

Department of Transportation
Maritime Administration

Development of a Maritime Human Factors Bibliographic Database

**Final Report
March 1996**



Texas A&M University at Galveston

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Human Factors Cooperative Research Program

This report was prepared under the Human Factors Cooperative Research Program between the Federal and State Maritime Academies and the U.S. Maritime Administration. The purpose of the Program is to assist the maritime industry by identifying and performing needed research and development in maritime-related human-factors areas, utilizing the substantial expertise of the faculties and students of the state and federal maritime academies.

Institutional members of the Cooperative are:

**California Maritime Academy
Great Lakes Maritime Academy
Maine Maritime Academy
Massachusetts Maritime Academy
State University of New York Maritime Academy
Texas A&M University at Galveston
United States Merchant Marine Academy
U.S. Maritime Administration**

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I would also like to express our appreciation to the library personnel and researchers associated with the following: the Technical Reference Center, John A. Volpe National Transportation Center; Barker Engineering Library, MIT; U.S. Coast Guard Research and Development Center; Massachusetts Maritime Academy; Institute of Transportation Studies Library, California; California Maritime Academy; University of California-Berkeley; U.S. Merchant Maritime Academy; Marine Safety International/CAORF, National Maritime Research Center; State University of New York Maritime College; International Maritime Organization (IMO); The Nautical Institute; Texas Transportation Institute, Texas A&M University; and Jack K. Williams Library, Texas A&M University at Galveston.

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1.0 EXECUTIVE SUMMARY

A Maritime Human Factors (MHF) Bibliographic Database of 420 fully verified and abstracted citations has been developed to support research benefiting the maritime industry. The bibliography contains references to major categories of maritime human factors research, such as: effects of automation, manning/personnel issues, organizational factors, safety, simulation, navigation, regulations/laws, education/training, human factors engineering (ergonomics), human performance (fatigue, physical/psychological effects), and communication (person-to-person and man-machine). The primary emphasis was on the maritime transportation industry; however, other modes of transportation, such as aviation, are included where applicable. The bibliography covers the period from 1990 to 1995 and certain references which are considered "classics" from earlier periods. The bibliography was designed for electronic searching of eighteen fields of information, including: title of reference, journal title, individual author, subject and abstract. A focused resource review and input from a user survey of academy faculty were the basis for development of this MHF Bibliographic Database.

2.0 INTRODUCTION

2.1 Purpose

The Human Factors Cooperative Research Program with the Federal and State Maritime Academies and the U.S. Maritime Administration has the purpose of assisting the maritime industry by identifying and performing needed research and development in maritime human factors areas, utilizing the substantial expertise of the faculties and students of the state and federal maritime academies. One of the priorities for the first year was to conduct a comprehensive literature search of maritime human factors research and to develop an electronic bibliographic database.

This report documents the results of the FY 1995-1996 project entitled, *Development of a Maritime Human Factors Bibliographic Database*¹. The purpose of this project was to develop a quality bibliographic database supporting the cooperative research goals of the Program. Accordingly, the following tasks were completed during this first year: a user survey; a selected resources review; database design, creation and demonstration; user-interface development; and updating process development.

2.2 Background

Human factors have been found to be the direct or contributing cause in some 80 percent of accidents across all modes of transportation and related industries. Proper application of human factors principles is critical to achieving safety, reducing potential for pollution, and assuring efficiency of operations. The maritime industry is operating in a time of change, of tremendous advances in technology and of fierce competition among seafaring nations. This is a time when human factors must be a key component to achieving safe and economically sound operations, requiring new understanding and careful consideration of changes being experienced.

The federal and state maritime academies are an excellent environment for research in this human factors area. Experienced faculty, enthusiastic students, training technologies such as state-of-the-art simulators, and communication technologies such as the World Wide Web (WWW), are just a few of the significant research resources available at the academies. Faculty bring both industry and academic experience to the research effort. Researching new methods or solutions to help industry meet today's challenges tends to be a highly motivating experience for students and faculty alike. Moreover, many of the possible changes needed in the industry may be best introduced during the academy educational process.

¹ This project was previously referred to by the title, *The Research and Development of a Maritime Related Human Factors Bibliographic Database*.

3.0 USER SURVEY - Summary

3.1 Introduction

The purpose of the user survey was to identify the target user group -- United States maritime academy faculty -- their information needs, the tools at their disposal presently and their recommendations regarding database design and content. Although the survey process focused on the academies, the survey results serve not only the educational and research needs of the academies, but transfer well to industry and governmental efforts in the arena of maritime human factors. Moreover, focusing on the maritime educational component effects change in industry through early education and cultivation of attitudes considered critical to making improvements in operational safety.

A summary report on the user survey is presented in this section. For additional detail, refer to the Survey Data and Discussion section, Appendix 1.

3.2 Survey Design and Distribution

The survey instrument was designed with input from potential survey respondents and according to experience gained from similar survey projects (Refer to Appendix 2 for the survey instrument). In all, 208 surveys were distributed starting in May 1995. An initial deadline for receiving completed surveys was June 1995 and was later extended to September 1995, to accommodate academy schedules.

3.3 Significant Results

Response Rate With 40 surveys received by the initial June deadline, a response rate of 19% was initially achieved. By September 1995, the total number of surveys received was 61, giving us a final response rate of 29%. This is considered a good response rate for a mailed survey. Response rates by school vary within a range of 17% to 52%, with the majority closer to the average of 29%. These rates reflect a significant level of academy faculty participation in this project.

Survey respondents' interests/experience/research activity Given eleven maritime human factors subject categories, the subject which garnered the most responses overall was education/training, followed by simulation, manning/personnel, automation and safety. Academy faculty indicated involvement in active research in all eleven categories, with the top five being -- education, simulation, communication, manning/personnel and organizational factors.

Availability of maritime human factors data/information/publications Approximately half of the respondents noted materials that they were having difficulty locating. It was found that for some areas of research, there was a lack of research and/or lack of published results. Another significant aspect of availability was further verified during this project, and that is the existence of

extensive maritime human factors data and information outside of the United States. Repeatedly, researchers shared the need to develop relationships with these international sources in order to improve access to critical data and information. These needs were specifically addressed by this project; thus, materials concerning such topics as current ECDIS information, IMO resolutions and simulator training and evaluation, for example, were uncovered, acquired and cited, where possible.

Regarding availability of maritime human factors materials at each of the academy's libraries, 43% of the respondents indicated that they were finding 50% or more of these materials in their campus libraries. 57% indicated that they were finding less than half. These results verified an hypothesized condition of related library collections -- budget restrictions have caused limited development, thereby increasing the need for and use of "shared resources" among lending sources. This situation increases the need for concentrated efforts to acquire maritime human factors publications and make them available to all of the academies' faculty.

How do faculty locate information they need? The survey requested respondents to mark up to two places where they locate information. Survey responses indicated that the predominant (57%) method of locating information is the traditional one -- personal contacts or collections. Computerized filing/catalog systems were used by 46%, while network accessible data/information is being used by 34%.

Availability and use of computer equipment and computerized information resources Practically all, 98%, of the respondents indicated that they had access to a personal computer. Although more than half of the respondents indicated that they have connections to a campus or departmental network and/or the Internet, it is important to note that some schools do not have such connections, or if they do it is only at a centralized location, such as a library. Information resource use statistics indicate that faculty are more likely to use those resources readily available to them.

Search strategy preferences Respondents indicated that their top five preferences for search strategies included: searching by subject (89%), title (52%), individual author, journal title, and abstract, at (39%). This information was directly utilized in database and user-interface design.

4.0 SELECTED RESOURCES REVIEW

4.1 Introduction

A resource review was performed to obtain an in-depth understanding of what MHF research and information exists, and how best to improve access to this body of work. Catering to dual research needs of access to the most recent information and knowledge of the classic publications in a field, an emphasis was placed on obtaining references to publications dating from 1990-1995, as well as identifying "classics" in the field, which might be considerably older.

All MHF bibliographic database citations were based upon references which were fully verified, with an emphasis on accuracy of information instead of quantity. Due to accessibility factors, the majority of references are for publications located in private, public and government collections in the United States. Therefore, the dominant geographic focus for the Selected Resources Review was the United States, although it is understood that there are considerable MHF research resources to explore outside the United States.

For a few priority publications contact outside of the United States was attempted. For example, one of the publications acquired and cited was the original German version and the English translation of the report, The German Ship of the Future. In addition, several publications were reviewed and obtained from The Nautical Institute, London, during a non-project-funded trip to Great Britain, where a wealth of pertinent resources exist.

The subject of the resource review was the maritime transportation industry and those human factors elements which, when well understood and applied, improve safety and productivity. The human factors parameter was further divided into the following eleven areas: effects of automation; manning/personnel issues; organizational factors; safety; simulation; navigation; regulations/laws; education/training; human factors engineering (ergonomics); human performance (fatigue, etc.); and communication (person-to-person and man-machine). The maritime transportation industry parameter was further defined to exclude research in the offshore industry, shipyards, refineries, stevedoring, fishing industry, recreational boating, and the military. Where human factors research in these areas was directly applicable to the maritime transportation industry, it was included. For example, certain vision and fatigue studies conducted by the U.S. Coast Guard were included.

