



## Project Summary

# A Computerized Bibliographic Literature Information System for Total Human Exposure Monitoring Research

Michael Dellarco, Wayne Ott, Lance Wallace, and Herb Hunt

The Bibliographic Literature Information System (BLIS) is a computerized data base that provides a comprehensive review of available literature on total human exposure to environmental pollution. Brief abstracts (often condensed versions of the original abstract) are included; if the original document had no abstract, one was prepared. Unpublished reports are listed, as well as final reports of the U.S. Government and other countries, reports by governmental research contractors, journal articles, and other contributions to the field of total human exposure research. This bibliography covers publications on exposure models, new field data, and newly emerging research methodologies. Although the bibliography covers the entire field of human exposure methodology, emphasis is on those field studies measuring all the concentrations to which people may be exposed, including indoors, outdoors, or in-transit. This report lists the 788 full abstracts and all keywords contained in the BLIS system as of fall of 1987. The 788 abstracts provide a good representation of much of the world literature on total human exposure and indoor air quality. The time period covers 1962 to the end of 1986, with only a few abstracts from early 1987.

Versions of this data base are available on floppy diskettes that can

be accessed on IBM-compatible personal computers. Different versions are available that will run on either a floppy disk or on a hard-disk system. These computer programs can search for abstracts rapidly and print out desired combinations of literature citations and full abstracts. In practice, these abstracts can serve the user as an "automated index" of the BLIS data base on total human exposure and indoor air quality.

*This Project Summary was developed by EPA's Office of Acid Deposition, Environmental Monitoring and Quality Assurance, Washington, DC, to announce key findings of the research project that is fully documented in a separate report of the same title (see Project Report ordering information at back).*

### Introduction

Total human exposure monitoring is a new concept that seeks to determine, with known precision and accuracy, the pollutant concentrations actually reaching people through food, water, and air, whether people are located indoors, outdoors, or in-transit. Such monitoring provides the key information needed to protect public health and to make risk assessments through representative samples of the general population. This new field also includes:

- Surveys of human activity patterns;

- Models designed to predict human exposures from activity;
- Studies of the pollutant concentrations found in the microenvironments that people visit, such as in-transit vehicles and indoor and outdoor settings.

The emergence of this new topic over the last two decades as a cohesive scientific field has been accompanied by a rapid growth in the scientific literature. To facilitate access to this literature, the U.S. Environmental Protection Agency (EPA) developed the Bibliographical Literature Information System (BLIS) to assist managers and scientists responsible for planning total human exposure research. BLIS currently consists of a data base of 788 abstracts of journal articles, reports by contractors, and other scientific documents up to February 1987. The entire data base can be transported on 5.25" floppy diskettes, and the BLIS program runs on an IBM-PC/XT or equivalent to retrieve, search, and print out these abstracts efficiently. One version of this program, BLIS II, requires only a single disk drive, while a second can be installed on a hard disk drive, requiring about 1.3 megabytes of disk space.

### Design Criteria

BLIS was designed to meet the following criteria:

- Is user friendly; no personal computer (PC) experience and no written manual.
- Uses programming in the public domain; proprietary commercial programs need not be purchased.
- Is completely portable; uses standard floppy disks.
- Changes drives to accommodate different data bases and PCs.
- Employs Microsoft Disk Operating System (MS-DOS) file management capabilities. Individual files or groups of files may be copied using DOS.
- Can be used with all PC clones.
- Abstracts, files, and keywords, entirely in American Standard Code for Information Interchange (ASCII) text. (Any text editor can be used on the data base.)
- Does not restrict size of abstract files.
- Provides well written, easy-to-understand abstracts of the scientific literature.
- Allows printing of reference and/or full abstracts.
- Automatically lists all references or citations alphabetically with automatic generation of page numbers and an index.

