# WATERBORNE TRANSIT

## SPECIAL BIBLIOGRAPHY

## OCTOBER 1978

Maritime Research Information Service
Transportation Research Board
Commission on Sociotechnical Systems
National Research Council

National Academy of Sciences
Washington, D.C.
1978

**Waterborne Transit: Special Bibliography**
Price $7.00

Transportation Research Board publications are available by ordering directly from the board. They may also be obtained on a regular basis through organizational or individual supporting membership in the board; members or library subscribers are eligible for substantial discounts. For further information, write to the Transportation Research Board, National Academy of Sciences, 2101 Constitution Avenue, N.W., Washington, D.C. 20418.

Notice
The project that is the subject of this report was approved by the Governing Board of the National Research Council, whose members are drawn from the councils of the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine. The members of the committee responsible for the report were chosen for their special competence and with regard for appropriate balance.

**Library of Congress Cataloging in Publication Data**
National Research Council. Transportation Research Board.
Maritime Research Information Service.
Waterborne transit.

Includes indexes.
1. Shipping–Abstracts. I. Title.
HE571.M37 1978 387.5'08 78-11094
ISBN 0-309-02801-9

**MRIS PUBLICATIONS AND SERVICES**

| | |
|---|---|
| *MRIS CURRENT AWARENESS SERVICE* (ISSN 0148-8465) | |
| Annual subscription (12 monthly issues) | $50.00 |
| *MRIS ABSTRACTS* (ISSN 0147-572X) | |
| Annual subscription (2 issues) | $50.00 |
| CUMULATIVE INDEX–1970-1976 | |
| Subscribers to both *Current Awareness* and *Abstracts* | Free |
| Subscribers to either *Current Awareness* or *Abstracts* | $15 |
| Nonsubscribers | $25 |
| FILE SEARCHES | |
| Computer retrieval | $50 per request plus 25 cents per printout page |
| Add for computer-prepared indexes | $20 per request plus 35 cents per printout page |

For multiple subscriptions, please list the names of all individuals so that publications can be mailed directly. Payment must be in international money order or a check drawn on a U.S. bank for U.S. funds. Make payable to the National Academy of Sciences.



*Office Address*
2100 Pennsylvania Avenue, N.W., Washington, D.C.

*Telephone*
202-389-6687 or 202-389-6452

*Mail Address*
Transportation Research Board, National Academy of Sciences, 2101 Constitution Avenue, N.W., Washington, D.C. 20418

# Contents

INTRODUCTION ..... iv

AVAILABILITY OF DOCUMENTS ..... v

ABBREVIATIONS ..... vi

ABSTRACTS ..... 1

SOURCE INDEX ..... 31

AUTHOR AND INVESTIGATOR INDEX ..... 34

SUBJECT TERM INDEX ..... 36

# Introduction

This special bibliography contains 183 abstracts of selected reports and journal articles that cover a range of topics, problems, and vessels found in the area of waterborne transit. Although a portion of the bibliography is devoted to cargo transportation, the emphasis is on passenger transportation.

One of the abstracts is shown below to identify the information contained. Abbreviations used in the abstracts are given on page vi.

Accession Number → **157869**

Title → **ADVANCED SURFACE CRAFT ECONOMIC MODEL**

Abstract →

A full revelation of a computer program prepared at Louisiana State University for Panel MS-1 of the Marine Systems Committee. It is a complete computer analysis of any number of shipping operations using advanced surface craft such as hydrofoils or air-cushion vehicles. Ten years in the making, this milestone publication can aid a prospective operator in choosing which type of craft to utilize, either in a high-speed cargo and/or passenger service. Making use of the material contained in Bulletin 5-1 can give an operator a hypothetical dollars and cents "bottom line" using any type of marine transportation. The entire methodology, which consists of an explanation of the program, the hand-calculated version and the computer version in an abbreviated program is contained in the 75-page book. The detailed economic model, "Appendix D," is reproduced on three microfiche included with each copy. The program is said to work well with displacement craft also.

For those who wish to incorporate this study into their own computer program, the computer card deck is also available at a price of $150.00.

Author (Affiliation) → **Pruett, JM**

Publisher and Publication Data → **Society of Naval Architects and Marine Engineers T&R Bulletin 5-1, Dec. 1976, 75 pp, 3 Fig., 12 Ref., 3 App.**

MRIS Data Source → **ACKNOWLEDGMENT: SNAME**

Availability of Full Text (see also Publisher) → **ORDER FROM: SNAME**

# Availability of Documents

Articles, reports, documents, and other materials that are abstracted in this volume are NOT available from the Maritime Research Information Service unless indicated. To obtain copies of the full text of published documents abstracted in this volume, write to the source or to the publisher, both given with the abstract. Libraries may also contain the documents.

Prices are subject to change by the individual suppliers. When ordering a report of completed research, always quote entire information shown after the words, "Order From" and include the order number when shown. Also give the title, author, volume, number, and date.

Because a large number of documents are available from a few sources, space and printing costs have been reduced by abbreviating those sources and giving their full names and addresses below instead of with the abstracts and project summaries.

ESL
Engineering Societies Library
345 East Forty-seventh Street
New York, New York 10017

NTIS
National Technical Information Service
5285 Port Royal Road
Springfield, Virginia 22161

SNAME
Society of Naval Architects and Marine Engineers
Suite 1369, 1 World Trade Center
New York, New York 10048

GPO
Government Printing Office
Superintendent of Documents
Washington, D.C. 20402

**International Information**

Photocopies of orginal reports are available from the British Ship Research Association (BSRA) at 15 cents per page (minimum charge, 75 cents). Copies of existing translations are available for $20 for the first copy and $2.50 for duplicate copies. Orders should be addressed to

Head of Technical Information Division
British Ship Research Association
Wallsend Research Station
Wallsend, Northumberland
England

Photocopies are available from the Ship Research Institute of Norway (NSFI) at NKr 3.50 per page (approximately $0.65 per page at September 1977 currency rates). Orders should be addressed to

Ship Research Institute of Norway
Technical University of Norway
7034 Trondheim-NT4, Norway

**TRISNET Centers**

The Northwestern University Transportation Center Library and the University of California Institute of Transportation Studies Library are functioning as TRISNET Centers in the operation of a prototype document delivery system under contract to the U.S. Department of Transportation.

The objective of the TRISNET Centers is to provide the documents identified through search of the TRIS abstracting and indexing services (MRIS and the Highway, Railroad, and Air Transportation Research Information Services).

In referring your requests to either of these libraries, please cite

| | |
|---|---|
| Accession number | Publisher or journal title |
| Author | Date of publication |
| Title | |

The request may be for either loan of publications for a period of two weeks plus estimated mailing time (Northwestern accepts requests directly from users, but University of California requires submission of an interlibrary loan request) or for photocopies of articles and conference papers. If the document is unavailable at the library, referral to the best available source will be made.