Resource reviews conducted during this project indicated that MHF research efforts in the United States have occurred only recently -- during the past twenty to thirty years as compared to the age of the industry². Also, there are many human factors areas for which there is limited maritime information, if any at all. Research and information from other modes of transportation and their corresponding industries have been included for the purpose of technology transfer and are considered a key to full and effective development of useful research tools for our industry.

² Refer to Appendix 3 for the publication date analysis of a DIALOG bibliographic database search.

4.2 Process

In order to cover as completely as possible this relatively new focus on maritime human factors, the Selected Resource Review task ran simultaneously along several courses. From discussions with several researchers and review of the Draft Charter for the Human Factors Research Program with the Federal and State Maritime Academies, the previously described subject focus was developed. Resource review efforts were guided and monitored using this subject focus.

The Resource Review consisted of the following efforts:

- 1) Electronic database searches - DIALOG (TRIS), several library catalogs, CD-ROM, and FirstSearch / OCLC (library holdings worldwide)
- 2) Identification and review of journals and conference proceedings for production of citations, at the article or paper level
- 3) Review of print bibliographies / indexes / reference lists
- 4) Research visits to academic, government and private library collections
- 5) Contact with maritime academy faculty, with researchers in this field, and with librarians and information specialists
- 6) User Survey

A DIALOG search was produced by Mr. Pollard of the Volpe Transportation Center, using the Transportation Research Information Services (TRIS) DIALOG file 63 for the years 1970 - 1994 October. Refer to Appendix 4 for a description of TRIS. A printout of the resulting 270 references was reviewed by the project with two main purposes in mind: 1) identification of specific publications for acquisition and review, and 2) identification of journals and proceedings for acquisition and review.

The identified publications were then searched for availability information using FirstSearch, an Internet-accessible database of library holdings worldwide. A portion of the publications were then requested through Interlibrary Loan. The remaining references were organized by library, then publication date, for use during academy and resource visits scheduled for later in the summer and fall. During use of the FirstSearch database, additional publications (not found in the DIALOG search), were identified and added to the resource review process.

For the purposes of on-site journal and proceedings reviews, a review list was developed from the DIALOG search result. This part of the resource review was conducted to increase the timeliness of references and produce references which wouldn't be identified in any other way. Appendix 5 contains journal titles reviewed during the June visit to Evans Library at Texas A&M University. The review list includes titles identified from DIALOG, from card catalog searching and from shelf browsing.

Resource Research

The focus of our resource research was largely within the maritime field. However, some efforts went into analyzing how the information and basic research studies available in other areas and industries might be accessed and applied in an effective manner. Extensive resources were found to exist in other areas such as aviation and medicine. While the maritime environment is significantly different, there is much to be gained through direct transfer of some information, concepts and research efforts.

Local resource research consisted of continuous use of the Jack K. Williams Library at Texas A&M University at Galveston, due to the project team's location within this library. In addition, a one day-trip to College Station, Texas was conducted during June for the purposes of utilizing the collections of the Evans Library and the Texas Transportation Institute Library, and meeting with researchers.

A second resource trip was conducted from July 29 through August 5. It consisted of visits to: Volpe National Transportation Center Library; MIT Libraries; Massachusetts Maritime Academy; State University of New York Maritime College; U.S. Merchant Marine Academy; and the U.S. Coast Guard Research and Development Center.

A third resource trip was conducted from October 09 - 13, for the purposes of visiting the library and researchers at Maine Maritime Academy and the offices of the Maritime Administration Federal Aviation Administration in Washington, D.C.

A fourth resource trip was conducted from October 16 - 20, for the purposes of visiting the libraries and researchers at the California Maritime Academy and the University of California-Berkeley (including -- the Institute of Transportation Studies Library, the Thomas J. Long Business and Economics Library and the Engineering Library).

A fifth resource trip was conducted during September, associated with a non-project-funded trip to London, England. The libraries of the International Maritime Organization (IMO) and the Nautical Institute were visited. Journals and reports were reviewed and several publications were acquired.

A Working List of MHF Research Resources identified, contacted and/or visited during this project is included as Appendix 6. A brief description of major library resources, including information applicable to this project's MHF focus, is included as Appendix 7.

Acquisition and Distribution of Publications

During the project, certain publications were provided "free of charge" to the project team by researchers and other materials were purchased in support of the project goal of improving access to MHF research. A total of forty publications were acquired, the majority of which were published from 1990 to 1995. Refer to Appendix 8 for a list of these publications in order by title. In order to facilitate broad access for academy and other potential users, these publications have

been sent to the five Academy libraries which worked with this project and which participate (are "providers") in the OCLC Interlibrary Loan (ILL) system: Jack K. Williams Library, Captain Charles H. Hurley Library, Nutting Memorial Library, California Maritime Academy Library and Stephen B. Luce Library. Therefore, as soon as these publications are processed and added to these library collections, the materials will be accessible by electronically submitted ILL request. This process of publication distribution was devised to support building of collective resources, thus sharing both the results of project acquisition efforts and the responsibilities of resource sharing.

5.0 MHF DATABASE

5.1 Database Description

Structure and Content

For bibliographic database development, the project utilized Inmagic, Inc. software. The project team had four years of experience with the software, which allowed for more focus of effort on content and design. It has been shown that software which offers unlimited field length options is beneficial to bibliographic database development. Inmagic, Inc. software offers this flexibility, has many other features desired by the targeted users, and as a company continues to develop its software toward compatibility with new communications technology.

Combining software features, User Survey responses and design research, the following database structure was developed:

Field		Label	Name
Field	1	ID	Identification number
Field	2	TY	Type of work cited: report, article, chapter, manuscript, book, etc.
Field	3	TI	Title of work cited
Field	4	AU	Author, individual
Field	5	CAU	Author, corporate
Field	6	ED	Editor
Field	7	DT	Date of publication
Field	8	LANG	Language in which the publication is published
Field	9	PD	Physical description, including pagination, publication format, etc.
Field	10	SOTI	Title of the source document, for example, title of a journal when citing an article
Field	11	VI	Volume and issue for journals
Field	12	PUB	Publisher name, city, state and country
Field	13	SERTI	Series title
Field	14	REPNO	Report number(s)
Field	15	NTS	Notes field
Field	16	SU	Subject terms, controlled by thesaurus
Field	18	GNSU	Subject terms, in addition to above
Field	19	AB	Abstract

Many of these fields were included for citation completeness. Although some fields such as physical description, series title and volume/issue are not frequently searched by users, they are

important based upon completeness and uniqueness factors which come into play when distinguishing among similar materials. Due to the international nature of the subject of maritime related human factors, a language field was included. Abbreviations utilized include: "n.d." for no date, "n.p." for no publisher, and "p." for page(s).

Other fields exist in the database for the purpose of tracking development work completed on each citation.

User-interface and Searching Features

In question 6 of the User Survey, respondents indicated up to five search strategies they use most often. All of the top five search strategies are represented in our database structure and user-interface or search screen: subject, title, journal title, abstract and individual author.

The number one search strategy was searching by subject (89%). A traditional way to provide the user with this searching option is to develop a controlled subject term field. Terms are then assigned to each work cited utilizing a thesaurus of accepted (or controlled) terminology. Consistency provided by thesaurus use within a database and within a scientific discipline, improves searching efficiency and search result quality. Although labor-intensive, this option was incorporated into this project due to the overwhelming user survey response and the value added to the bibliographic database product. A multi-modal thesaurus entitled, Transportation Research Thesaurus, which is under development by CDB Enterprises, Inc., under contract to the National Cooperative Highway Research Program (which functions under the National Research Council of the National Academy of Sciences), was obtained for this purpose.

Through the use of electronic bibliographic database software, it was possible to efficiently provide an uncontrolled subject field as a supplement to the controlled field. The uncontrolled subject field was utilized for storage and searching purposes. Terms for which a controlled subject term was not determined are placed in this field, thus providing additional access points for the database user. This information is then available for searching and is stored for future controlled subject term development. Terms which were provided by authors and often referred to as "key words," were placed in this field.

The user-interface, or what is seen and utilized by the database user, consists of a search screen, searching features, and a display format for viewing citations in a given search result. The following is a representation of the search screen developed for this project:

ID:
Titles:
Authors:
Publisher:
Dates:
Subject:
Search All Fields:

By placing the cursor in any one or more of the search fields on this screen, the user may conduct a very broad or narrow search, without changing screens. In the search field *Titles*, the main title, source title and series title fields of the database are searched. This improves efficiency of a title search, improves search results, and decreases frustration and "failure" due to "missed hits" stemming from confusion concerning a title's formal designation. For the search field *Authors*, the editor field of the database is searched as well as the individual and corporate author fields. The search field *Subject*, provides access to the controlled and uncontrolled subject fields of the database. The broadest search is provided by the last search field, *Search All Fields*. This is where literally all citation content fields of the database are accessed, often most importantly the abstract field. This field is often used when no hits are being found and alternative searching strategies are being sought.

INMAGIC, Inc., software provides numerous searching features, some of which have been described thus far. Other features include: boolean searching (and, or, not); field browsing; truncation; range searching for dates (using >, >=, :, etc.). When the platform for user access to this MHF database is determined, a full set of user guides will need to be developed, which will provide further details regarding searching features.