- May be string searched for any keyword quickly, with slower full-text search capability available.
- Provides high speed keyword search. Uses arrays where possible to achieve Random Access Memory (RAM) high speed search (for example, 150+ abstracts/second).
- Provides alphabetical list of authors and a keyword search list which can be called up to assist the user.

### File Structure Requirements

The file structure is intended to be compatible with virtually every word processing package as well as scores of other programs that can import ASCII files without control characters. Each citation is contained in a separate file easily located by use of the BLIS reference number within the file name.

### Development of the Data Base

BLIS was designed to accommodate only studies of human exposure to environmental pollution. The aim was to construct a comprehensive bibliography consisting of human exposure, and studies of sources of indoor pollutants or exposures.

BLIS emphasizes studies in which pollutants were observed in contact with members of the general public rather than specific occupational groups. BLIS includes all pollutants and categories of pollutants except asbestos. Because of the extensive data bases already available on radon, the literature in BLIS on radon is not complete.

Five key journals were scanned as sources for BLIS:

- *Environmental Research*
- *Environment International*
- *Environmental Science and Technology*
- *Journal of the Air Pollution Control Association*
- *Atmospheric Environment*

Other sources of materials were the proceedings of pertinent conferences and symposia, two bibliographic reviews on indoor air quality, and reports, both published and unpublished, from EPA and other federal agencies.

After approximately 400 abstracts were entered into BLIS, a report was prepared listing these abstracts. This report was sent to many of the authors with a letter requesting that they review the 400-abstract manuscript for its accuracy and send additional articles and reports that should be included. Replies were received from the U.S., Denmark, Germany, Japan, the Netherlands, Switzerland, and Yugoslavia. Most re-

spondents had favorable comment about BLIS and nearly all reviewers included additional articles or citations for inclusion in BLIS. All of these articles along with many others, were entered into the system to give the 788 abstracts currently comprising the data base.

One of the most important considerations in the development of BLIS was the criteria establishing keyword search capability. Keywords are relevant to indoor air and total human exposure. They are single words; no combinations are used. Keywords include cities, pollutants, foreign nations, and a great variety of nouns and adjectives.

Citations, abstracts and keyword were edited by a scientific reviewer and a professional technical editor to ensure uniform quality control and concise comprehensive abstracts.

BLIS was developed in two versions:

- Floppy Version - "BLIS II" is for users without a hard drive. It consists of seven disks: a main program disk and six data base disks covering 196 through Feb. 1987. BLIS II requires a single 5.25" disk drive, 256K of memory, and DOS 2.0 or higher. BLIS II is limited to accessing 999 abstracts.
- Hard Disk Version - "HIGHBLIS" allows users to search the entire data base at one time. All years of data are searched as a combined group of files. This version fits on 10 diskette and requires about 1.3 megabytes of disk space. HIGHBLIS must be installed on a subdirectory called "C:\HIGHBLIS" to be operational. HIGHBLIS theoretically has the ability to access up to 9,999 abstracts.

Both versions of BLIS presently contain 788 abstracts. Because of the number of abstracts that can be printed out efficiently, a laser or other high speed printer is very helpful.

A report is being prepared describing the BLIS system and data base, including a full listing of the 788 abstracts and literature citations currently in BLIS. Copies of this report will be made available from both the Environmental Protection Agency and the National Technical Information Service.

Currently a mechanism is being explored for distributing the BLIS software and its data base on floppy diskettes. The software is in the public domain and is available for a reasonable fee covering duplication and handling charges from:

Herb Hunt  
PrograManagement Systems  
Suite 100

1377 K Street, NW  
Washington, DC 20005

## Using BLIS

Perhaps the easiest way to understand the BLIS software functions is to illustrate a typical use of the system: With the floppy version (BLIS II), the user inserts the main disk into one of the disk drives and types "BLIS II." A welcome banner identifies the system and its authors and asks the user to "press any key to continue." The next screen instructs the user to place the disk for the "years of interest" in the disk drive and "press any key to continue." Six functions are available on the BLIS main menu of options: Set Up Printer, Display System Author List, Search for Specific Author, Search Abstracts for Keywords, Return to Menu, and Search Every Word in Every Abstract.