Loan services are free when the publications are mailed at the book rate. If the user requires priority mailing, the library will charge for mailing costs. Photocopies of articles or individual conference papers are made at the rate of 10 cents per page plus a handling charge of 50 cents per item. In all cases, invoices are mailed with the loan or photocopy.

The TRISNET Center at either Library may be contacted as follows:

Northwestern University
Transportation Center Library
Evanston, Illinois 60201
312-492-5273
TWX 910-231-0872

University of California
Institute of Transportation Studies Library
412 McLaughlin Hall
Berkeley, California 94720
415-642-2304

# Abbreviations

**Agencies**

| | |
|---|---|
| AFC | U.S. Air Force Cambridge Research Laboratories |
| AFL/CIO | American Federation of Labor/Congress of Industrial Organizations |
| AIAA | American Institute of Aeronautics and Astronautics |
| AIMS | American Institute of Merchant Shipping |
| AINA | Arctic Institute of North America |
| AMO/MEBA | American Merchant Officers/Marine Engineers Beneficial Association |
| ANL | Argonne National Laboratory |
| API | American Petroleum Institute |
| APL/JHU | Applied Physics Laboratory/Johns Hopkins University |
| ASCE | American Society of Civil Engineers |
| ASME | American Society of Mechanical Engineers |
| BCF | Bureau of Commercial Fisheries |
| BISI | British Iron and Steel Industry Transportation Service |
| BSRA | British Ship Research Association |
| COE | U.S. Army Corps of Engineers |
| DDC | Defense Document Center |
| DIA | Defense Intelligence Agency |
| DOD | U.S. Department of Defense |
| DOT | U.S. Department of Transportation |
| EI | Engineering Index |
| EPA | U.S. Environmental Protection Agency |
| ERDA | Energy Research and Development Administration |
| ESL | Engineering Societies Library |
| FWPCA | Federal Water Pollution Control Administration |
| FWQA | Federal Water Quality Administration |
| JPRS | Joint Publications Research Service |
| MARAD | Maritime Administration |
| M/C | Maritime Information Committee, National Academy of Sciences |
| MTRB | Maritime Transportation Research Board |
| NAE | National Academy of Engineering |
| NAS | National Academy of Sciences |
| NASA | National Aeronautics and Space Administration |
| NBS | National Bureau of Standards |
| NOAA | National Oceanic and Atmospheric Administration |
| NODC | U.S. Navy Oceanographic Data Center |
| NOIC | U.S. Navy Oceanographic Instrumentation Center |
| NOO | Naval Oceanographic Office |
| NRL | Naval Research Laboratory |
| NSF | National Science Foundation |
| NTIS | National Technical Information Service |
| ORNL | Oak Ridge National Laboratory |
| SCA | Shipbuilders Council of America |
| SIE | Science Information Exchange |
| SNAME | Society of Naval Architects and Marine Engineers |
| TRB | Transportation Research Board |
| TRIS | Transportation Research Information Service, National Academy of Sciences |
| UCRL | University of California, Lawrence Radiation Laboratory |
| USCG | U.S. Coast Guard |

**Other**

| | |
|---|---|
| AD | Prefix followed by 7 characters indicates a DOD document available from NTIS, e.g., AD-A 025 685 |
| COM | Prefix identifying an NTIS accession number |
| N | Number of the series publication |
| PB | Prefix identifying an NTIS accession number |
| Repr PC | Reproduced paper copy of original document |
| Rpt | Report |
| Req Price | Price on request |

# Abstracts

001945
**A PARAMETRIC STUDY OF HIGH SPEED SUPPORT AMPHIBIANS**

The report presents the results of a parametric study of high speed support amphibians. The vehicle types considered include planing hulls, hydrofoils, hydrokeels, captured air bubble craft and catamarans. The parameters considered include vehicle dimensions, speed, range, payload and machinery characteristics. Emphasis was placed on hydrodynamic characteristics and waterborne performance. The parametric results were obtained through the use of computer aided conceptual design models for each of the vehicle types. Appendices are included which present the background data used in the conceptual design models. ( Author )

Miller, ER Scherer, JO Barr, RA
Hydronautics, Incorporated Tech Rpt TR-615-1, FEB68, 228Pp

ACKNOWLEDGMENT: Defense Documentation Center
ORDER FROM: NTIS

AD-667251

003142
**NEW FERRYPORTS AT SWANSEA AND CORK. CAR FERRY ROUTE TO SOUTHERN IRELAND.**

These terminals, specially built for a new service opening up a cargo and passenger route from the southern half of Britain to the Republic of Ireland, are designed for the rapid disembarkation and embarkation of passengers, accompanied cars, and wheeled cargo at any state of the tide. When working to capacity, they will handle 240 cars and 1200 passengers in each direction every voyage. Some details are given for the facilities of the terminals, other facilities at Swansea, the flow of passengers and freight, and other services of the B. & I. Line.

*Shipping World and Shipbuilder* Vol. 162 No. 3835, JUL69, pp969-71

ACKNOWLEDGMENT: EI (EI 70 22533)
ORDER FROM: ESL

007493
**AN ANALYSIS OF RIGID SIDEWALL SURFACE EFFECT CRAFT FOR HIGH-SPEED PERSONNEL TRANSPORTATION**

A number of commercial applications have been proposed for rigid sidewall surface effect craft. The transport of crews to off shore operations is an application which is well-suited to the immediate use of moderately sized craft of this type. Because the crews are paid while they are in transit, high speeds are required to minimize the total transportation costs. The characteristics and performance of rigid sidewall surface effect craft suitable for crew transport operations are developed. The major design parameters studied include payload, total power, and machinery type. Performance estimates are made for operations in both calm water and waves. An economic model is developed to simulate crewboat operations. Cost estimates are based on current technology and price levels. The total unit transportation cost is used as the economic criterion in the determination of the relative merit of various craft. For the purpose of comparison the characteristics and costs of planing hull crewboats for the same mission are developed. It is concluded that rigid sidewall surface effect craft have the potential of being economically superior to planing boats for crew transport operations.

Miller, ER, Jr (Hydronautics, Incorporated) *Marine Technology* Vol. 7 No. 1, Jan. 1970, pp 55-68, 17 Fig, 4 Tab, 1 Phot, 12 Ref, 2 App
ACKNOWLEDGMENT: SNAME
ORDER FROM: SNAME

007580
**NEW THOUSAND-TON CARGO CATAMARAN**

Following the operational and seaworthiness testing of a 600-ton experimental cargo catamaran, over a seven year period, a prototype 1,000-ton catamaran is now at the test stage. This new vessel is designed to carry high tariff deck cargo and sail on main inland waterways. A complete description of the catamaran is given and it is pointed out that this type of ship has operating-technical advantages over similar designated single hull vessels.