For this project, a format was developed for viewing citations in search results. An example citation is provided below:

TYPE:	Report	[319]
TITLE:	Human factors evaluation of electronic chart display and information systems (ECDIS). Final report.	
AUTHOR:	Smith, M.W.	
DATE:	1995	
LANGUAGE:	English	
DESCRIPTION:	201 p.	
PUBLISHER:	U.S. Coast Guard, Office of Engineering, Logistics, and Development: Washington, D.C.	
NOTES:	Performing organizations' report nos. are: R&DC 10/93, and MSI/CAORF 26-9038-01A.	

This report examines the contributions that ECDIS might make to the operational practices on the commercial bridge. Issues examined were: contribution to the safety of navigation, effect on the navigational workload, features required during route monitoring, and potential contribution of integration with radar. Two commercially available ECDIS devices were installed on the simulator bridge at MSI/CAORF. Expert mariners made repeated port arrivals and departures. A variety of ship and mariner performance measures were collected and extensive debriefings were conducted. ECDIS demonstrated the potential to increase safety, primarily by decreasing the cross track distance from a planned track, and the potential to decrease the workload of route monitoring, primarily by replacing time-consuming plotting on the paper chart. For route monitoring, mariners required only a simple display outlining safe water, but recommended access to a larger set of chart features as reference.

Refer to the following Appendices for additional details concerning the MHF Database: Appendix 9. Structure; Appendix 10. Search Screen Format; Appendix 11. Search Results Format. Appendix 12 consists of one, 3 1/2" diskette (1.44 MB) containing ASCII files for the database of 420 citations, and the corresponding structure and formats.

5.2 Database Updating Process

Accuracy is the foundation of a resource such as the MHF Bibliographic Database. In this case, fully verified and abstracted references are both historical and modern in content. The recent increase in activity in the maritime human factors field makes continuous updating of the resource imperative to secure relevancy to present practices in maritime education, research, policy-making and commerce.

A complete updating process for such a database would involve a database content and communications manager (DCCM) and a database "access" or technical manager (DTM). The content and communications manager would be responsible for continuing to populate the bibliographic database and communicate with users, with particular attention to accuracy and completeness of references, subject field coverage, indexing, abstracting, etc. The access manager would be responsible for maintaining technical communications linkages for database users; for example, modem access, telnet access, World Wide Web access, etc. The following process describes the database content and communications manager's role, for that has been the responsibility of the project thus far.

The process of updating the bibliographic database would involve regular review of journals, publication reference lists and announcements, proceedings, and other databases. Automatic submission of publications to the DCCM by authors, publishers, or agency representatives would be the most efficient and complete method of maintaining the database. Traditionally, many bibliographic databases relied primarily on this method.

Due to funding realities, the updating process cannot rely on traditional methods, whereby all items cited in the database would be purchased or received "free of charge" by the DCCM. Therefore, in addition to automatic submission agreements, other methods of acquiring complete references for addition to the database must be developed. These methods might include:

- 1) Regular review process by DCCM:
 - a) Identification of a reference;
 - b) Determination of source for the publication;
 - c) Request for a loan copy through Interlibrary Loan where possible, or personal contact as needed;
 - d) Creation of complete citation;
 - e) Return of the loan copy.

This method is also quite traditional; however, its importance has increased as the possibility has significantly decreased of maintaining in one physical location all known documents on any subject.

- 2) Regular submission of publications or references by individual Sources:
 - a) Loan or "free" copies of publications are sent to the DCCM with a Publication Form, Appendix 13.
 - b) Reference information is sent to the DCCM with a Reference Form, Appendix 14.

The first method is one commonly used for database updating, where the DCCM is the primary publication identification agent. The second method would allow individuals aware of developments in their field to submit their publication recommendations to the DCCM. Anyone throughout the U.S. or abroad could be a potential Source; thereby increasing input from researchers, educators, industry, and others. Representatives from each of the academies could serve as Sources, as a part of the MHF program.

These forms would be developed in print and electronic form for greatest ease of use with various communication systems. Potentially, completed forms could be sent to the DCCM by mail, by electronic mail, by fax, or through the use of a form fill-in procedure as a part of a Maritime Human Factors Web Page. Recent technology supports the potential for transmission of entire documents in electronic form, although there is minimal use of this method at this time probably due to low accessibility.

The following information would be important to capture in these forms:

- 1) Source: name, title and primary department, company or agency name, address, email, telephone, fax, any other communication systems, and areas of experience

There could be an option for the individual to indicate whether they wanted their source information to be added to a contact database to be made available for access through a Maritime Human Factors Web Page. Their information could then be maintained by the individual, who would submit changes as needed. This type of specialized contact database has always been quite useful to researchers, students, government agencies and others who need to find out who is doing what in a particular field.

- 2) Submission:
 - publication is included or is being sent separately by mail
 - reference only included (publication not available from source)
 - source of reference (name of index, bibliography, database, publication that includes the reference, etc.)
 - source of publication (include borrowing or purchasing information where applicable)
- 3) Publication title, author, publication date, publisher, etc. and type of publication, such as article, report, electronic data, etc.
- 4) Recommendations for subject indexing emphasis
- 5) Recommendations (with a brief explanation) concerning a publication's special contribution to the field:
 - new methodology
 - new technology
 - unique data or interpretation of existing data
 - one-of-a-kind study in the area of ...
 - other, please describe:

6.0 FUTURE DEVELOPMENT AND USE

6.1 Potential of the World Wide Web

The Internet is a worldwide network of computers, with the World Wide Web (WWW or Web) being one of the latest information services available for using the network. The Web utilizes hypertext technology and browser software which allow for links between multiple hypertext pages containing information, data, images, sound, video, etc. This technology, which has its origins at the CERN, the European Particle Physics Laboratory, creates a highly fluid environment for data exchange and communication.

Its speed, flexibility, ease of use and worldwide nature, make it a broadly appealing tool for not only researchers, but all members of academia, industry and the public. Recent estimates of regular users have reached 24 million in North America. The overall effect of the Web is a new level of "connectedness," which translates to new opportunities for collaboration and communication, in ways which haven't been possible before. The Web provides a powerful environment within which to: conduct online conferences for the review of research underway rather than only after publication; participate in informal listservs where an electronic address is established for regular exchange of information, news and questions; and make use of electronic mail, electronic journals, electronic publishing, file transfer, and bibliographic and other types of searchable databases.

6.2 Vision for Future MHF Bibliographic Database Use and Development

This project's user survey results indicated that faculty use those electronic resources which are readily available to them, such as electronic mail which was accessible from their office computers. As evidenced by the popularity of the Web, use of an electronic resource is directly related to its flexibility and ease of use. In order for the MHF Bibliographic Database to be most useful to researchers and industry, it must be available in a timely, convenient manner and provide accurate and current information. The tool which best meets the myriad needs of electronic resource developers and users at this time is the Web.

The MHF Bibliographic Database has been designed for and is ready for adaptation to the Web environment. Continued growth of the database and development of other electronic resources in support of the Program will be augmented greatly by use of the Web. Moreover, one of the most important aspects of future development of the bibliographic database is the incorporation of extensive international research in the maritime human factors field. Because of the Web's potential of bridging great distances in a timely manner, it will be an important factor in the success of such a collaborative effort.

The benefits of utilizing the Web extend beyond the future development and use of the MHF Bibliographic Database, to the future of the MHF Cooperative Research Program as a whole.

7.0 CONCLUSIONS AND RECOMMENDATIONS

Results of the user survey indicated a keen need for and interest in development of a MHF Bibliographic Database. To be most useful for researchers and beneficial to industry, this database must be timely, convenient, accurate and current. The MHF resource review revealed that: there are new programs focusing efforts in the MHF area, such as the U.S. Coast Guard's *Prevention Through People*; there are many MHF areas of research needing further attention; there is much to be gained from HF research existing in other areas such as medicine and aviation; at this time there is no one easy location/method for accessing MHF research; and much of what has been done in the MHF field has been conducted in other countries, so development of international resource sharing relationships is critical.

Recommendations include securing funding for continued development of the MHF Bibliographic Database and other information services in support of the goals of the MHF Cooperative Research Program. Efforts should continue to encourage participation by researchers, agencies and industries across transportation modes, scientific fields and geographic boundaries, with the purpose of increasing usefulness and efficiency of MHF research resource development.

8.0 REFERENCES

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Introduction

The purpose of the user survey is to identify the targeted user group, their information needs, the tools at their disposal now and their recommendations regarding database design, content and searching options. Since the development of the maritime related human factors bibliography is intended to enhance the educational and research efforts of the United States maritime academies, the potential users of the bibliography are the members of the MHF Research Program, or primarily the maritime academy faculty. To identify the individual maritime faculty members, where possible, contact was established with each academy. Through this contact, 162 individual faculty members were identified. In addition, academy superintendents and library faculty were also identified so that their input could be solicited for the user survey.

Survey Design & Distribution

An initial literature review was made to determine the best format for the design of the user survey tool. A 1993 SUNY study, *Electronic Information Access Technologies: A Faculty Needs Assessment*, by Adams, Andersen, Bonk, Faerman and Galvin proved an invaluable reference in the creation of the survey instrument. Survey design was initiated and completed in May, 1995. A completed survey tool was passed through a review by faculty and technical staff prior to distribution. Refer to Appendix 2 for an example of the survey instrument.

