass/fail type certification standard was set such that the large majority of new aircraft delivered in 2019 already met the 2028 requirements in order to pass less fuel-efficient planes. [EPA-HQ-OAR-2018-0276-0168-A1, p.4] [Refer to page 8 of docket number EPA-HQ-OAR-2018-0276-0168-A1 for the Appendix]

As shown in the Appendix, a hypothetical standard allowing averaging of different aircraft types produced by the same manufacturer could be set 5% more stringent than the pass/fail standard for individual aircraft models that EPA is proposing. Similarly, a standard that allows major manufacturers to bank credits from fuel-efficient designs to comply with more stringent future targets could be set 8% tighter than a pass-fail standard. We encourage EPA to consider these flexibility mechanisms in its final rule. [EPA-HQ-OAR-2018-0276-0168-A1, p.4] [Refer to page 8 of docket number EPA-HQ-OAR-2018-0276-0168-A1 for the Appendix]

These include investigating a more ambitious phase of the new-type standard around 2030 and applying the 2028 in-production standard to in-service aircraft to promote the retrofit and retirement of older, less efficient designs. EPA should likewise expand the GHG reporting requirement to in-service aircraft and other GHGs, and, as a precautionary principle, apply ICAO recommended subsonic standard to supersonic designs. We also encourage the agenda to incorporate flexibility mechanisms such as averaging and banking to support more ambitious, cost-effective standards in the future. [EPA-HQ-OAR-2018-0276-0168-A1, p.6]

[The following comments were submitted as testimony at the virtual public hearing on September 17, 2020.]

We have thus far identified five areas of refinement in the proposed rule, namely that, five, that for future standards, flexibility mechanisms, like averaging and banking, should be considered to enable more ambitious cost-effective standards.

Finally, we encourage that future standards should incorporate flexibility mechanisms for greater effectiveness. A large body of research indicates that pass/fail certification standards fail to promote vehicle fuel efficiency. More flexible standards, for example, allowing manufacturers to meet a standard on average across all aircraft delivered in a year called averaging or over time called banking, can support more cost-effective and ambitious standards. These flexibility mechanisms allow standards to be set based upon the performance of the best, rather than the worst aircraft. ICAO's pass/fail-type certification standard was set such that the large majority of new aircraft planes delivered in 2019 already comply with the 2028 requirements for the reason that it should pass less fuel-efficient planes. By our initial estimate, EPA's aircraft standard could be set at least 8 percent more stringent if averaging and banking were allowed. We encourage EPA to consider this approach in its final rule.

Organization: Kroeker, Anne

I am writing as a concerned individual, with a long time environmentalist, conservationist and justice-minded set of values, who happens to also live under the ever-increasing and lower flight paths, exposed to jet engine toxins and noise every day, above accepted livable levels. [EPA-HQ-OAR-2018-0276-0162 p. 1]

The rule the EPA is proposing to regulate greenhouse gas emissions from commercial aircraft, changes nothing that isn't already being done and is a waste of your time and taxpayer's dollars. Please do not continue with this proposed rule. [EPA-HQ-OAR-2018-0276-0162 p. 1]

Organization: Life:Powered, an initiative of the Texas Public Policy Foundation

While we understand the EPA's need to respond to potential litigation and the possibility of more flawed and onerous rules being imposed in the future, those reasons do not justify promulgating a rule that is fundamentally flawed in the first place. By refusing to rebuke the regulation of aviation GHG emissions under the Clean Air Act (CAA), the only result of this rule will be to further drag out the arguments over the appropriate level of regulation. The EPA should tackle the task of overturning the flawed endangerment finding that underpins this rule, instead of further cementing that finding by promulgating this rule. [EPA-HQ-OAR-2018-0276-0172-A1, p.1]

We think that finding is flawed for several reasons. First, it is not at all clear that Congress wrote Section 231 of the CAA to allow for the possibility of regulating GHGs from aircraft. The law instructs the Administrator to determine "the extent to which [air pollutants from aircraft] affect air quality in air quality control regions throughout the United States." This statement applies well to local forms of air pollution, such as particulate matter, but not to GHGs, which are nearly uniform in concentration throughout the atmosphere and are not directly harmful to human health. That initial language is later repeated in the instructions to hold multiple hearings "in air quality control regions which are most seriously affected by aircraft emissions." [EPA-HQ-OAR-2018-0276-0172-A1, p.1]

Given the lack of clarity in Section 231 on regulating GHGs, the EPA bases its endangerment finding on two premises. First, it argues that elevated concentrations of GHGs on the whole endanger the public health and welfare. Second, it notes that GHG emissions from aircraft contribute to this air pollution and therefore should be regulated pursuant to Section 231(a)(2)(A). [EPA-HQ-OAR-2018-0276-0172-A1, p.1]