*Rechnoy Transport* No. 2, 1970, 46p, 1 Tab

ACKNOWLEDGMENT: Joint Publications Research Service
ORDER FROM: NTIS,

JPRS-50515

012006
**THE TRANSPORTATION OF REFRIGERATED ANHYDROUS AMMONIA ON THE INLAND WATERWAYS**

The carriage of refrigerated anhydrous ammonia by barge is a relatively new technique and has grown rapidly in the past several years. As the movement has grown many problems have been identified and solved, but others remain to be worked out. This paper attempts to trace the development of ammonia barging, presents an operating profile of a typical ammonia movement and identifies remaining problems.

Creelman, William A (National Marine Service, Incorporated) *Marine Technology* Vol. 8 No. 1, Jan. 1971, pp69-74, 1 Fig

ACKNOWLEDGMENT: SNAME
ORDER FROM: SNAME

014617
**AUTOMATED RUDDER COMPLEX FOR RIVER SHIPS**

A method for the semiautomatic control of the rudder system of inland navigation vessels is described, and the requirements of this type of control are cited. An analysis is made of structural and schematic diagrams of this semiautomatic control system for underway conditions and maneuvering under manual control. Contact-free selsyns constitute the basic components of the system. Recommendations are given regarding the practical design of specific structural subsystems. The probability of failure-free system operation during a navigational period is given as approximately 0.95.

Neuymin, YG Kapalov, DD *Trudy Leningradskiy Instituta Vodnogo Transporta* Russian, 1967, pp57-63

ACKNOWLEDGMENT: Joint Publications Research Service
ORDER FROM: Library of Congress, Photoduplication Service, Washington, D.C., 20540 Repr PC

014891
**HISTORY AND FUTURE OF OHIO RIVER NAVIGATION**

The 981-mi long waterway has been continuously improved to float cargo downstream. The old locks and dams that were replaced and the new locks under construction are described. Continuing improvement in equipment and projected increase in traffic requires continuous reappraisal and timely improvement to assure the maximization of economic returns.

Gaum, CH (Army Office of Chief of Engineers) *American Society of Civil Engineers Journal* Vol. 96 No. WW2, Paper 7304, No Date, pp 483-495

ACKNOWLEDGMENT: EI (EI 70 50821)
ORDER FROM: ESL

014924
## DETERMINING THE DISPLACEMENT OF A HYDROFOIL AT THE INITIAL PLANNING STAGE

The accuracy of a determination of the displacement of a hydrofoil in the initial planning stage is most important and depends on the quality of the processing of the weight data, which for ordinary ships is based on a statistical analysis of a great number of ships which, all other things being equal, have nearly the same dimensions. Since sufficient statistical data on a great number of hydrofoils is lacking, primarily because existing hydrofoils differ so greatly one from the other, and since other known methods of computing weight data are based on exact dimensions, which are not yet known for a hydrofoil in the initial planning stage, the authors proposed a method of computing the weight data of a hydrofoil on the basis of the maximum number of passengers carried, cruising speed, economic cruising range and seaworthiness (maximum admissible height of waves when ship rides on the foils). The example computation given includes tabulated data on eight types of Soviet hydrofoils (Volga, Belarus, Chayka, Raketa, Meteor, Kometa, Sputnik and Vikhr).

Dementyev, VA Perelman, BS *Sudostroyeniye* No. 2, 1968, pp7-10

ACKNOWLEDGMENT: Joint Publications Research Service
ORDER FROM: Library of Congress, Photoduplication Service, Washington, D.C., 20540

015004
## A STUDY OF RIVER PORTS AND TERMINALS

The study covered by this report was conducted by the Transportation Institute of Southern Illinois University over the academic year 1967-1968, and was funded in part by the Maritime Administration, U. S. Department of Commerce, through a contract (No. MA-4319) with the University. The design set for the study required the assembly of information, primarily from extant publications but also from direct field contact where possible, on the distribution, capacity, and types of facilities on the inland waterways, on the commerce served by those facilities, and on the systems or modes of operation employed. Accordingly, abstracts of data were made from pertinent records and reports, and a mail survey, augmented by field trips, was utilized. The material thus assembled provided the basis for selecting criteria by which to describe the inland waterways in terms relevant to the prospective development of closer links between inland and marine carriers, and by which river ports may be defined, ranked, and identified. The resulting descriptions and identifications are presented in this report. The report is in two sections. Section 1 is devoted to a general view of inland waterway transportation in terms relevant to a prospective inland extension of marine commerce, with comments on related problems and steps toward solution. Section 2 is a presentation of more detailed information, including tabulated data on facilities and commerce and relevant maps or charts.

Southern Illinois University June 1968, 68 pp, 22 Tab

Contract MA-4319

ACKNOWLEDGMENT: Maritime Administration
ORDER FROM: NTIS

PB-183322

015035
## COMPARISON OF SOME FEATURES OF HIGH SPEED MARINE CRAFT

Some of the principal features of the main types of high speed marine craft are examined as an aid to assessing their present effectiveness. The craft considered are those which have service speeds greater than 30 knots and which are large enough to serve a practical commercial or naval purpose. The three main types are high speed displacement or planing craft, hydrofoil ships, and hovercraft. Power requirements are considered for these craft in calm water, and in waves representing conditions likely to be met in typical service operations. This performance comparison is extended to include some trial and service data. Published and other available information on the disposable load factors for various types of craft are then summarized, and it is suggested that apparent variations in structural efficiency are largely due to technical choices based on commercial considerations and to differences in certification requirements. Simple methods are used to compare some design features selected on economic considerations rather than technical efficiency. Cost criteria are examined and used in a broad discussion from which tentative conclusions are drawn about the present relative overall operating costs for foilcraft and hovercraft. Some characteristics of various types of craft which can affect their use in particular practical operating conditions are considered.

Silverleaf, A Cook, FGR
Royal Institution of Naval Architects Vol. 112 No. 1, Jan. 1970, pp69-86, 22 Ref

ACKNOWLEDGMENT: EI (EI 71 01602)
ORDER FROM: ESL

015184
## FRAMEWORK PLAN FOR OHIO BASIN NAVIGATION TO 2020

To meet future needs, a framework plan and development program is formulated as a broad guide to the best use of navigation resources. Demand for navigation on the existing system is estimated for 1980, 2000, 2020, based generally on indices of projected industrial and household demand in base subareas for five commodity groups representing the bulk of current waterborne commerce. Capabilities of going program facilities to serve the demand is evaluated. A framework plan for further development of navigation resources is defined.

Kent, TA (Army Engineering Division, Cincinnati) *ASCE Journal of Waterways and Harbors Division* Vol. 96 No. WW3, Paper 7473, Aug. 1970, pp665-687

ACKNOWLEDGMENT: EI (EI 71 02888)
ORDER FROM: ESL

015199
## EUROPEAN FERRIES AND SERVICES

A foldout map shows the routes for several hundred European ferry services, and a table, gives, for each line--name of each vessel, tonnage, ports served, time and distance of voyage, service speed, service season, passenger and vehicle capacity, container capacity, loading methods, turn around time, ship dimensions, ship features, and propulsion machinery.