Initial letters of introduction to the project were sent to each maritime academy superintendent in May, 1995. These letters described the MRHF bibliography project and gave the academy superintendent advance notice of the forthcoming user surveys which were to be distributed to individual faculty members. Subsequently, during the first week of June 1995, user surveys were sent out to all academy faculty, superintendents, library faculty and MHF Program members. In all, 208 user surveys were mailed to the academies and other members of the MHF Program. (Refer to Table 1 for survey distribution by academy (206)). Accompanying the survey instrument was information describing the MRHF program and the MRHF bibliography project. The requested response deadline was June 30, 1995.

Table 1. Survey Distribution

<i>Academy</i>	<i>Faculty</i>	<i>Superintendents</i>	<i>Library Staff</i>	<i>Total</i>
California Maritime Academy	21	1	2	24
Great Lakes Maritime Academy	8	1	2	11
Maine Maritime Academy	13	1	3	17
Massachusetts Maritime Academy	20	1	2	23
SUNY Maritime Academy	37	1	3	41
Texas State Maritime Program	21	1	3	25
U.S. Merchant Marine Academy	60	1	4	65
Totals	180	7	19	206

Survey Responses

Of the 206 surveys sent out to the academies, 40 were returned by the June 30, 1995 deadline. These 40 responses represent an initial response rate of 19%. The deadline was extended to September 30, 1995 and 20 more responses were received, totaling 60 in all, representing a 29% response rate. This response rate is considered quite satisfactory for a mailed survey. This rate reflects a significant level of academy faculty participation in this project and considerable interest in this new human factors program.

Participation rates by school vary. Response rate was initially negatively influenced by the timing of the survey period during the summer months, a time when many faculty members are not at their regular posts. Timing of the survey, academy program differences, etc. may account for some of the variances in the participation rates of each academy.

Table 2. Academy Representation in Survey Responses

<i>Academy</i>	<i>Sent</i>	<i>Received</i>	<i>Response Rate at School</i>	<i>Percentage of Survey Participation</i>
California Maritime Academy	24	8	33.33%	13.33%
Great Lakes Maritime Academy	11	2	18.18%	3.33%
Maine Maritime Academy	17	6	35.29%	10.00%
Massachusetts Maritime Academy	23	4	17.39%	6.66%
SUNY Maritime Academy	41	12	29.27%	20.00%
Texas State Maritime Program	25	13	52.00%	21.66%
U.S. Merchant Marine Academy	65	15	23.08%	25.00%
Totals	206	60	29.13%	

Survey responses were further analyzed according to profession (Refer to Table 3). Interpretation of information provided about departments and position titles was used for the following response analysis. Survey responses included the following professional categories: Engineering, Maritime Administration, Deck, Naval Science, Librarian, Administrator. The Engineering and Librarian categories included responses from Engineering and Library departments, respectively. The Maritime Administration category included responses from Maritime Administration, Maritime Management and Transportation departments. The Deck category included responses from Maritime Transportation, Nautical Science and Navigation departments. Responses from deans, chairmen, directors, administrators and one anonymous entry are represented in the Administrator category. This analysis illustrates fairly uniform participation across the professions. The exceptions are the Naval Science (least at 3%) and Deck (greatest at 33%) categories. One explanation of these two exceptions may be that these categories may be similarly represented in personnel totals among departments at the academies. This analysis does not address the possibility of respondents with experience in more than one professional category; thus, a response may represent more than one professional perspective (for example, an administrator with deck experience). Therefore, these survey responses potentially represent greater professional input that is represented in the one response:one profession ratio utilized here.

Table 3. User Survey Academy Responses by Profession

<i>Professional Category</i>	<i>Academy</i>							Total
	CMA	GLMA	Maine MA	Mass MA	SUNY MA	TSMP	USMMA	
Engineering	1	1	---	2	2	---	6	12
Maritime Admin.	6	---	---	---	1	3	---	10
Deck	---	1	4	2	2	5	6	20
Naval Science	---	---	---	---	1	---	1	2
Librarians	1	---	2	---	3	3	1	10
Administrators	---	---	---	---	3	2	1	7
Total	8	2	6	4	12	13	15	60

Survey Analysis

To further identify potential users of the MRHF bibliography and their individual information needs, in *question one* of the user survey, the maritime faculty were asked to describe their level of professional interests and/or activities in the area of general maritime related human factors subjects. Specifically, faculty were asked to indicate whether they had an interest, were an expert or if they were engaged in active research in a particular field. Information concerning identification of active researchers was utilized in the Selected Resources Review Task.

Table 4. Survey *Question One* Responses

<i>Subject</i>	<i>Interest</i>	<i>Expert</i>	<i>Active Research</i>	<i>Total</i>
Education/Training	19	22	12	53
Simulation	24	9	10	43
Manning/Personnel	29	5	7	41
Automation	35	2	4	41
Safety	26	9	6	41
Regulations	23	9	5	37
Communication	22	6	9	37
Human Performance	30	2	3	35
Organizational Factors	24	4	7	35
Navigation	12	16	6	34
Human Factors Engineering	28	0	4	32

Not surprisingly, the subject which garnered the most responses overall was education/training followed by simulation, manning/personnel, automation and safety.

The five subjects garnering the most responses in each category are, in order of rank:

<u>Interested in</u>	<u>Expert in</u>	<u>Active Research in</u>
◦Automation	◦Education	◦Education
◦Human Performance	◦Navigation	◦Simulation
◦Manning/Personnel	◦Safety	◦Communication
◦Human Factors Engineering	◦Simulation	◦Manning/Personnel
◦Safety	◦Regulations	◦Organizational Factors

Respondents were given the opportunity to list other areas which described their professional interests and activities. Other areas of interest to the respondents are:

- | | | |
|-----------------------------|-----------------------------------|---------------------------|
| • GIS (w/GPS collections) | • ECDIS | • man-machine interface |
| • fire fighting | • marine power plants & machinery | • bridge procedures |
| • cargo stowage and care | • family unit support | • environmental training |
| • piloting | • motivation | • cultural factors |
| • navigation law | • robotics | • maritime labor unions |
| • transportation management | • vision systems | • internat'l. competition |

In *question two* of the user survey, the respondents then indicated those categories of data/information which they were finding particularly difficult to obtain. During resource review efforts, these comments were given priority. Of the 61 respondents, 26 respondents indicated difficulty in locating the following categories of information:

- cargo stowage
- recent data on college students relating to education
- ship handling and fatigue
- IMO resolutions, regulations and recommendations
- Ship building costs by type and unit price
- GAT data productivity
- current ECDIS research publications
- textbook quality information of fossil fuel steam generators
- human performance and human factors engineering
- information concerning the latest development in maritime robotics applications
- physical and environmental data/information
- stress recovery
- simulator training and performance monitoring
- human factors related to methods of education and training
- maritime communities and cultural factors
- sleep time and rest quality data
- data on marine casualties involving human errors
- psychological/sociological aspects of life at sea
- pay/salary rates of seamen
- simulation of port activities, economic modeling
- waterway management
- terminal traffic organization
- stress during bridge watches
- watchstanders stress related behavior

In *question three* of the user survey, faculty were asked to list specific publications which they would recommend for inclusion in the bibliography. This question was designed as a manner of tapping expert resources at the academies regarding bibliography content, thus leading to increased relevancy to the users and increased depth of content. Respondents shared reference information for important materials, as well as content reviews. Some respondents included copies of noted articles and reports with their surveys, which proved valuable to the project.

In survey *question four*, the respondents were asked to indicate what percentage of MRHF materials they were finding in their campus libraries. Of the 61 respondents to the survey, 44 indicated availability ranging from less than 25% to 90% or more. 43% of the respondent sub-group indicated that they were finding 50% or more of these materials. 57% of the respondent sub-group indicated that they were finding less than half.

Table 5. Survey Question Four Responses

<i>Availability</i>	<i>Number of Responses</i>	<i>Percentage</i>
90% or more	4	6.56%
75% or more	4	6.56%
50% or more	11	18.03%
25% or more	13	21.31%
less than 25%	12	19.67%

To understand where maritime faculty currently locate information they need, *question five* of the user survey asks the respondent to indicate up to two different places they locate information they needed. As seen in Table 6, a majority, 35 of the 61 possible respondents, use personal contacts and/or collections to obtain the information they needed. 46% rely on computerized filing/catalog systems to find information. A third of the respondents use network accessible data and information. 17 use a hardcopy filing or catalog system.

Table 6. Survey Question Five Responses

<i>Data/Information</i>	<i>Number of Responses</i>	<i>Percentage of Responses</i>
Personal contact/collections	35	57.38%
Computerized Filing/Catalog System	28	45.90%
Network Accessible Data/Information	20	34.43%
Hard Copy Filing/Catalog System	17	27.87%

To better understand how the targeted users might search a bibliography, *question six* asks the respondents to indicate up to five search strategies which they use most often. The results are presented in Table 7. The most common search strategy is subject, followed by title, individual author, journal title and abstract. The data garnered by this question was directly utilized in database design and creation tasks.

Table 7. Survey Question Six Responses

<i>Search Strategy</i>	<i>Number of Responses</i>	<i>Percentage of Possible Responses</i>
Subject	54	88.52%
Title	32	52.46%
Individual Author	24	39.34%
Journal Title	24	39.34%
Abstract	23	37.70%
Corporate Author	18	29.51%
Date	7	11.48%
Series Title	6	9.84%
No response	5	8.92%
Other	3	4.92%

In *questions seven and eight* of the user survey, information was collected concerning the computer equipment now available to the maritime academy faculty, the type of information resources currently available, and how frequently they are used. The table below shows that nearly all the respondents have access to a personal computer, as well as a printer and FAX machine. Roughly half of the respondents have connections to a campus or departmental network and/or the Internet, as well as CD-ROM players and modem or communications software. Not all schools have access to Internet resources, and some who do have access might only have access at a centralized location, such as a library.