Assuming the user wants to perform a keyword search for information coded in BLIS, option 4 would be the main menu option choice. The system instructs the user to use standard chemical nomenclature (i.e. Fe, CO, NO<sub>2</sub>) and notes that all keywords are in lower case except acronyms and proper names.

Suppose the user searches for the keyword "model" in the 1984 volume of BLIS. After entry of the word "model," BLIS reports 33 matches found out of 189 abstracts searched in the year 1984. The 33 BLIS II abstract reference numbers (3-digit codes) appear at the top of the screen. Sub-options then permit the user to search for a new keyword, display or print the citations or abstracts associated with the found keyword, or return to the main menu.

If the user specifies option 4, BLIS prints the screen displayed citation, keywords, and the full abstract alphabetically, by author.

In the future, the following enhancements to BLIS will be fully explored:

- Expanding the data base by increasing the number of abstracts.
- Further refining the keywords to improve search capabilities.
- Improving the speed of HIGHBLIS searches by using larger arrays.
- Making HIGHBLIS available to IBM System 2 users.
- Investigating high-density storage media such as CD-ROMS (Compact Disk - Read Only Memories).

EPA participates in the Human Exposure Assessment Location (HEAL) project, an effort sponsored by World Health Organization (WHO) designed to improve the quality of human exposure

data collected globally. Technology transfer and training are important components in the establishment of HEAL. Not all of the participants are actively involved in total human exposure monitoring and must familiarize themselves with the theory and practice of this emerging field.

BLIS has received a favorable reception in WHO and among several of the participants. In the future, it may serve not only as a central repository for technical information and past studies concerning human exposure monitoring but also may be appealing because it is easily transportable to foreign colleagues. For those countries where English is a second language, BLIS may be especially useful because it can be queried to produce only those citations which are immediately relevant to the issue at hand. This would facilitate retrieval of technical reports and minimize translation costs to only those studies deemed necessary for particular HEAL studies. Currently, officials in WHO headquarters, Geneva, are evaluating the utility of BLIS for transferring information to member states.

## Conclusion

BLIS currently is built on the total human exposure and indoor air quality literature and can be adapted to other topics. BLIS demonstrates that today's personal computer can be used as a literature searching tool to assist researchers and officials seeking information on projects that may not yet be published in the scientific literature, as well as papers given at scientific meetings and articles in journals.

The BLIS approach is especially suited to emerging new scientific fields, such as total human exposure, where the literature is not yet too voluminous. At the present time, the authors believe that the 788 abstracts in BLIS represent a substantial fraction of the world's literature on human exposure to environmental pollution (excluding radon and asbestos) up to February 1987, the date the last abstract was entered. In 1988, they plan to add about 300 more abstracts to the system. At present, no decision has been made about expanding the data base beyond 1988. If the data base expands, it might be useful to explore CD-ROMS as the system storage medium.

By following a design concept of "maximum compatibility" with all other software and word processors that use DOS, the system and its data base are extremely flexible and easy to use. The

system is ideally suited to "technology transfer" activities that seek to educate personnel about rapidly emerging fields. In its current form, BLIS, and the report developed from it, can help promote a wider understanding of the many advances that are being made in total human exposure monitoring research and will facilitate improved communication among federal, state, and local governments, universities and private consulting firms, and foreign countries.

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**The complete report, entitled "A Computerized Bibliographic Literature Information System for Total Human Exposure Monitoring Research," (Order No. PB 88-250 360/AS; Cost: \$38.95, subject to change) will be available only from:**

**National Technical Information Service  
5285 Port Royal Road  
Springfield, VA 22161  
Telephone: 703-487-4650**

**The EPA Project Officer can be contacted at:  
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