*Motor Ship* Vol. 51 N No. 98, May 1970, pp 3,6-23, 1 Tab

ACKNOWLEDGMENT: EI (EI 71 01245)
ORDER FROM: ESL

015267
## COST-BENEFIT ANALYSIS FOR INLAND NAVIGATION IMPROVEMENT. VOLUME 1.

Research is directed towards improvement in procedures for the estimation of that portion of inland waterway transportation benefits which contribute to national income. The report is in three volumes. The first volume develops a conceptual framework which reflects interaction of supply and demand as they relate to the evaluation of transportation alternatives. A model for demand for transportation is developed, the application of modal split is introduced, and engineering and statistical cost functions are developed. (Author)

REFERENCES:
Cost-Benefit Anal for Inland Navig Improvements. Volume 2 Moses, Leon N; Lave, Lester B; Stucker, James P, Northwestern University, AD-715012

Moses, Leon N Lave, Lester B Stucker, James P Allen, William B Beuthe, Michael V
Northwestern University Final Rpt IWR-70-4-Vol-1, Oct. 1970, 77pp

DA-49-129-CIVENG6523

ACKNOWLEDGMENT: NTIS (AD-715011)
ORDER FROM: NTIS

AD-715011

015268
## COST-BENEFIT ANALYSIS FOR INLAND NAVIGATION IMPROVEMENTS. VOLUME 2.

Research is directed towards improvement in procedures for the estimation of that portion of inland waterway transportation benefits which contribute to national income. The report is in three volumes. The second volume deals with the development of demand and modal split analysis, and with the estimation of cost functions for rail and waterway transportation. (Author)

REFERENCES:
Cost-Benefit Anal for Inland Navig Improvements. Volume 2. Moses, Leon N; Lave, Lester B; Stucker, James P;, Northwestern University, AD-715106

Moses, Leon N Lave, Lester B Stucker, James P Allen, William B Beuthe, Michael V
Northwestern University Final Rpt IWR-70-4-Vol-2, Oct. 1970, 810pp
DA-49-129-CIVENG6523

ACKNOWLEDGMENT: NTIS (AD-715012)
ORDER FROM: NTIS

AD-715012

**015269**
**COST-BENEFIT ANALYSIS FOR INLAND NAVIGATION IMPROVEMENTS. VOLUME 3.**
Research is directed towards improvement in procedures for the estimation of that portion of inland waterway transportation benefits which contribute to national income. The report is in three volumes. In the third volume, an analysis of regulatory policy, its influence upon intermode competition, and a model of regulatory behavior based upon modern utility theory are presented. (Author)
REFERENCES:
Cost-Benefit Anal for Inland Navig Improvements. Vol 1 Moses, Leon N; Lave, Lester V; Stucker, James P, Northwestern University, AD-175011

Moses, Leon N Lave, Lester B Stucker, James P Allen, William B Beauthe, Michael V
Northwestern University Final Rpt IWR-70-4-Vol-3, Oct. 1970, 192pp

DA-49-129-CIVENG6523

ACKNOWLEDGMENT: NTIS (AD-715106)
ORDER FROM: NTIS

AD-715106

**015387**
**SELECTION OF OPTIMUM SPEED PERFORMANCE REGIME OF THE PROPULSION UNIT OF A RIVER VESSEL**
Methods for selecting an optimum operating regime of a propulsion unit of river vessels are discussed. This work is investigated by a finding that a decrease of 3 percent in the speed of boats leads to a 20-50 percent increase in the fuel efficiency. The criterion for the speed is the rate of revolution of the propulsion unit. It is used to describe a simple method that determines the boat speed as a function of propulsion power and other parameters. A similar approach is taken in modernizing the method developed by G. Ye. Pavlenko (O regulirovanii rezhimov i avtomatizatsii sudovozhdeniya na rekakh. Izd-vo AN UkrSSR, 1961). A concrete example is worked out and the optimum number of revolutions depending on the river depth is given.

Chernysh, AF *Gidromekhanika* No. 5, 1967

ACKNOWLEDGMENT: Joint Publications Research Service

**015455**
**HOVERCRAFT OPERATIONS**
The engineering aspects of running a cross-channel hovercraft operation are discussed, including-integral strength of hovercraft as demonstrated in accidents; frequency of skirt failures and approaches being taken to solve the problem; defects in the hydraulic systems; and efforts being made to reduce corrosion in the gas turbine power plants and propellers. Operational techniques and operating statistics are given for the 1969 season, during which two SRN4 hovercraft provided service between Ramsgate and Calais.

Colquhoun, LR *Shipbuilding and Shipping Record* Vol. 115 No. 17, May 1970, 2pp

ACKNOWLEDGMENT: EI (EI 71 10737)
ORDER FROM: ESL

**015500**
**SYSTEM ANALYSIS OF OBSTRUCTIVE BRIDGES**
In 1966 the U.S. Coast Guard took over various bridge functions from the Corps of Engineers and one of these functions is the program of altering bridges that obstruct navigable waters. This program requires the Commandant to make a determination if a bridge is an unreasonable obstruction to navigation before he can proceed to have it altered. The primary purpose of this study is to develop criteria that can be used for that determination. A system analysis will be developed where the relevant factors are modeled. A ranking criteria will be established within a decision framework to permit the determination of obstructiveness. This same model can then be used to rank all new cases in order to establish priorities for the Planning, Programming and Budgeting System by updating specific data inputs.

Jacobson, IB (United States Coast Guard)
United States Coast Guard No Date, 87 pp, 14 App.

ORDER FROM: NTIS

PB-192376

**019167**
**RIVER ICEBREAKER CONCEPT DESIGN AND TESTING**
The document describes the conceptual design and testing of a unique icebreaking vessel. The hull form is developed around 'least energy' ice handling techniques and a model testing program is conducted to optimize the concept. A math model of the ice handling principle is presented to support the testing program. Ice cutters are designed utilizing the water cannon principle. The performance and characteristics of the water cannon are developed. Underwater jets are investigated for flushing the broken ice away from the channel edge. Life cycle costs are presented for a river icebreaker system. Naval architecture studies and machinery selection complete the design package. (Author)
Final Report Jun 70-Feb 71

Consultec Incorporated Feb. 1971, 178pp

ACKNOWLEDGMENT: NTIS (AD-723333)
ORDER FROM: NTIS

AD-723333

**019239**
**HYDROFOIL CRAFT AND THEIR MARINE ENGINEERING ASPECTS**
Upon consideration of a general design philosophy for commercial hydrofoil craft, the percentage weight of some structural groups, published by various authors, are discussed and some data are added according to the present state of the art. Design and analysis problems for the layout of long, inclined propeller shafts, as well as for power transmission by means of bevel gears. Finally, a brief prospect for assumed future tendencies is given.