Table 8. Survey Question Seven Responses

<i>Type of Equipment</i>	<i>Available to:</i>	<i>Percentage</i>
Personal Computer	60	98.36%
Printer	57	93.44%
Fax machine	49	80.33%
Connection to Internet	36	59.02%
Connection to dept or campus network	35	57.38%
Communications Modem/Software	31	50.82%
CD-ROM connected to computer	30	49.18%

With *question eight* of the user survey, it was determined what electronic information resources were available and the associated levels of usage. The table below shows specific types of information resources and their availability in academy offices or libraries. Except for electronic mail, electronic journals and listservs, which are usually available through the Internet, when the listed resources are available to academy faculty, they appear more likely to be found in the library rather than the office.

Table 9a. Survey Question Eight Responses - Part A

<i>Resource</i>	<i>Library</i>	<i>Percentage</i>	<i>Office</i>	<i>Percentage</i>
Online Catalog	40	65.57%	8	13.11%
Listsers	18	29.51%	23	37.70%
Electronic Journals	18	29.51%	23	37.70%
Email	11	18.03%	26	42.62%
Full text database	21	34.43%	10	16.39%
CD-ROM	18	29.51%	9	14.75%
Commercial Database	21	34.43%	9	14.75%

The data in Table 9b indicates that the faculty are more likely to use those resources readily available to them. It is important to note that the users of the online catalog in their office are primarily library faculty. The most used resource (on a daily basis) is email, with listservs and online catalog users following. The most used resource, overall, is the library online catalog. It can be speculated that since the heaviest use of email is on a daily basis, that if email was available to all faculty, it would be the most used information resource. Most faculty will use the library at some time, but as seen in the table, the usage of the catalog varies. Some academies may have email capabilities without Internet accessibility. No attempt was made to determine the types of resources being used on the Internet, whether it be web pages, gophers, newsgroups or other resources. During this time frame of this project, the number of academies with web pages grew from three to six: Maine, Massachusetts, Texas State Maritime Program, Great Lakes, U.S. Merchant Marine, and California. However, availability of university web pages does not necessarily equate with Internet or WWW access for all faculty from their office computers.

Table 9b. Survey Question Eight Responses - Part B

<i>Resource</i>	<i>Daily</i>	<i>Weekly</i>	<i>Monthly</i>	<i>Infrequently</i>	<i>Total</i>
Online Catalog	8	12	7	14	41
Listsers	10	5	7	13	35
Electronic journals	3	10	7	13	33
Email	25	3	0	5	33
CD ROM	6	3	4	16	29
Full text databases	4	2	6	15	27
Dialog	0	3	4	13	20
Commercial databases	0	2	0	1	3

Please answer the following questions as completely as possible. Then mail or fax the completed survey by **June 30, 1995**, to: MRHF Bibliography Project Fax: 409/740-4702

Galveston Bay Information Center Telephone: 409/740-4703

Texas A&M University at Galveston

P.O. Box 1675

Galveston, Texas 77553-1675

Your responses to this survey will be used to create a profile of information needs. This information will be incorporated into the development of an electronic bibliographic database for use by U.S. Maritime Academies in their maritime related human factors (MRHF) research.

Name _____

Telephone _____

Title _____

Fax _____

Organization _____

Email _____

Address _____

1. The following is a list of general maritime related human factors subjects. Please check the box(es) which best describe(s) your professional interests/activities.

	Interested In	Expert	Active Research
Automation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Manning/Personnel	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Organizational Factors	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Safety	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Simulation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Navigation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Regulations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Education/Training	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Human Factors Engineering (ergonomics)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Human Performance (fatigue, physical/psychological effects)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Communication (person-to-person, equipment-to-person)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Other, please list _____

2. Is there a category of data/information which you're finding particularly difficult to obtain?

_____ Yes _____ No

If yes, please list.

3. Are there specific publications which you would like included in the bibliography which is being developed? _____ Yes _____ No If yes, please list below.

References (Please provide as much information as possible.) Ex. Ship Operations Cooperative Program. 1994 Program Description. Program Adm. - Mr. John Edgar, PRC, Inc. [1994] 15 p.	Content Notation Exs. new research program unpublished paper on... classic treatise on..., standard, methodologies	Availability Ex. my office (copy attached) Ex. TAMUG Library (1 copy)

4. What percentage of MRHF materials which you have identified as needed for your research are available from your campus library?

☐ 90% or more ☐ 50% or more ☐ less than 25%
☐ 75% or more ☐ 25% or more ☐ none identified at this time

5. How do you generally find data/information that you need? Check up to two.

_____ personal contact/collections _____ computerized filing/ catalog system
 _____ hard copy filing or catalog system _____ network accessible data/ information
 Other, please specify _____

6. When searching for data/information, which of the following search strategies would you use most often? Please check up to five.

_____ search by title _____ search by journal title or title
 _____ search by date of larger work (proceedings
 _____ search by subject title for a chapter citation)
 _____ search by individual author (Smith, J.D.) _____ search the abstract
 _____ search by corporate author (U.S. Coast Guard) _____ search by series title

Other, please specify _____

7. The following equipment is used for accessing electronic networks. Please indicate which of the following equipment is now readily available to you in your office/department. Check all to which you have access.

	Yes	No
a. Personal computer	<input type="checkbox"/>	<input type="checkbox"/>
b. Communications modem/software	<input type="checkbox"/>	<input type="checkbox"/>
c. Connection to department or campus network	<input type="checkbox"/>	<input type="checkbox"/>
d. Connection to Internet	<input type="checkbox"/>	<input type="checkbox"/>
e. Printer	<input type="checkbox"/>	<input type="checkbox"/>
f. FAX (telefacsimile) machine	<input type="checkbox"/>	<input type="checkbox"/>
g. CD-ROM player connected to a computer	<input type="checkbox"/>	<input type="checkbox"/>
h. Other, please specify: _____	<input type="checkbox"/>	<input type="checkbox"/>

8. The following is a list of information resources available through networks. Please indicate the location(s) from which you use the resource and **circle** your frequency of use, regardless of location.

	Office/Dpt.	Library
a. Your campus library online catalog <i>daily weekly monthly infrequently never</i>	<input type="checkbox"/>	<input type="checkbox"/>
b. Discipline-based electronic bulletin boards, listserves, etc. <i>daily weekly monthly infrequently never</i>	<input type="checkbox"/>	<input type="checkbox"/>
c. Electronic journals and newsletters <i>daily weekly monthly infrequently never</i>	<input type="checkbox"/>	<input type="checkbox"/>
d. Electronic mail (Email) <i>daily weekly monthly infrequently never</i>	<input type="checkbox"/>	<input type="checkbox"/>
e. Full text electronic databases (e.g., Lexis/Nexis) <i>daily weekly monthly infrequently never</i>	<input type="checkbox"/>	<input type="checkbox"/>
f. CD-ROM index/abstract databases <i>daily weekly monthly infrequently never</i>	<input type="checkbox"/>	<input type="checkbox"/>
g. Index/abstract databases via commercial vendor		
<u>Dialog</u> <i>daily weekly monthly infrequently never</i>	<input type="checkbox"/>	<input type="checkbox"/>
<u>Other, please specify:</u> <i>daily weekly monthly infrequently never</i>	<input type="checkbox"/>	<input type="checkbox"/>

9. Please use the space below for any additional comments, information or questions you would like to provide.

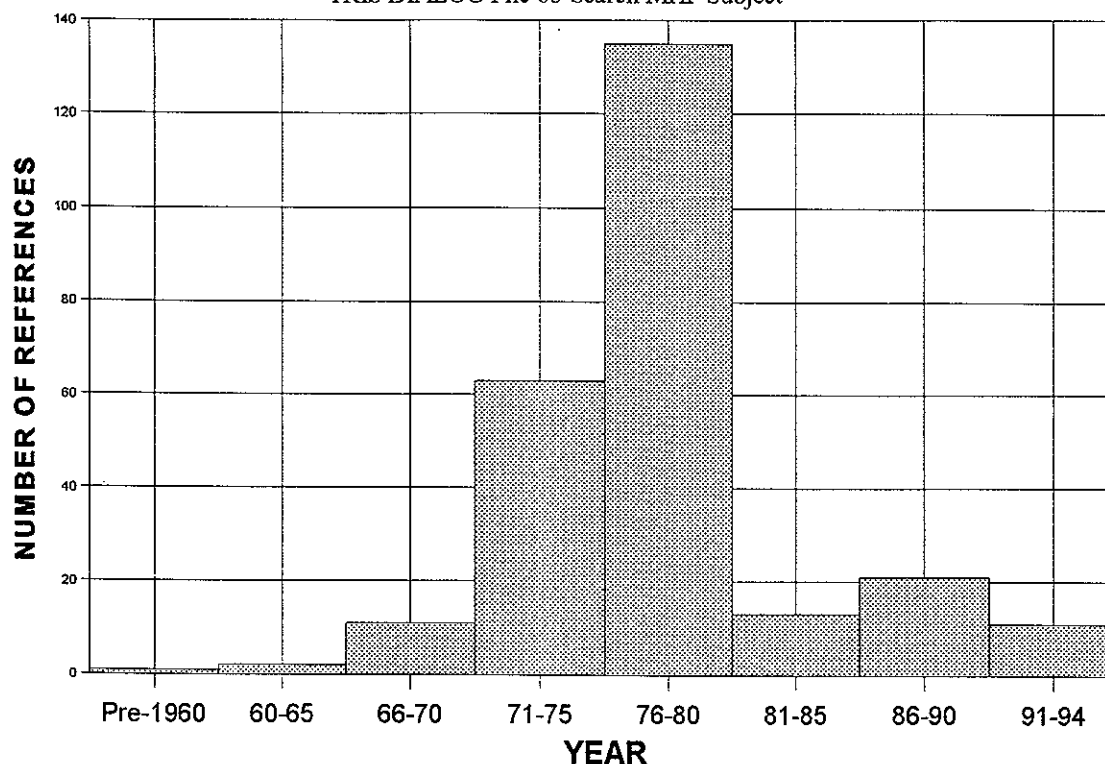
Thank you for completing this survey.

