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Issue Paper

Lead Time Requirement for an Evaporative Emission Standard of 2.0 g/test for Light Duty Vehicles and Trucks

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Lead Time Requirement for an Evaporative Emission Standard of 2.0 g/test for Light-Duty Vehicles and Trucks

1. Statement of the Problem

Is the implementation of a nationwide 2.0 g/test evaporative emission standard for light duty vehicles and trucks feasible for the 1980 model year?

2. Facts Bearing on the Problem

a. In response to California's request for waiver with respect to 1977 evaporative emissions, several automotive manufacturers submitted information in regards to lead time requirements for a 6.0 g/test standard. Information submitted by GM is contained in the Appendix as Attachment 1, and information submitted by Ford is contained as Attachments 2 and 3 of the Appendix. This information, along with lead time considerations submitted by Chrysler and AMC, is summarized and presented in Table I. Major events in the vehicle certification schedule are also indicated. Table I has been constructed with the assumption that an evaporative standard will be implemented with the 1980 model year. Lead time requirements are then based relative to start of 1980 model year engine production.

b. In their comments to the evaporative NPRM, manufacturers did not submit detailed lead time information in regards to implementation of a 2.0 g/test standard.

3. Discussion

a. Table I compares the lead time requirements of the four largest U.S. manufacturers in regards to a SHED evaporative standard implementation for the 1980 model year. The manufacturers agree quite closely in regards to the tooling time needed for making carburetor vent changes. This lead time, which varies from 10 to 12 months, includes both internal and external vent modifications. Beyond the carburetor vent changes, Ford indicated in May 1975 (Attachment 2 of the Appendix), that they need to make major changes to their model 2700 carburetor. These tooling changes have already been made for compliance with the 6.0 g/test standard. It is anticipated that lead time for carburetor vent modifications is the longest tooling lead time requirement for a 2.0 g/test standard.

In May 1975, Ford also indicated that they would need to use EGR cooling, requiring a tooling lead time of 22 to 24 months, to meet a 6.0 g/test evaporative standard. However, Ford has complied with the 6.0 g/test standard without EGR cooling and it is not expected to be used in their 2.0 g/test systems.

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(1) "Comments in Response to the Notice of Proposed Rulemaking, published in 40 Fed. Reg. 2022 et seq., dated January 13, 1976," Ford Motor Company, February 27, 1976.

The manufacturers also agree reasonably well on the time required for the production design, development, and testing before tooling can begin. The estimates for the 3 largest manufacturers, as shown in Table I, range from 7 to 9 months.

Prior to the production design, development and testing, the hardware to be used on each vehicle-engine combination must be defined. Since many 1978 emission certification vehicles and several modified vehicles have given evaporative test results of less than 2.0 g/test, the technical feasibility of producing vehicles to meet this level has already been demonstrated[2,3]. Defining the required hardware for all vehicles will be a process of applying the current technology to attain an effective system for each vehicle-engine combination.

The amount of additional time required for defining the hardware is dependent on several factors. Perhaps the major factor is the quantity and quality of evaporative emission control work which has already been done by the manufacturers. Since a SHED evaporative standard of 6.0 g/test was implemented for the 1978 model year, all manufacturers have already defined, designed, and tooled hardware for the 6.0 g/test standard. This has developed much information which can be applied to defining hardware for a 2.0 g/test standard.

GM, Ford and Chrysler have supplied the EPA with a sizable amount of data from evaporative emission testing of various control system configurations. Each of these three manufacturers have tested systems which gave below 2 g/test (described in reference (3)). In addition, vehicles modified and tested by Exxon Research and Engineering under Contract No. 68-03-2172 (reference (2)) gave test results of less than 2 g/test, and many 1978 certification vehicle test results were under 2.0 g. So the hardware required for several vehicle-engine combinations has already been defined. Continuing effort will be required to determine which specific combination of hardware will be effective for other vehicle-engine combinations. Although it is not expected that costly modifications will be required, it will take some time to determine which modifications are necessary.

Another important consideration in lead time requirement is cost of the control system. If an inadequate period of time is allowed for defining the hardware, the control system may be more complex and cost more than necessary.

b. Because of essentially non-existent lead time estimates from the manufacturers for a 2.0 g/test standard, the above analysis was based on manufacturer lead time estimates for a 6.0 g/test standard.

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(2) Clarke, P.J., "Investigation and Assessment of Light Duty Vehicle Evaporative Emission Sources and Control," Exxon Research and Engineering, EPA Contract #68-03-2172, May, 1976.

(3) "Technical Feasibility of a 2 g/test SHED evaporative Emission Standard for Light Duty Vehicles and Trucks, Issue Paper by Michael W. Leiferman, U.S. EPA, Ann Arbor, Michigan, June, 1976.