Faber, E *Hovering Craft and Hydrofoil* Vol. 9 No. 10, July 1970, pp28-39, 26 Ref

ACKNOWLEDGMENT: EI (EI 71 34724)
ORDER FROM: ESL

**019258**
**SYSTEMS ANALYSIS OF INLAND CONSOLIDATION CENTERS FOR MARINE CARGO**
This Technical Note documents a study, carried out for the U.S. Maritime Administration, to develop analytical techniques for use in optimizing the locations and characteristics of inland centers to facilitate the flow of containerizable marine cargo. Such centers would perform the consolidation of small lots (LCL) of break-bulk general cargo into container loads for export; for the reverse flow, they would carry out the handling and unloading of import containers for cargo distribution. The basic conclusions of this study are: (1) The present line-haul container rates and consolidation costs at inland consolidation centers, when compared with cost of shipment in less-than-container load lots of break-bulk, appear to give a distinct monetary advantage to the shipping community from the use of inland consolidation centers. (2) A computerized mathematical model to guide the selection of consolidation center locations is both feasible and useful; its use, level of detail, and the interpretations given its outputs must be duly sensitive to the quality of the data available. (3) For a port authority, a freight forwarder, an exporter or transportation company interested in containerization, or a government agency promoting such a program, it is essential to know points of origin, routes of transportation, times in transit, pertinent rates, volumes, seasonal variations, and points of destination of present and future flows of export and import cargo. These data are not presently available. The data are at least as important as the means by which they are manipulated. (4) The cost to a shipper of a center, can vary appreciably depending on precise center location, but given reasonably acute acquisition choices and operating practices, this variation should not be so appreciable as to affect a shipper's choice of center. Therefore, it is not necessary for the mathematical model to pinpoint the exact geographical location of each center in order to indicate how to achieve near-minimum total costs. The balance of this document, which reports fully the fact-finding and model-related work described just above, is relatively lengthy. It contains considerable technical detail, describes a number of data interpretations and modeling possibilities alternative to those actually adopted, and includes a good deal of material which (although relevant) proved peripheral to the main course of the study.

Jordan, RH

National Bureau of Standards Tech Note NBS 530, Nov. 1970, 138pp, 46 Tab, 40 Ref, 7 App

PO P1-MA68-112

ORDER FROM: GPO

C13.46:530

**019391**

**CONCEPT DEVELOPMENT PROGRAM FOR ICEBREAKING ON THE UPPER MISSISSIPPI RIVER**

A number of concepts were considered for cleaning a channel in the Upper Mississippi River. All of those concepts considered feasible, utilized an upward breaking bow of shallow angle in combination with a conveyor or system for placing clear ice well back from the channel. The use of impact or, mechanical cutters, jets, projectiles, heat and several other forms of ice management aids were reversed. Two concepts, one using a fixed underwater scoring device and the other using movable impactors on top of the ice, were in the final selection process. (Author)

Waggner, JP Cappel, K
Franklin Institute Research Laboratories FIRL-C2717, Mar. 1971, 270pp

Contract DOT-CG-00397-A

ACKNOWLEDGMENT: NTIS (AD-723995)
ORDER FROM: NTIS

AD-723995

**019530**

**HOVERCRAFT RESEARCH AT THE UNIVERSITY OF SOUTHAMPTON**

Hovercraft research at the University of Southampton has been in the general field of hovercraft motion and stability. In this article the author discusses his research papers written between 1967 and 1970. Each section of the article deals with a specific research project, its objectives, assumptions, findings, and practical application possibilities. Areas touched upon include: hovercraft behavior over water with emphasis on the influence of water free surface on hovercraft motion, hovercraft motion at zero ahead speed, a method of statistical prediction of hovercraft motion in general conditions over a short period, wave resistance of a hovercraft with emphasis on control and maneuverability problems, the hull form of the hovercraft air cushion with emphasis on air pressure variations, studies relative to the stable height of a hovercraft in operation, and a potential flow theory for the motion of a hovercraft in a seaway.

Murthy, TKS *Hovering Craft and Hydrofoil* Vol. 10 July 1971, 5pp, 10 Ref

ACKNOWLEDGMENT: United States Merchant Marine Academy (N-065)
ORDER FROM: Kalerghi Publications, Inc., 51 Welbeck Street, London W1, England

**019609**

**HOVERPORTS: TERMINAL REQUIREMENTS FOR MARINE FERRY HOVERCRAFT**

British hovercraft which carry passengers and automobiles across the English Channel must adapt their operations to the needs and desires of the people they service. The base hoverport is the most important factor in the swift and efficient movement of people and their goods. The hoverports of Hovertravel, Ltd., British Rail Seaspeed, and Hoverlloyd are compared, and special features of each are discussed with particular emphasis on the base hoverports. The similarity the operations at Hoverlloyd have to the operations at an airline terminal are described, as is the computer handling system utilized by Seaspeed. The advantages and limitations of the port locations of the three operators are discussed, and the steps each concern has taken to promote its advantages and overcome its disadvantages are mentioned. The conclusion of the authors is that the cross-Channel operators are indeed capturing a large share of this highly competitive market due to efficient operations and sound practices.

Colver, H Curtis, C *Hovercraft World* Vol. 5 No. 5, July 1971, pp88-93, 8 Pho

ACKNOWLEDGMENT: United States Merchant Marine Academy (N-097)
ORDER FROM: Air Age Publications, Ltd, 1 Temple Chambers, Temple Avenue, London EC4, England

**019676**

**A STUDY OF THE INLAND WATERWAY USE CHARGE PROGRAM**

The purpose of the study is to examine the economic implications of a number of proposed user charge methods. First the criteria are presented by which user charge methods should be evaluated. These criteria include economic efficiency, equity, and administrative simplicity. Then a number of alternative user charge mechanisms are examined and appraised in light of these criteria. In addition, estimates are made of the rates necessary under each user charge method to recover current annual operating and maintenance costs as well as investment costs. An attempt is also made to appraise the diversion of traffic that might occur on the different waterways if these charges were imposed. This study is confined to shallow draft, inland waterway transport. Port operations, deep channels connecting ports to the sea, deep draft coastal shipping, and Great Lakes shipping are excluded. While the theory of user charges is general, evaluation of impact is confined to shallow draft operations, principally on the Mississippi and its tributaries. (DOT abstract)

Charles River Associates Incorporated Rpt 157-1, Dec. 1970, 82pp

DOT-OS-00072

ACKNOWLEDGMENT: NTIS (PB-201617)
ORDER FROM: NTIS

PB-201617

**024765**

**AN ANALYTICAL MODEL TO PREDICT SHIP TRANSIT CAPACITIES OF SEA-LEVEL CANALS**

The large first cost and subsequent operation and maintenance costs of sea-level canals demand that all economic and technical alternatives be thoroughly investigated before construction is begun. The vast number of variables to be considered for any given set of alternative canals requires study in an orderly and meaningful manner. An analytical model in the form of a digital computer program to predict ship transit calculates ship movements by evaluating, at small, equal time increments, the many changing factors which affect their movement. In addition to inserting ships into the canal in some prescribed order, the program keeps track of each ship (its type, location, speed, and direction) in the canal and adjusts its speed at each time increment so that each ship operates safely under a predetermined set of conditions. The program is designed to predict the number of ship transits per unit time by considering the canal configuration, flow conditions in the canal, and the shipping which is expected to use the canal. The program can be used to optimize canal configuration for any given expected shipping, to optimize the manner of ship input for a given canal configuration, and to develop operation procedures for any canal configuration with any ship mix. (Author)