Please return to us by June 30, 1995.

Fax: 409/740-4702 or Use the enclosed self-addressed stamped envelope.

Appendix 3. MHF Publications Analysis

TRIS DIALOG File 63 Search MHF Subject



During reviews of the DIALOG search results, a question arose concerning the high number of "old" or pre-1980 publication dates. An analysis of number of references per publication date was performed. The above graph contains the results of this analysis. As the graph illustrates, the majority of the work captured by the DIALOG search was published during the 1970's, 198 references out of 270. The graph depicts the overall scarceness of publications on the subject as well as the surge of activity in the 1970's, particularly the latter half. (Researchers contacted during this project, some of whom led the first efforts in the field, verify these interpretations.

These results guided us in our resource review efforts as described in section 4.0 Selected Resources Review of this report.

FACTS ABOUT TRIS

What is TRIS?

TRIS is the Transportation Research Information Services data base, a computerized information file maintained and operated by the Transportation Research Board, National Research Council, under the sponsorship of the Federal Highway Administration, the Urban Mass Transportation Administration, the National Highway Traffic Safety Administration, U.S. Department of Transportation, the fifty state highway and transportation departments, the District of Columbia and Puerto Rico, the Motor Vehicle Manufacturers Association, the National Asphalt Pavement Association, the U.S. Army Corps of Engineers, and the Association of American Railroads.

What Information is in TRIS?

TRIS contains information on various modes and aspects of transportation including planning, design, finance, construction, maintenance, equipment, traffic, operations, management, marketing, and other topics. TRIS contains more than 315,000 abstracts of completed research and summaries of research projects in progress.

Where does the information come from?

TRIS has worldwide sources of information. The primary U.S. sources are the Federal Highway Administration, the Urban Mass Transportation Administration, and the National Highway Traffic Safety Administration, U.S. Department of Transportation, congressional hearings and reports; the U.S. General Accounting Office; trade and professional associations, universities; research institutes; and regional and state organizations. TRIS receives worldwide transportation information through its exchange with international bodies such as the International Union of Public Transport, the International Union of Railways, the International Road Research Documentation of the Organisation for Economic Cooperation and Development, the European Conference of Ministers of Transport, the Dutch Ministry of Transport, and others. More than 1,000 journals are scanned for selection of materials for TRIS.

What is TLIB?

A valuable addition to the TRIS file is the Transportation Library Subfile, TLIB. The Institute of Transportation Studies Library at the University of California, Berkeley, and the Northwestern University Transportation Library at Evanston provide TRIS with bibliographic citations of their new acquisitions. This tape is added to the TRIS Online file at DIALOG and becomes a subfile of the TRIS data base.

TLIB broadens the subject scope of TRIS through coverage of all modes of transportation, and provides an annual input of more than 17,000 records.

TRIS Format

The TRIS information file provides abstracts, index terms, and bibliographic citations (including availability) for records of completed research and a project summary, index terms, names and telephone numbers of the responsible individuals and their corresponding sponsoring agencies, names and telephone numbers of principal investigators and their corresponding performing agencies, and reports published, if pertinent, for ongoing research projects. The TLIB records in the TRIS file contain bibliographic citations and modified Library of Congress subject headings as index terms, but do not include an abstract.

What services are available from TRIS?

Literature Searches

The TRIS Information File is available online as DIALOG File 63. You may either request a search from our Online Search Specialist by calling (202)334-3250 or search DIALOG directly. (See "Connecting to DIALOG with a PC" and "Tips for Searching TRIS on CompuServe's IQuest Service"). In either case, please feel free to call us for additional information.

Topical Services

Each month, the TRIS staff selects timely topics from recent searches for dissemination. Please contact Suzanne Crowther at (202) 334-3250 for additional information regarding these services.

Customized Services

Different types of services are available on request. Please call us for further information.

Publications

TRIS publishes three abstract bulletins. These are available by subscription. They are the annual *Urban Transportation Abstracts*, *Highway Safety Literature*, and quarterly *Highway Research Abstracts*. Call the TRB Publications Sales Office at (202) 334-3214 for subscription information.

Journal Title	Issues Reviewed		
American Shipper	1995	vol.37	no.2-4
	1994/95	vol.36	no.1-13
	1993	vol.35	no.1-12
	1992	vol.34	no.10-12
	1989	vol.31	no.2
Applied Ergonomics (Human Factors in Technology & Society)	1995	vol.26	no.1-2
	1971	vol.2	no.2
American Waterways Organization (AWO)	1995	vol.52	no.1-12
	1994	vol.51	no.1-25
Fairplay International	1995	vol.325	no.5797, 5798, 5800, no.5810-5819, 5821
	1994	vol.324	no.5781, 5783, 5784
Human Factors: The Journal of the Human Factors and Ergonomics Society	1995	vol.37	no.1
International Labour Review	1994	vol.133	no.1-6
	1993	vol.132	no.1, 2, 4-6
Journal of Navigation	1995	vol.48	no.1-2
	1978	vol.31	no.7
	1973	vol.26	no.1, 3
Journal of Safety Research	1995	vol.26	no.1-2
Lloyd's Ship Manager	1995	vol.16	no.1-3, 10, 12, supp
Logistics and Transportation Review	1995	vol.31	no.1
	1994	vol.30	no.4
Marine Digest and Transportation News	1995	vol.73	no.10
Marine Log	1995	vol.100	no.6
Marine Policy and Management	1995	vol.22	no.1-3
Master, Mate and Pilot	1995	vol.31	no.2-3

Journal Title	Issues Reviewed		
Naval Engineers Journal	1995	vol.107	no.1-3
	1994	vol.106	no.1-4, 6
	1993	vol.105	no.1-6
	1992	vol.104	no.1-6
Proceedings of the Marine Safety Council	1995	vol.52	no.1-3
	1994	vol.51	no.1-6
	1993	vol.50	no.1-6
	1992	vol.49	no.6
	1991	vol.48	no.6
Ship Care and Maritime Management	1995	JAN, MAR	
	1994	JAN, MAR, MAY, JUL SEP, NOV	
Shipping World and Shipbuilder	1995	vol.196	no.4110-4113
Transportation Quarterly	1995	vol.49	no.1-2
	1994	vol.48	no.1-4
Workboat	1995	vol.52	no.5/6
	1994	vol.51	no.½-11/12
	1993	vol.50	no.½-11/12
	1992	vol.49	no.5/6, 9/10, 11/12
	1991	vol.48	no.½-5/6, 11/12
	1990	vol.47	no.½, 5/6-9/10

Name of university, agency or company	Review status
Jack K. Williams Library (Texas State Maritime Academy) Texas A&M University at Galveston Galveston, Texas	Surveyed Visited
Evans Library Texas A&M University College Station, Texas	Visited
Texas Transportation Institute (TTI) College Station, Texas	Visited
John A. Volpe National Trans. Systems Center Cambridge, Massachusetts	Surveyed Visited library
MIT Libraries Barker Engineering Library Cambridge, Massachusetts	Visited
Captain Charles H. Hurley Library Massachusetts Maritime Academy Buzzards Bay, Massachusetts	Surveyed Visited
Stephen B. Luce Library SUNY, Maritime College Library Fort Schuyler, Bronx, New York	Surveyed Visited
Bland Memorial Library and MSI/CAORF: Marine Safety International / Computer Aided Operation and Research Facility National Maritime Research Center U.S. Merchant Marine Academy Kings Point, New York	Visited & Surveyed Visited
U.S. Coast Guard R&D Center Library and Human Factors Research Group Groton, Connecticut	Visited
Nutting Memorial Library Maine Maritime Academy Castine, Maine	Surveyed Visited
California Maritime Academy Library Vallejo, California	Surveyed Visited

Name of university, agency or company	Review Status
Institute of Transportation Studies Library	Visited
Thomas J. Long Business & Economics Library	Visited
Engineering Library	Visited
Dr. Robert Bea - offshore industry safety	Visited
University of California, Berkeley Berkeley, California	
International Maritime Organization (IMO) London, England	Visited library
The Nautical Institute London, England	Visited
U.S. Coast Guard Academy Groton, Connecticut	Contacted library
New York/New Jersey Port Authority Library New York, New York	Contacted
Transportation Library Northwestern University Evanston, Illinois	Identified
Ship Analytics N. Stonyton, Connecticut	Contacted
Paradym Associates East Lime, Connecticut	Identified
Unisys Corporation Reston, Virginia	Contacted
Battelle Seattle, Washington	Identified
Germanischer Lloyd Hamburg, Germany	Contacted

The **Jack K. Williams Library at Texas A&M University at Galveston** covers maritime systems engineering, maritime history, marine transportation and technology, and maritime resources. Its holdings include 35,000 books, 27,000 bound periodical volumes, 50,000 titles on microfiche, and 800 journals and other serials. It is open to the public and offers interlibrary loans.