Whether and to what extent GHG emissions might endanger human health depends on the degree to which those emissions will alter global temperatures, a prediction which is still subject to a wide degree of uncertainty, and the relative degrees of the harms and benefits of that temperature change. Quantifying the extent to which aviation GHG emissions—a small portion of total GHG emissions—endanger human health with any degree of reasonable certainty is impossible given the current state of scientific understanding. As noted by Bjorn Lomborg, climate models indicate that eliminating all aviation emissions between now and 2100 will reduce the rise in global temperatures by 0.03°C. Given that this change is a fourth as large as the error range of the commonly used HadCRUT4 global surface temperature data set, this effect would likely not even be measurable. [EPA-HQ-OAR-2018-0276-0172-A1, pp.1-2]

While the EPA notes in its 2016 finding that U.S. aviation, in 2010, accounted for 29% of global GHG emissions from aircraft, that share is declining. U.S. emissions also are declining more rapidly than any other major country, compromising a much lower global share when compared to 2010. Aviation GHG emissions also represent a small and declining share of overall U.S. transportation emissions, falling from 9.5% in 2005 to 8.9% in 2018. Therefore, the application of the 2009 endangerment finding for motor vehicles to aviation is suspect at best. The EPA must revisit the scientific basis for that finding before promulgating any further rules based on it. [EPA-HQ-OAR-2018-0276-0172-A1, p.2]

The flawed endangerment finding under Section 202, which we have petitioned the EPA to review and potentially repeal, should not be propaga ted to an even smaller and less significant subset of GHG emissions. [EPA-HQ-OAR-2018-0276-0172-A1, p.3]

It is also false to assume that the EPA must adopt the International Civil Aviation Organization (ICAO) standards in order for U.S. airline manufacturers to remain competitive and for U.S. airlines to fly internationally. Other options for compliance with the ICAO standards include an FAA rulemaking, if not guidance, that does not require the legal and scientific gymnastics of regulating GHGs under CAA Section 231, voluntary certification by U.S. companies (possibly with verification through a third-party for all U.S. and, more importantly, non-U.S. aircraft engines), as well as diplomatic and trade agreements. The EPA does not consider any of these less costly options in its rulemaking. [EPA-HQ-OAR-2018-0276-0172-A1, p.2]

Another potential complication that is not mentioned in the proposed rule is the relevance of the ICAO's Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA). This program may eventually require international aviation to be "net zero" with respect to GHG emissions through the use of carbon offsets. Notwithstanding whether this program could ever be implemented in an effective, verifiable manner and at a reasonable cost, the EPA does not have the authority to enter into an international carbon trading or offset program without the explicit permission of Congress. The EPA should clarify the limit of its authority and note that these standards do not imply or tend toward U.S. participation in the CORSIA program. [EPA-HQ-OAR-2018-0276-0172-A1, p.2]

It is also important to note that Section 231(a)(2)(A) limits EPA's authority to "aircraft engines" and "aircraft engine emission standards," not to the entire aircraft. Section 234 clearly references the statutory definitions from U.S.C. 49 § 40102 of both "aircraft" and "aircraft engines," so Congress was not ambiguous on its use of the term "aircraft engines" in Section 231. If the EPA ultimately attempts to enforce a carbon offset program such as CORSIA, or any other non-engine-related standards, it would be clearly exceeding its regulatory authority under Section 231. [EPA-HQ-OAR-2018-0276-0172-A1, p.2]

Organization: Office of the Comptroller of New York City, et al.

Finally, the rule fails to take GHG gases other than CO_2 into account, or address supersonic airplanes, which can be five to seven times more carbon intensive than conventional aircraft.[1] [EPA-HQ-OAR-2018-0276-0166-A1, p.1]

Finally, the rule fails to take non-CO_2 emissions, such as NOx and particulates linked to contrail/cirrus formation, into account; these emissions are estimated to have warming impacts two to five times greater than CO_2 alone.[7] [EPA-HQ-OAR-2018-0276-0166-A1, p.2]

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[1] https://theicct.org/publications/environmental-performance-emerging-commercial-supersonic-aircraft
[7] https://www.europarl.europa.eu/RegData/etudes/STUD/2015/569964/IPOL_STU(2015)569964_EN.pdf

Organization: Petri, Virginia

The U.S. EPA needs to listen to health experts and tighten the ozone National Ambient Air Quality Standard to no higher than 60 parts per billion.