Harrison, J Simmons, HB Stinson, BG Anklam, FM
Army Engineer Waterways Experiment Station Final Rpt AEWES-H-69-10, Sept. 1969, 113pp

ACKNOWLEDGMENT: NTIS (AD-728096)
ORDER FROM: NTIS

AD-728096

**026416**

**THE ECONOMIC FEASIBILITY OF PASSENGER HYDROFOIL CRAFT IN U.S. DOMESTIC AND FOREIGN COMMERCE**

On the basis of 4 case studies (Intra-Hawaiian Islands, Miami-Nassau, Seattle to Bremerton and Point Defiance, and New York-Atlantic Highlands and Tour) passenger hydrofoil craft appear to offer prospects of profitable operation in providing short range water transportation service in the U.S. Hydrofoil craft offer considerably higher speed (up to 60 knots for first models) and better riding comfort than other waterborne vehicles. Potentially successful hydrofoil routes are limited by competitive modes of transportation, market characteristics and favorable environment. The total costs of the hydrofoil service for the 4 cast studies ranged between 4 and 7 cents per seat-mile. These costs are higher than those of land vehicles and small boats, and of aircraft and large ships at long ranges; they are less than those of aircraft, large ships, and helicopters at short ranges.

SR 1 Project no. IMU-3532.

Haney, DG Smith, SR
Stanford Research Institute Aug. 1961, 223 pp, 18 Ref

Contract MA-2510

ACKNOWLEDGMENT: NTIS (PB-181119), Maritime Administration
ORDER FROM: NTIS

PB-181119

028633
**THE MARINE BUSINESS IN THE CENTRAL UNITED STATES**

There are over 14,000 miles of commercially navigable inland and coastal waterways in the central United States. A unique and prosperous marine transportation system has developed on these waterways. This paper describes the magnitude of the business, the physical limitations of the waterways, operating patterns that have developed, and some of the technical aspects of the business. Particular emphasis is placed on the maneuvering of barge fleets and on the design of floating equipment.

Presented at the Annual Meeting of SNAME, November 11-12, 1971

Courtsal, DP (Dravo Corporation)
Society of Naval Architects and Marine Engineers Paper 12, Nov. 1971, 31pp, 15 Fig, 5 Ref

ACKNOWLEDGMENT: SNAME
ORDER FROM: SNAME,

028926
**HOVERCRAFT NOISE AND VIBRATION**

Hovercraft are a relatively new and unique form of transport, capable of traversing terrains which hitherto have been almost impassable at speed by surface transport. This high-speed capability was gained partially at the cost of ride comfort, but unlike some vehicle developments, as power and speed have increased, the noise and vibration within the hovercraft have steadily decreased with each new craft. The sources of noise and vibration are discussed, together with their possible methods of reduction in order to improve crew and passenger comfort.

Lovesey, EJ *Journal of Sound and Vibration* Vol. 20 No. 2, Jan. 1972, pp 241-245, 3 Fig, 2 Tab, 4 Ref

ACKNOWLEDGMENT: United States Merchant Marine Academy (N-282)
ORDER FROM: Academic Press Incorporated, Berkeley Square House, Berkeley Square, London SW1, England Repr PC

032649
**RESEARCH ON HYDROFOIL CRAFT**

The article contains a review of the technological state of the hovercraft and hydrofoil industry including many of the problems associated with the design and operation of the craft. Problems such as drag reduction, cavitation and lift are discussed and possible solutions are reviewed. The article also discusses foil profiles, foil systems, seakeeping capabilities and stability and maneuverability of the craft. Tests and test results are discussed in conjunction with the above.

Schuster, S *Hovering Craft and Hydrofoil* Vol. 11 No. 3, Dec. 1971, pp 5-10, 27 Fig

ACKNOWLEDGMENT: United States Merchant Marine Academy (N-335)
ORDER FROM: Kalerghi Publications, 51 Welbeck Street, London W1, England

033705
**THE USE OF LOW LIGHT LEVEL TV CAMERAS FOR SHIP TRAFFIC CONTROL IN RESTRICTED WATERS**

A system of low light level TV cameras has been installed at two locations on the Chesapeake and Delaware Canal. One camera is located at the Reedy Point entrance to the canal from the Delaware River and the second location at Town Point near the Chesapeake Bay entrance. Two identical cameras are installed at each location, one at the 70 foot elevation and the second at the 30 foot elevation. The television display from each location is at the Chesapeake City central dispatching office. Microwave equipment of special design operating in the 2ghz range is used to transmit the video signals from the remote locations to the dispatchers office. Complete remote control of each camera is also provided. Remote control of a set of traffic lights at each location with full supervision of their operation is also a part of the system. The paper describes the installation features, engineering and operating results of this aid to navigation of the C and D Canal. A similar installation in nearing completion at the Cape Cod Canal however, this installation will also provide radar surveillance at two locations. The radar information will be displayed on standard television equipment at the Buzzards Bay central control. The Corps of Engineers is studying the possibility of using low light level TV camera equipment for more safe and efficient operation of river locks.

Presented at the April 24-26th 1972 New Orleans RTCM Assembly Meeting. Volume 1-Papers AA and A thru F-Marine Traffic Systems, Volume 2-Papers G thru L-Safe Ship Operations, Volume 3-Papers M thru Q-Maritime Satellite Systems, Volume 4-Papers R thru Z-Trends in Maritime Communications. SOLD ONLY AS A COMPLETE FOUR VOLUME SET $10.00 PER SET.

Gray, CH (United States Army, Corps of Engineers)
Radio Technical Commission for Marine Services Apr. 1972

ACKNOWLEDGMENT: Radio Technical Commission for Marine Services
ORDER FROM: Radio Technical Commission for Marine Services, P.O. Box 19087, Washington, D.C., 20036

034661
**ANALYSIS OF THE SAFETY OF TRANSPORTATION OF HAZARDOUS MATERIALS ON THE NAVIGABLE WATERS OF THE UNITED STATES**

The report analyzes the safety of transportation of bulk hazardous materials on the navigable waters of the United States. Typical hazardous materials (H.M.) accidents are analyzed to determine what countermeasures are necessary to prevent recurrence. Risks involved in the transportation of H.M. are analyzed, with priority given to prevention of catastrophic accidents. The ingredients necessary for the occurrence of a catastrophic H.M. incident are discussed, and the risk peaks leading to the casualty are analyzed. Federal regulatory authority over the transportation of H.M. by water is summarized. Projects of the future shipment of H.M., and trends in H.M. accidents are made. The report concludes with a summary of areas of control of H.M. needed to prevent major H.M. accidents, and recommendations made to implement these added controls.