The **Sterling C. Evans Library at Texas A&M University** collection includes approximately 2,000,000 volumes, 4,300,000 microforms, and 12,000 serial titles, supporting a broad range of undergraduate and graduate degree programs. Located on the main campus for the College of Geosciences and Maritime Studies, of which Texas A&M University at Galveston belongs, the library was utilized for its collection of journals and publications concerning human factors, maritime studies, technology, engineering and education.

The **Texas Transportation Institute (TTI) Library** houses a collection of TTI and Transportation Research Board publications. The collection contains approximately 6500 monographs and 60 journals focusing on transportation, primarily on land. Public access is restricted to specific title/author requests, with TTI publications being available for purchase and TTI and other materials being available for use on the premises.

The **Technical Reference Center within the John A. Volpe National Transportation Center**, U.S. Department of Transportation, has 20,000 books, 650 bound periodical titles, 350,000 microfiche, and 150 journals on the subject of transportation. It offers interlibrary loans and is open to the public for reference use only.

The **Barker Engineering Library at Massachusetts Institute of Technology** covers transportation, mechanical engineering, ocean engineering, and materials engineering. It contains 87,058 books, 34,397 bound periodical volumes, 48,914 bound serial volumes, 20,798 M.I.T. theses, 59,501 technical reports, and 3319 journals and other serials. It is open to the public for brief room use with a fee for borrowing, and it offers interlibrary loans.

The **Captain Charles H. Hurley Library at Massachusetts Maritime Academy** has holdings in the following subjects: marine and ocean engineering, maritime transportation, oceanography, navigation, seamanship, merchant marine operations, nautical astronomy, radar, cargo handling, naval architecture, fishing gear and vessel operation, marine and naval science, law of the sea, and admiralty law. Its holdings include 36,000 books, 25,000 reels of microfilm, National Ocean Survey charts, Defense Mapping Agency maps, and 368 journals. The library is open to the public for reference use only, and it offers interlibrary loans.

The **Stephen B. Luce Library at the State University of New York, Maritime College** covers marine transportation, maritime history, marine engineering, naval architecture, and the merchant marine. Its holdings include 90,000 books and government documents, 13,500 microfiche, and 750 journals and other serials. It offers interlibrary loans and is open to the public with identification.

The **Schuyler Otis Bland Memorial Library at the U.S. Merchant Marine Academy** covers marine engineering, nautical science, maritime history and economics. Its holding include 220,000 volumes, 7500 bound periodical volumes, 97,000 microfiche, 400 maps, and 1246 journals and other serials. The library is open to the public for reference use only, and it offers interlibrary loans by individual request.

The **Maritime Technical Information Facility** is a resource which included a print product (Maritime Abstracts) and an electronic database (once entitled MARIBASE and now a part of DIALOG file 63 TRIS). Maritime Administration-sponsored and fee-based resource in operation from 1970's through May 1991. Human factors portion of the collection is stored at MSI/CAORF; the rest of the collection is stored as a research collection of the Bland Memorial Library.

MSI/CAORF collections were those of individual researchers and the human factors section of the Maritime Technical Information Facility.

The **Technical Information Center of the U.S. Coast Guard Research and Development Center** covers marine engineering, information systems, systems analysis, environmental safety, navigation systems, surveillance systems, marine fire research, and ice technology. Its holdings include 1000 books, 1000 reports, 250 journals and other serials, and U.S. Coast Guard reports. The center is open to the public with permission, and it offers interlibrary loans.

The **Nutting Memorial Library at Maine Maritime Academy** has holdings in the following subjects: marine engineering, marine transportation, nautical science, maritime management, engineering technology, and power engineering. Its collection contains 79,750 books, 5347 NTIS fiche, 2086 maps and charts, 149,734 government documents, and 915 serials. It is also open to the public and offers interlibrary loans.

The **California Maritime Academy Library** covers marine engineering and technology, navigation, ship operations, marine transportation, and cargo handling. Its holdings include 25,000 books, 20,000 technical reports on microfiche, 3000 bound periodical volumes, 1800 microforms of periodicals, and 385 journals. The library is open to the public and offers interlibrary loans.

The **Institute of Transportation Studies Library at the University of California at Berkeley** includes 133,000 volumes, 900 maps, 100,000 microfiche and 3000 journals and other serials dealing with transportation. It offers interlibrary loans and is open to the public for reference use only.

The **International Maritime Organization (IMO) Library** collection is maintained to support the objectives of the IMO and efforts of its staff members, delegates, students and representatives. Subject coverage includes maritime safety and protection of the marine environment, ship design and equipment, fishing vessel safety, standards of training and watchkeeping, marine pollution, navigation and communications, and technical cooperation. The collection comprises approximately 15,000 books and more than 300 periodicals, including IMO and United Nations publications. The library is open for reference use to non-members by appointment.

The **Nautical Institute** maintains a collection of their publications which are available for purchase. Subject focus is "practical advice on operational problems which cannot be found elsewhere." Materials include books, proceedings, briefings and newsletters.

The **U.S. Coast Guard Academy Library** covers Coast Guard and Naval history as well as marine technology. Its collection includes 160,000 volumes, 20,221 government documents, and 1023 journals. The library offers interlibrary loans, and only the government document collection is open to the public.

The **New York-New Jersey Port Authority Library** maintains a large collection of transportation materials (for both land and sea), such as shipping statistics and economic impacts of port activity; however, the subject focus is not on the "operator." They have an electronic catalog for in-house use only.

The **Transportation Library at Northwestern University** covers general transportation, modal transportation, intermodal transportation focusing on socioeconomic aspects, and environmental impact (of transportation?). It contains 33,000 volumes of environmental impact statements, 182,000 books and reports, 18,000 pamphlets, 100,000 microforms and 1500 journals. It offers interlibrary loans and is open to the public with some restrictions.

Publication Title	Date	Library
Accident and loss prevention at sea: International conference and workshops. November 1993	1993	Mass MA
Applicability of foreign innovations for U.S. flag ships of the future	1989	CMA
Assessment of the impressions of station personnel on the effectiveness and suitability of the 47-foot motor life boat (mlb)	1994	CMA
Bridge design and ship operations: Third international conference	1987	Mass MA
Bridge team management: A practical guide	1993	CMA
Cognitive analysis of navigation tasks: A tool for training assessment and equipment design. Interim report	1994	Maine MA
Command seminar '90: Updating for the 90's	1990	SUNY MA
Conference: Education and training for the nautical profession	1992	Mass MA
Crew adaption evaluation of the Norwegian Crew Concept (Norcrew)	1994	Maine MA
The effect of ship inherent controllability on piloted performance: Evaluation and prediction	1991	SUNY MA
Effective manning in the Or	1988	Mass MA
Ergebnisse des forshungs-u	1986	TAMUG
Human factors analysis of E (ECDIS)	1993	SUNY MA
Human factors assessment of production model (Cape M	1994	Mass MA
Human factors evaluation of Systems (ECDIS)	1995	Maine MA
Human factors evaluation of	1992	Maine MA
Human factors plan for maritime safety. Final report	1993	TAMUG
Human factors plan for maritime safety: Annotated bibliography. Interim report	1993	TAMUG
The international command seminar: For operators, ship captains and those aspiring to command	1995	Maine MA
International convention on standards of training, certification and watchkeeping for seafarers	1995	Maine MA

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Publication Title	Date	Library
Marine safety management international conference and exhibition	1995	SUNY MA
Maritime shipping as a high reliability industry: A qualitative analysis	1994	SUNY MA
Marsim '93: International conference on marine simulation and ship maneuverability	1993	Maine MA
Modeling techniques for shipboard manning: A review and plan for development	1993	TAMUG
Navigation and the human factor: Seminar, 10 December 1987	1987	TAMUG
The Nautical Institute on pilotage and shiphandling	1991	TAMUG
The Nautical Institute on the management of safety in shipping	1990	CMA
The Nautical Institute training and assessment conference	1995	CMA
Prevention through people	1995	TAMUG
Professional curriculum standard Maritime Academy training pro	1985	Maine MA
Results of research and developn	1986	TAMUG
A review of the literature on train simulator fidelity	1984	Mass MA
Shipboard crew fatigue, safety at	1990	TAMUG
Ship operations cooperative prog upgrade, foreign vs. U.S. differ	1994	SUNY MA
Ship operations cooperative prog upgrade, industry performance	1994	CMA
Ship operations cooperative program: Program description 1994	1994	Mass MA
A study of human resources in ship operations: Phase 2 report	1982	CMA
A systematic approach for evaluation of port development and operations problems utilizing real time simulation	-----	SUNY MA
U.S. Coast Guard marine casualty investigation and reporting: Analysis and recommendations for improvement. Interim report	1994	TAMUG
Vessel productivity assessment: Annotated bibliography	1988	CMA
Waterway design manual	1992	SUNY MA
1993 At sea evaluation of ECDIS	1993	Mass MA