All Americans deserve to breathe clean air, but your decision to not tighten the ozone/smog health standard puts the well-being of everyone at risk, especially people living with lung disease. People must be able to breathe and not fear that air pollution allowed by the EPA will keep them at home, send them to the doctor's office, or require them or their children to be hospitalized. Your proposal to do nothing will allow this damage to continue unabated, threatening the lives of the nearly 25 million people already living with asthma and the more than 16 million diagnosed with COPD.

Firing the EPA's experts who know how ozone damages human health, ignoring the pleas of the EPA's own science advisors, and failing to consider scientific fact before rushing to do nothing further to protect people will only benefit big polluters who are already harming our lungs.

The EPA needs to look carefully at all the air pollution and medical science, invite back its ozone pollution experts, and set a health standard for ozone that protects everyone and prevents people from getting sick simply by breathing. The EPA should start over and do this the right way. But if the EPA continues on the current path of finalizing an ozone National Ambient Air Quality Standard, the level must be set at no higher than 60 parts per billion.

Organization: Quiet Skies Coalition

Although I appreciate the efforts of EPA to provide guidance in answer to an endangerment finding, I am disappointed it took so long and legal action to compel change. [EPA-HQ-OAR-2018-0276-0081-A1, p.1]

NAAQS compliance means nothing if monitoring never comes near an airport.

For the past 25 years of tracking regional monitoring and compliance, it is evident the monitoring network has not come close to Sea-Tac Airport. In a limited research in 1998-99, monitoring near the airport disclosed a potential exceedance of the particulate standard, NO_2 at the highest historical regional level and CO at 80-90% of the federal standard outside areas of highest impact. We now know there is a particular threat to public health both outdoors and indoors from aircraft related ultrafine particulate. This must be addressed by proactive rulemaking at EPA. [EPA-HQ-OAR-2018-0276-0081-A1, p.2]

Sea-Tac Airport area are dominated by residential uses. These residents are predominately low-income minority populations which are more susceptible to the effects on climate. Because EPA allows AEDT estimates of climate impact emissions to not reflect real-world effects, these populations are kept in the dark about their environment and resources they may depend upon for survival. Because these populations have a historically lower than average access to healthcare along with language barriers, they are barred from understanding how these environmental effects may harm them and their children. EPA should require transparency and truth from the industry to assure protection of their public health and welfare responsibility with protection that is just, fair and equitable. [EPA-HQ-OAR-2018-0276-0081-A1, pp.2-3]

However, there are numerous gaps in the rulemaking that need to be addressed. [EPA-HQ-OAR-2018-0276-0081-A1, p.1]

Aviation is considered by many to be the fastest growing contributor to climate emissions in the world. As such, there has been little to no control or scrutiny because of lack of regulatory framework and the aviation GHG emissions are largely hidden from scrutiny. This is aided by the lack of data in previous FAA emission models and is not accurately reported in the current version, Airport Environmental Design Tool (AEDT). [EPA-HQ-OAR-2018-0276-0081-A1, p.1] [[See Docket Number EPA-HQ-OAR-2018-0276-0081-A2 for projected aviation emissions]]

[The following comments were submitted as testimony at the virtual public hearing on September 17, 2020.]

EPA knows that certification of individual new aircraft engines never considers the thousands of older, dirtier engines operating at a single airport site. EPA is aware that airports are producing thousands of tons of toxic and criteria pollutants at single airports annually and millions of metric tons of greenhouse gas emissions.

The AEDT model that EPA has certified for use by FAA dies not calculate greenhouse gas in a transparent manner. It truncates the emissions to part of the landing/takeoff cycle. So when airports decide to expand their operations, they provide a figure to the public of greenhouse gas emissions that is not accurate. It is not true to what the global impact is. So emissions are calculated locally for their ground-level impact on populations near the airport.

EPA is allowing FAA's AEDT model to calculate the global impact of greenhouse gas emissions from aviation in this same manner. This is wrong. And it should be addressed, and it should be changed.

The problem with ignoring site-specific impacts and allowing industry to hide their emissions keeps the dirty secret of aviation from scrutiny. And it doesn't allow local people, elected officials, and agencies, and educational institutions to have a clear picture of what is really happening in the global environment. This also leads to a continued increase of greenhouse gas emissions due to a lack of local regulation. The reason for that is because only the single engines are certified for use. Airports are not regulated as a source of emissions. So you might have individual reductions in single engines, but you won't have overall reductions at airports that are continually expanding their operations.

EPA needs to take a much stronger role in regulating the source of these emissions in communities. So I will say better projection in 2019 for SeaTac Airport, which I live by, had the emissions of toxic and criteria pollutants at 13,000 tons per year. It is the single largest producing facility of emissions in the State of Washington. And the greenhouse gas emissions are rivaling a coal-fired power plant.