Special Marine Safety Study performed by Bureau of Surface Transportation, National Transportation Safety Board, Washington, D.C. 20591.

National Transportation Safety Board NTSB-MSS-72-2, Mar. 1972, 28 pp

ACKNOWLEDGMENT: NTIS (PB-209099)
ORDER FROM: NTIS

PB-209099

034732
**INLAND WATERWAY TRANSPORT POLICY IN THE U.S.**

The report analyzes the role of inland waterway transport within the dual framework of national water policy and national transportation policy, based on a synthesis of existing information and policy debates about the development and future of inland waterway transport in the United States. A logical framework for identifying and evaluating the problem is developed as a basis for considering the future of inland waterway transport. A descriptive summary of the inland waterway system and industry is given, along with a review of the history and development of the system.

Blood, DM
Wyoming University NWC-SBS-72-041, Feb. 1972, 266 pp

Contract NWC-71-010

ACKNOWLEDGMENT: NTIS (PB-208668)
ORDER FROM: NTIS

PB-208668

034915
**INTERNAL NOISE REDUCTION IN HOVERCRAFT**

The aim of this paper is to summarize the results of several years work on the internal noise of hovercraft. The basic mechanism of noise production is described and methods for controlling it are put forward. A case history is also described. Internal noise measurements from other forms of transport are compared to those of hovercraft and it is shown that comparatively small overall noise reductions of 4 dBA would make the internal noise the same as that of short-haul jet aircraft. Larger reductions of 10 dBA would be needed to match the noise levels in current public service vehicles. Structure-borne noise is shown to be a major source of noise in at least one current production craft. Low structural damping combined with light-weight and rigidly mounted machinery are found to be the major causes of structure-borne noise, and vibration isolation of major machine elements has produced substantial (10 dBA) reductions in internal noise levels.

Anderton, D *Journal of Sound and Vibration* Vol. 22N3 June 1972, pp 343-359

ACKNOWLEDGMENT: United States Merchant Marine Academy (N-444)

ORDER FROM: Academic Press Incorporated, 24-28 Oval Road, London NW1 7DX, England Repr PC

035111
**THE BARGE AND TOWING INDUSTRY CATALOG OF PUBLICATIONS FILMS AND INFORMATION RESOURCES**

This catalog lists publications, pamphlets, films and information resources that will be of interest to those who want a better understanding of domestic water carrier operation. The listings range from small 4 page flyers on waterway pollution to treatises on transportation law to the handling of dangerous cargoes and the future employment possibilities in this field. A brief description of 24 films highlighting our navigable rivers and barge operations on these rivers that can be used for training or educational purposes is included.

American Waterways Operators Nov. 1970, 23pp

ACKNOWLEDGMENT: American Waterways Operators, Incorporated
ORDER FROM: American Waterways Operators, Incorporated, Suite 502, 1250 Connecticut Avenue, NW, Washington, D.C., 20036 Repr PC

035176
**LARGE HYDROFOIL SHIPS FEASIBILITY LEVEL CHARACTERISTICS**

An analytical approach encompassing the preliminary feasibility level considerations necessary for determining the configuration definition, design and performance of hydrofoil platforms in the systems analysis context has been developed. The relationships among full load displacement, horsepower take-off margin, maximum speed capability, endurance, and range are examined for twenty-four configuration candidates (400-2000 tons) derived by varying powerplant shafthorsepower (30000-50000), foil loading (800-1200 psf), and propulsor (propeller-waterjet) parameters. The design criteria employed pertain to minimum take-off margin (25 percent maximum available horsepower) and maximum speed attainable (50 knots). The resulting performance characteristics are examined for constant speed operation and an alternating sprint/drift speed mode. The identified parametric inter-relationships and their sensitivities are systematically explored and summarized, enabling the designer/analyst to evaluate alternatives via the desired criterion.

Presented at AIAA/SNAME/USN Advanced Marine Vehicles Meeting, Annapolis, Maryland, July 17-19, 1972

Greco, JR (Naval Ship Engineering Center)
American Institute of Aeronautics and Astronautics 72-595, July 1972, 8 pp, 8 Fig, 2 Tab

ACKNOWLEDGMENT: AIAA
ORDER FROM: AIAA.

035975
**RIVER SEARCH AND SALVAGE AS VIEWED BY THE UNDERWRITER**

Operating on the inland waterways there are some 18,000 barges and 4,250 towboats. These ply the thirteen rivers sometimes known as the Mississippi River System or Western Rivers. The Marine Insurance Industry is very much a part of this vast system. Their expertise enables them to render considerable aid and assist those involved in the complexities of river search and salvage. The sinkings or strandings of the barges and their cargoes or towboats on these inland waterways are usually caused by accidents very seldom experienced, if ever, by ocean or lake vessels. Probably the only exception would be one of collision between two tows. Marine Salvage which is practiced or applied on the inland waterways also departs from that employed by ocean or lake salvors. Strandings, also referred to as groundings, are probably the most common of all misfortunes to befall a towboat and its barges, or, as it happens in most cases, the barges alone. Single barge sinkings are the most prevalent. Multiple sinkings are not an everyday occurrence as compared to the frequency of single barge mishaps. They are, however, the most spectacular involving many barges. Other sinkings are those caused by buckling, capsizing, burning or exploding. The search and recovery preparations to raise a sunken barge, her cargo, or the towboat vary from river to river. Each one has its own unpredictable phenomena that will be described.

Preprints-8th Annual Conference and Exposition of the Marine Technology Society. $15.00 per set.

Drabik, A (Appleton and Cox Corporation)
Marine Technology Society Sept. 1972, pp 551-562

ACKNOWLEDGMENT: Marine Technology Society
ORDER FROM: Marine Technology Society, 1730 M Street, NW, Washington, D.C., 20036 Repr PC

039326
**DOMESTIC SHIPPING INDUSTRY AND MARITIME POLICY**

Despite its vast importance to the U.S. transportation network and the fact that its vessels transport 400 million more tons than all of the vessels engaged in our foreign trade, the domestic shipping industry has always appeared curiously remote from any connection with shipping and the sea, an idea enhanced by its tug-barge approach, which, although its fleet included almost one million tons of barges over 10,000 deadweight tons, still seems to those familiar with deep sea trading purely a "sand and gravel" operation. However, appearances are deceptive, for the domestic fleet transports almost 25 percent of the total intercity ton miles of freight in the United States and is, because of the highly developed nature of our waterways network, best able to meet the growing transportation crisis that is facing this nation. The domestic trades have provided the impetus for the development of containerization and super tug-barge vessels and continues to provide the major raison d'etre for the U.S. tanker fleet. Additionally, domestic vessels employ 70,000 more American seamen than its sister fleet engaged in our foreign commerce. This paper analyses the major components of the domestic merchant marine and sketches the background behind a major shift in maritime policy as well as the major domestic shipping program elements, as established at the National Planning Conference on Domestic Shipping in May 1972.