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Appendix 9. MHF Database Structure

Define Data Structure

Name of structure: HUMAN3

Description line (optional): MRHF revised data structure (3/10/96)

Record ID field(s): IDNUM

Order key field(s): IDNUM

Type	LABEL	NAME	INDEX	SORT	EMPHASIS	for each field
F/1	ID	IDNUM	T	7	1	
F/2	TY	TYPE	T	7	1	
F/3	TI	TITLE	Y	9	1	
F/4	AU	AUTHOR	Y	7	1	
F/5	CAU	CORP_AU	Y	7	1	
F/6	ED	EDITOR	Y	7	1	
F/7	DT	DATE	Y	7	1	
F/8	LANG	LANGUAGE	T	7	1	
F/9	PD	PHYS_DES	Y	7	1	
F/10	SOTI	SOURC_TI	Y	5	1	
F/11	VI	VOL_ISS	T	7	1	
F/12	PUB	PUBLISH	Y	7	1	
F/13	SERTI	SERIES_TI	Y	5	1	
F/14	REPNO	REPORT_NO	Y	5	1	
F/15	NTS	NOTES	K	7	1	
F/16	SU	SUB_TERM	Y	7	1	
F/17	GNSU	GEN_SUBJ	Y	7	1	
F/18	AB	ABSTRACT	K	7	1	
F/19	UD	UPDATE	Y	4	1	
F/20	PR	PRIORITY	T	7	1	
F/21	REQDT	REQUEST_DT	Y	4	1	
F/22	COST	ACQ_COST	Y	5	1	
F/23	ADT	ACQ_DATE	Y	4	1	
F/24	ASO	ACQ_SOURC	Y	5	1	

Stop words: A AN AND BY FOR FROM IN OF ON THE TO WITH

Leading articles: THE A AN

Master password (if passwords are desired):

Passwords and field lists

P/1

Appendix 10. MHF Database Search Screen Format

Define Search Prompts

Search prompts file: C:\MRHF\MHFFIN

Data Structure: HUMAN3

Display format:

Search prompt/1 ID: [ID]

Search prompt/2 TITLES: [TI, SOTI, SERTI]

Search prompt/3 AUTHORS: [AU, CAU, SERTI]

Search prompt/4 PUBLISHER: [PUB]

Search prompt/5 DATES: [DT]

Search prompt/6 SUBJECT: [SU, GNSU]

Search prompt/7 SEARCH ALL FIELDS: [ID, TY, TI, AU, CAU, ED, DT, LANG, PD, SOTI, VI, PUB, SERTI, REPNO, NTS, SU, GNSU, AB]

Appendix 11. MHF Database Search Results Format

Define Report Format

Name of format: C:\MRHF\USEREXP
Name of data structure: HUMAN3
Date created: 09/12/95 10:44:21
Date last modified: 03/12/96 22:27:26

A. PAGE DEFINITION

Physical page length (number of lines): 60
Top header margin (number of lines): 1
Bottom footer margin (number of lines): 3
Maximum page width (number of characters): 79
Number of blank lines between records: 3
Break record across pages if needed (Y/N): N
Print underline characters as spaces (Y/N): N
Pause between pages (Y/N): N

B. USER QUESTION DEFINITIONS

Type a name for the user response, followed by the question.
B/1

C. CALCULATION DEFINITIONS

Type a name for the result, followed by the calculation.
C/1

D. PAGE LAYOUT

Type specifications for the page.
D/1

E. RECORD LAYOUT

Type specifications for each record.

E/1 TYPE, LINE 1, COLUMN 8 - 39, BEGIN 'TYPE: ', INDENT 0
E/2 IDNUM, LINE 1, COLUMN 40 - 60, BEGIN '[', END ']', INDENT 0
E/3 @PARAGRAPH, LINE BOTTOM + 1, COLUMN 21 - 69, INDENT -13
E/4 'TITLE: ', COLUMN 8 - 69, INDENT 0
E/5 TITLE, LINE SAME 4, COLUMN 21 - 69
E/6 AUTHOR, LINE BOTTOM, COLUMN 21 - 69, BEGIN 'AUTHOR: ', SEPARATE ';',
INDENT -13
E/7 @LIST, LINE BOTTOM, COLUMN 21 - 69, INDENT -13
E/8 SOURC_TI, BEGIN 'SOURCE: '
E/9 VOL_ISS, BEGIN 'VOL/ISSUE: '
E/10 @PARAGRAPH, LINE BOTTOM, COLUMN 21 - 69, INDENT -13
E/11 DATE, LINE BOTTOM, COLUMN 8 - 69, BEGIN 'DATE: ', INDENT 0
E/12 EDITOR, LINE BOTTOM, BEGIN 'EDITOR: ', SEPARATE ';'
E/13 CORP_AU, LINE BOTTOM, COLUMN 21 - 69, BEGIN 'CORP AUTHOR: ', SEPARATE
'^M ', INDENT -13
E/14 @LIST, LINE BOTTOM, COLUMN 21 - 69, INDENT -13
E/15 LANGUAGE, LINE BOTTOM, COLUMN 21 - 69, BEGIN 'LANGUAGE: '
E/16 PHYS_DES, LINE BOTTOM, COLUMN 21 - 69, BEGIN 'DESCRIPTION: '
E/17 SERIES_TI, BEGIN 'SERIES: '
E/18 @PARAGRAPH, LINE BOTTOM, COLUMN 21 - 69, INDENT -13
E/19 REPORT_NO, LINE BOTTOM, COLUMN 21 - 69, BEGIN 'REPORT NO: ', SEPARATE
'^M '
E/20 PUBLISH, LINE BOTTOM, COLUMN 21 - 69, BEGIN 'PUBLISHER: ', SEPARATE
'^M '
E/21 @PARAGRAPH, LINE BOTTOM, COLUMN 21 - 69, INDENT -13
E/22 NOTES, BEGIN 'NOTES: '
E/23 @LIST, LINE BOTTOM + 1, COLUMN 10 - 75, INDENT -2
E/24 ABSTRACT

Appendix 13. Publication Submission Form

Maritime Human Factors Bibliographic Database Updating Process

Example PUBLICATION SUBMISSION FORM

1. **SOURCE:** Please provide the following information and indicate whether you would like to be added to a CONTACT Database which will allow World Wide Web access to your information, for the purposes of supporting research and collaboration.

- ☐ My name is provided below. I am already in your updating process files.
☐ Yes, please add me to the CONTACT Database.
☐ No, please retain this information for database updating purposes only.

Your name: _____ Title: _____

Department: _____

Company or Agency name: _____

Postal address: _____

Telephone: _____ Fax: _____

Electronic mail address: _____

Web page title and address: _____

Other contact information: _____

2. **PUBLICATION SUBMISSION:**

- Publication is included (☐ yes ☐ no) or is being sent separately by mail (☐ yes ☐ no).

Publication type: ___ article ___ report ___ electronic data ___ other: _____

Title: _____

Author(s): _____

Publisher, city, state, country: _____

Date of publication: _____ Journal Title, Vol., Issue: _____

Other information: _____

- Please provide contact information for purchasing (☐) or borrowing (☐) this publication, even if publication is being provided at this time:

☐ Check here if same as SOURCE information provided above.

Name: _____ Title: _____

Company or Agency Name: _____

Address: _____

Telephone, fax, email: _____

3. **RECOMMENDATIONS** for subject indexing emphasis: _____

4. **RECOMMENDATIONS** concerning publication's contribution to the field:

___ new methodology ___ new technology ___ unique data

___ one-of-a-kind study in the area of _____

___ other, please describe: _____

Thank you for your contribution to maintaining the relevancy and completeness of this resource.

Appendix 14. Reference Submission Form

Maritime Human Factors Bibliographic Database Updating Process

Example REFERENCE SUBMISSION FORM

1. **SOURCE:** Please provide the following information and indicate whether you would like to be added to a CONTACT Database which will allow World Wide Web access to your information, for the purposes of supporting research and collaboration.

- ☐ My name is provided below. I am already in your updating process files.
☐ Yes, please add me to the CONTACT Database.
☐ No, please retain this information for database updating purposes only.

Your name: _____ Title: _____

Department: _____

Company or Agency name: _____

Postal address: _____

Telephone: _____ Fax: _____

Electronic mail address: _____

Web page title and address: _____

Other contact information: _____

2. **REFERENCE SUBMISSION:**

➤ Where was reference found? _____

Publication type: ___ article ___ report ___ electronic data ___ other: _____

Title: _____

Author(s): _____

Publisher, city, state, country: _____

Date of publication: _____ Journal Title, Vol., Issue: _____

Other information: _____

➤ Please provide contact information for purchase or borrowing of this publication, if known:

☐ Check here if same as SOURCE information provided above.

Name: _____ Title: _____

Company or Agency Name: _____

Address: _____

Telephone, fax, email: _____

3. **RECOMMENDATIONS** for subject indexing emphasis: _____

4. **RECOMMENDATIONS** concerning publication's contribution to the field:

___ new methodology ___ new technology ___ unique data

___ one-of-a-kind study in the area of _____

___ other, please describe: _____

Thank you for your contribution to maintaining the relevancy and completeness of this resource.