If additional carburetor changes are necessary for the 2.0 g/test standard, the tooling lead time for this modification should be no greater than for the 6 g/test standard. Assuming that carburetor machining changes will require the longest tooling lead time of all equipment changes, tooling will need to begin by about June 1978 as shown in Table I.

Automotive manufacturers have estimated that production design, development and testing for a 6 g/test standard must begin 7 to 9 months before tooling can begin. Due to the increased difficulty of meeting a 2.0 g/test standard, it would be expected that, without any prior SHED test work, this phase of the program would take longer than 7 to 9 months. However, with implementation of the 6.0 g/test standard, considerable experience has been gained by the manufacturers in regards to designing systems to comply with a SHED test procedure. Considering this prior experience, it is believed that a production design and testing time of 7 to 9 months prior to hardware tooling for a 2.0 g/test standard is reasonable.

Based on lead time estimates for tooling and production design, development and testing, the date by which the manufacturers must have defined carburetor changes is determined. As shown in Table I, a new test standard for the 1980 model year would require that GM, Ford and Chrysler have defined these changes by October 1977, November 1977, and January 1978, respectively.

It is also informative to view lead time relative to the rulemaking time table. In the event that carburetor changes are needed, most manufacturers must have defined the hardware prior to expected rule promulgation (March, 1978).

C. Status of Manufacturers as of November, 1977.

On January 13, 1976 the Notice of Proposed Rule Making for both the 6.0 and 2.0 g/test standard was published. When final rule making for the 6.0 g/test standard was published (August 23, 1976), the original regulatory action was divided into two separate rule making actions. The August 23, 1976 publication stated that "final rulemaking for a longer term evaporative emission standard is presently being considered" and the 1978 standard will remain in effect for subsequent model years "until revised". These and other statements in the August 23 publication (as well as discussions between manufacturer and EPA representatives which followed) enforced the EPA's position that a standard less than 6.0 g/test was being developed and would be promulgated when some issues regarding its implementation were resolved. It was assumed that the manufacturers would make valuable use of the additional lead time, since they had stated in comments to the NPRM that more effective control equipment needed to be designed and developed in order to meet a 2.0 g/test standard.

At a EPA hearing in May, 1977 regarding California's request for waiver of 2.0 g/test standard (with a 1.0 g/test allowance for non-fuel emissions from data vehicles) in 1980, only three manufacturers (AMC, Ford and GM) presented information concerning their development efforts to achieve low evaporative levels. Considering the imminence of both California and Federal regulations more stringent than the 6.0 g/test standard, the level of effort by most manufacturers was not as high as anticipated. The level of effort and current status of some of the largest manufacturers are discussed below:

Ford - They basically supported the California request for waiver of a 2.0 g/test evaporative emission requirement in 1980. At these waiver hearings Ford presented test results from a program aimed at identifying the source of and eliminating HC emissions from carburetors. Their aggressive effort and success in developing effective evaporative control system is demonstrated by the fact that 61% of the valid certification tests on Ford's 1978 certification vehicles (conducted at EPA's Ann Arbor facility) gave results below 2.0 g. Ford is currently confident that about two-thirds of their present vehicles will meet a 2.0 g/test requirement with two modifications--(1) improved sealing and gasket materials and (2) improved canister purging. They also expect these two modifications to be adequate for the remaining one-third of their vehicles; however, this hasn't yet been determined[4]

GM - They favored a nationwide standard in 1981 as opposed to a California 2.0 g/test standard in 1980. They stated that a 2.0 g/test standard was not technologically feasible for the 1980 model year. Their lack of aggressiveness in developing 2.0 g/test control equipment is demonstrated by the fact that Rochester Products did not start working on the carburetor leak problem until this year (1977). Because of the slow pace in development, GM has now stated that 20 months time is required for them to obtain some of the equipment (air cleaner containing activated carbon) which is needed to meet a 2.0 g/test standard.[5]

Others - AMC presented a small amount of data at the California waiver hearing and stated their dependency on the carburetor manufacturers for a "leak-proof" carburetor. Little or no information has been submitted by any other manufacturers since comments to the NPRM; and consequently their status in regards to lead time for a 2.0 g/test evaporative standard is not known.

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(4) Information obtained in a phone conversation on October 19, 1977 with Donald Buist, Executive Engineer for Certification, Ford Motor Company.

(5) EPA Memorandum to the File entitled, "Meeting with General Motors Concerning Lead Time Necessary for Implementation of a 2.0 g/test Evaporative Emission Standard for Light Duty Vehicles and Light Duty Trucks," November, 1977.