Organization: Salim, Nadia

[The following comments were submitted as testimony at the virtual public hearing on September 17, 2020.]

The noise pollution here close to the airport is distressing for children, elders, and those suffering from certain medical conditions. The UFPs released are known to cause chronic pulmonary conditions, which can now acutely act as a COVID mortality risk multiplier.

Lastly, I am curious about the EPA's plan to work with local communities and neighborhoods that are affected by things like UFPs in partnership to mitigate the environmental impacts to us here locally. I couldn't find any information on this in the proposal, and I would be very happy to be directed to resources that reflect these commitments.

Organization: South Coast Air Quality Management District (South Coast AQMD)

Over 80% of our NOx emissions are from mobile sources – sources that we as a local air agency have limited authority to control. Aircraft emissions account for a significant and growing portion of the NOx emissions in the South Coast Air Basin, growing from 3% in 2012 to 6% in 2023 and 9% in 2031. They are expected to have an even greater share of NOx emissions in 2037 – the year by which we must attain the 2015 ozone NAAQS – due to the lack of sufficiently stringent aircraft emission standards and the projected growth in aircraft operations. [EPA-HQ-OAR-2018-0276-0144-A1, p.1]

We believe that there are a variety of technologies, operational practices, and fuels feasible today that can yield NOx emission reductions that EPA should evaluate. We therefore urge EPA to consider more stringent standards that are feasible and necessary to further reduce NOx, which will be critical for meeting the upcoming ozone standards in our region as well as in other ozone nonattainment areas. [EPA-HQ-OAR-2018-0276-0144-A1, p.2]

Organization: Uribe, Daniela and Molnar, Timothy

Standards Should Include Ultrafine Particulate Matter [EPA-HQ-OAR-2018-0276-0156-A1, p.13]

Organization: Washington State House of Representatives

[The following comments were submitted as testimony at the virtual public hearing on September 17, 2020.]

we have had studies done at the University of Washington looking at ultrafine particles. And they really are showing a footprint around airports of these concentrated particles, which are so small that they enter the lungs, they pass the blood-brain barrier, they are not only outdoors, but they are in indoor concentrations. And Boston Logan is showing that. So we really hope that you really expand pollution caused by jet A fuel so that when we are creating these new aircrafts and procedures, that we can have the greatest impact.

Again, I think a lot of this work that you are doing and doing with the FAA is so important. Airport communities are really impacted by this pollution. And, as you can imagine, we have COVID, we have airport pollution, we have smoke pollution. And it is pretty overwhelming. And, of course, all of those things cause inflammation in the body. So, again, the work you are doing is so critical to the health and wellbeing of our country, of our planet. And we just really hope that you can really help move us forward as we really address global warming, as we address the health impacts that this is having on our country and especially airport communities.

Organization: Zamore, Wig

[The following comments were submitted as testimony at the virtual public hearing on September 17, 2020.]

I would additionally point out with that that we do our epidemiology and our analysis of pollutants on a 20-meter by 20-meter by 8,760 hours per year. So it is much more spatially granular than any of the PM2.5 science-based studies. We find no variation in PM2.5 at all consistent with our ultrafine particle gradients and our cardiovascular inflammation gradients. And that is relevant to COVID and the environmental justice communities. PM2.5 is an incredibly important global and regional pollutant and health driver. It does not drive the health of people next to highways or next to airports. There is no gradient there to speak of.

So beyond that, what I want to point out is that many of the airports, including Logan, are not counting environmental impacts above 3,000 feet. So, notwithstanding that Logan burns 20 million gallons on the tarmac and 20 million gallons in the first 3,000 feet, up to 90 percent of climate impact of aviation is above 3,000 feet. Somebody has to direct the major metropolitan airports and their operators to include 100 percent of the climate pollutants and impacts. And, you know, it can be 50 percent on either end, arrival and departure airport. But right now, most of it is being ignored in the environmental, in the former environmental filings here.

Why not ask for 100 percent offset of climate pollutant impact and then work with the communities and with the overseers at the state and Federal level and the airport operators and aviation industry on how to get that offset?

Response:

The EPA is aware of the wide range of regulatory and other approaches that could result in reductions in the GHG and other emissions from aircraft, including the approaches raised in the comments found above in this section of the Response to Comments. The NPRM proposed GHG standards for newly produced engines on new-type and in-production aircraft. The actions suggested in the comments in this section, including the untimely comments regarding the basis for the 2016 Findings that triggered EPA's duty under CAA section 231 to propose and promulgate aircraft engine GHG standards, are outside the scope of this rulemaking. Therefore, these comments are not addressed in this document.