Conclusion

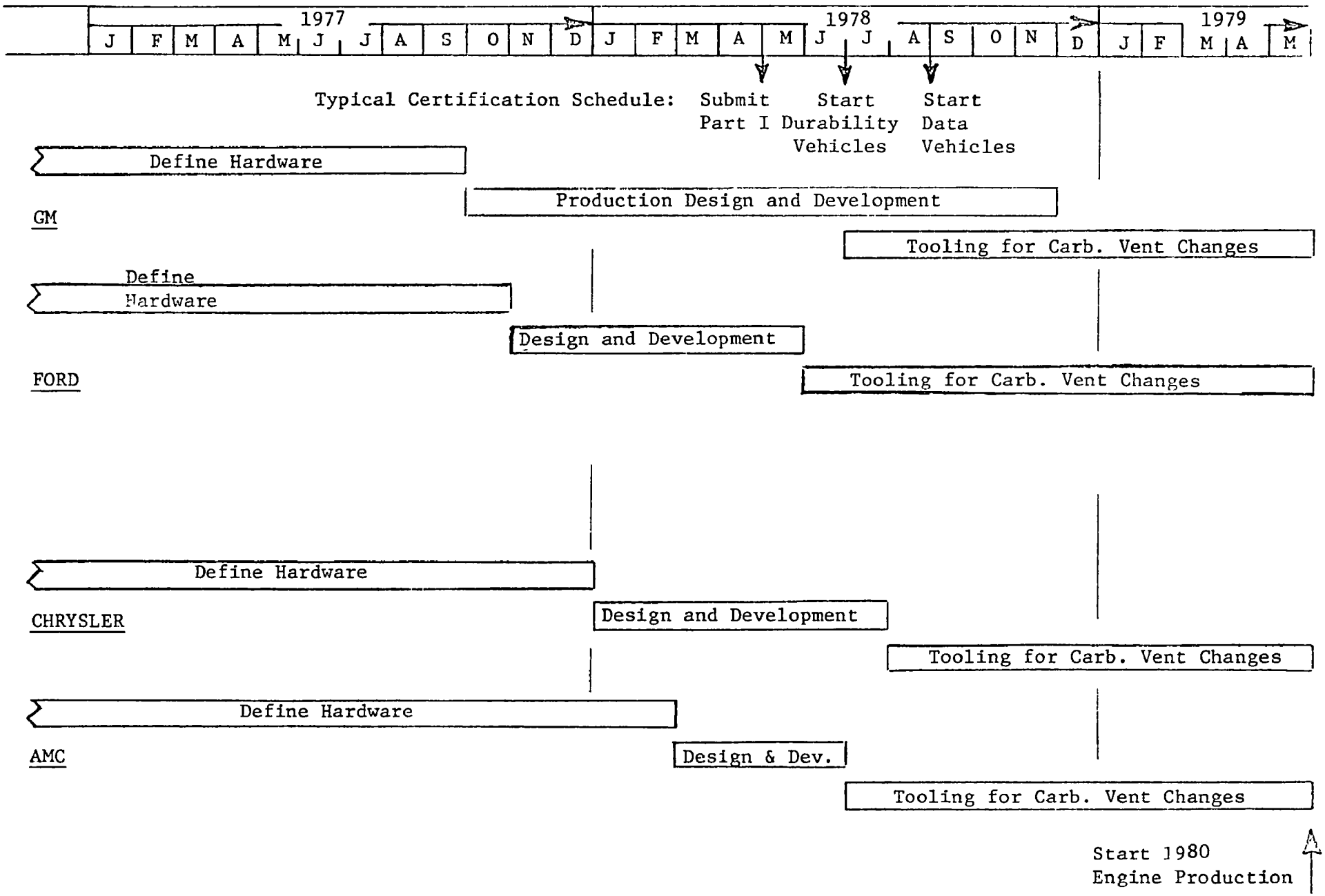
Although some manufacturers may have little trouble meeting a 2.0 g/test requirement in 1980, others have made such little constructive development effort that they would be faced with a high degree of risk if such a standard were promulgated. In retrospect, if any lesson can be learned from the development of the 2.0 g/test evaporative package, it is that delaying rule promulgation to give manufacturers requested time for development of control systems is an ineffective way of reducing emissions.

If, as one manufacturer stated, 20 months lead time is now required to obtain the necessary control equipment, a 1981 implementation date would provide the necessary time for hardware design and tooling. A 1981 implementation date may also result in the use of some control system components which would be more cost-effective and more durable than those which might be used for 1980. For example, a 1981 implementation date would hopefully allow manufacturers time to develop hot soak control measures which will not require the use of equipment which needs periodic replacement, such as engine air filters.

4. Recommendation

It is recommended that the proposed 2.0 g/test evaporative standard be promulgated for the 1981 model year.

Table I. Lead Time Considerations for a New SHED Evaporative Standard in 1980

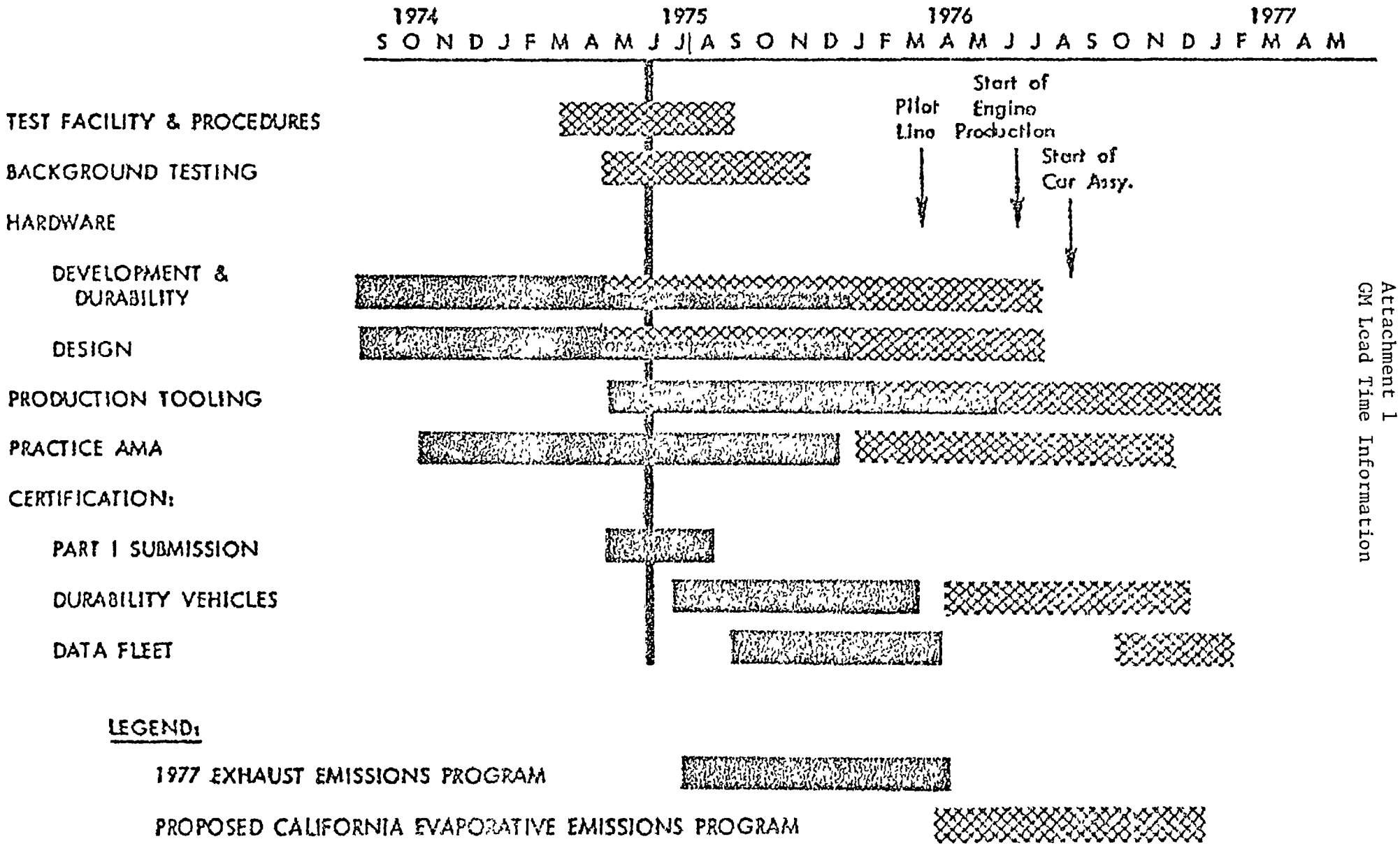


APPENDIX

Lead-time Information Submitted by
Automotive Manufacturers in Regard to the
California Waiver Request for a
6 g/test Standard in 1977

ATTACHMENT 2

1977 EMISSIONS PROGRAM



Attachment 1
GM Lead Time Information

Attachment 2
Ford Lead Time Information

The impact of the tooling lead time is summarized by passenger car engine family in the following table:

Engine	Carburetor Lead Time Series/Months	EGR Cooler 22-24 Months	Fuel Tank 11 Months
2-3L I-4	5200 / 12	Not required	x
2.8L V-6	2700 / 18	Not required	x
200 CID I-6	YFA / 12	Not required	x
250 CID I-6	YFA / 12	x	x
302 CID V-8	2700 / 18	Not required	x
351W CID V-8	2150 / 12	Not required	x
351M/400 CID V-8	2150 / 12	x	x
460 CID	4350 / 12	x	x

1977 SHED TEST
CONTROLLING COMPO[illegible]T TOOLING TIME
(EXCLUSIVE OF CONCEPT FEASI[illegible]LITY AND PRODUCTION DESIGN)