Presented at the Chesapeake Section of SNAME.

Sansone, WT (Maritime Administration)
Society of Naval Architects and Marine Engineers Oct. 1972, 33 pp

ACKNOWLEDGMENT: Maritime Administration
ORDER FROM: SNAME.

039894
**COST FUNCTIONS FOR INLAND WATERWAYS TRANSPORT IN THE UNITED STATES**

Rightly or wrongly government plays an important role in the investment and operating decisions of transport firms. The Interstate Commerce Commission oversees a complicated structure of rates and a point-to-point system of operating licences. For inland waterway transport, additional complications stem from the fact that the construction and maintenance of navigable waterways are controlled by Congress through the Army Corps of Engineers. It is necessary for Congress, the ICC, and the Army Corps of Engineers to cooperate and to pursue the national interest rather than the interest of any particular industry or company. These agencies therefore require knowledge of the underlying cost and demand functions. This paper is designed to provide some information on waterway cost functions. The object is to estimate long and short-term Quarterly observations were obtained on five firms for the period 1962-66 (although 17 of the 100 potential observations were not available). The five firms in the sample are major inland waterway carriers with diverse barging operations. They operate on all the navigable tributaries of the Mississippi and Gulf Intercoastal Waterway systems, including the Missouri River, the Gulf of Mexico and Lake Michigan. They offer a complete range of water transport services, both in commodities handled and in equipment available for freight transport. Two major trends

Case, LS (Virginia Polytechnic Institute & State University); Lave, LB (Carnegie-Mellon University) *Journal of Transport Economics and Policy* Vol. 4 No. 2, May 1970, pp 181-191, 1 Ref

ORDER FROM: London School of Economics and Political Science, Houghton Street, Aldwych, London WC2A 2AE, England Repr PC

041269
**TRANSPORTATION TECHNOLOGY FOR DEVELOPMENT. VOLUME I**

This report provides background information on the technology of various transportation modes and their capabilities. It is intended primarily for use by economists, program officers, general engineers, and others in the economic development field. Information is included on the broad capacities of particular modes to handle freight and passenger traffic; major features and the advantages and limitations of each mode in terms of technical capabilities; levels of technological sophistication that can be adopted within

each mode; and the 'inputs' of right-of-way preparation and construction, materials, vehicles, equipment, maintenance, and manpower required at each level to produce an 'output' of transport service. Volume One contains sections on: Intermodal factors of choice in transportation; highway transportation; railway transportation; conventional air transportation; V/STOL aircraft; inland waterway transportation; oceanway transportation; pipeline transportation; and intermodal/freight exchange.

See also Volume 2, MRIS #040902.

Cheaney, ES Leis, RD Landreman, DM
Battelle Memorial Institute TA/OST-AN-68-2-1, Feb. 1968, 488 pp

Contract AID/csd-762

ACKNOWLEDGMENT: NTIS (PB-210592)
ORDER FROM: NTIS

PB-210592

**041503**
**REPORT OF THE FIRST NATIONAL PLANNING CONFERENCE ON DOMESTIC SHIPPING**

The first National Planning Conference on Domestic Shipping was held in St. Louis, Missouri, April 4- May 4, 1972. The conference was sponsored by the Maritime Administration. This report constitutes the permanent record of the Conference. It is organized in three volumes: Volume 1 summarizes the Conference's recommendations, origins and objectives, organization and operation, program and presentations, and panel reports. Volume 2 details the specific program elements of each of the four panels. Volume 3 contains the presentations of the speakers who appeared before the Conference. The Conference was divided into four panels, representing the major functional concerns of the industry: Operations and Facilities (Panel 1); Finance and Insurance (Panel 2); Legislation and Regulation (Panel 3); and Research and Development (Panel 4). The objectives of the Conference were to: (1) Critically review the status of the industry and identify the major problems that are impeding the progress of the industry in providing improved economical, efficient, and safe transportation services. (2) Outline a five-year program that the Maritime Administration can undertake in cooperation with the industry to resolve as many of these problems as possible. (3) Recommend specific actions in the form of program elements, with associated priorities and resource requirements, for early implementation as part of the five-year program.

Volume 1, Conference Report, COM-73-10232, 76 pp; Volume 2, Program Elements, COM-73-10233, 149 pp; Volume 3, Remarks Presented at the Conference, COM-73-10234, 92 pp.

Maritime Administration May 1972

ACKNOWLEDGMENT: Maritime Administration
ORDER FROM: NTIS

COM-73-10231-SET

**041545**
**TEXAS WATERBORNE COMMERCE COMMODITY FLOW STATISTICS**

This study examines the commodity mix moving through Texas ports. Data are developed on flow patterns of commodities entering and leaving Texas. Major areas on the inland waterway system which originate and terminate commodities shipped or received at Texas ports are identified. Primary commodity groups which move through Texas ports in foreign, coastwise, and internal trade are specified. A relationship between Texas waterborne commerce and employment in selected S.I.C. categories is developed in this study.

Lamkin, JT Lowery, WR
Texas A&M University Oct. 1972, 54 pp

ORDER FROM: Texas A&M University, Sea Grant Program, College Station, Texas, 77843

**043971**
**SHIP-MODEL INVESTIGATION FOR RESTRICTED NAVIGATIONS**

High speed economic operation of inland water craft propelled by conventional screw propellers may be defeated by the very high resistance encountered by operation in restricted width waterways, such as canals. This article describes research work that is presently being done in the area of channel flow characteristics. A description is given of the construction of the model tank and its associated equipment, such a measuring devices, and the propulsion systems that were used in the testing is also described. The results of the tests that were conducted are also included in the presentation.

Schofield, RB Frodsham, RD (Salford University) *Engineering* Vol. 218 No. 2, Feb. 1973, pp 78-82, 2 Ref

ACKNOWLEDGMENT: United States Merchant Marine Academy (N-619)
ORDER FROM: Engineering, Chemical and Marine Press Limited, 33-39 Bowling Green Lane, London EC1P 1AH, England Repr PC

**043973**
**TECHNICAL AND ECONOMIC VIEWS ON ACV'S**

A committee has been set up by IMCO to draft SOLAS and loadline proposals for air-cushion vehicles, hydrofoils and similar high speed light-displacement passenger-carrying craft. The trend of thought for these proposals is towards a flexible approach in order that this type of vehicle can be governed by safety levels constructed specifically for them, and more conventional vessels can be governed in a manner quite similar to that for ordinary vessels. This article deals with the definition of hovercraft, and it describes features and limitations of these craft, as well as safety, construction and engineering aspects of this type of vehicle.

Based on a talk given to the South Sweden Engineers Club at Malmo on November 9, 1972.

Buckle, AK *Hovering Craft and Hydrofoil* Vol. 13 No. 4, Jan. 1973, pp 6-11

ACKNOWLEDGMENT: United States Merchant Marine Academy (N-617)
ORDER FROM: Kalerghi Publications, 51 Welbeck Street, London W1, England

**046116**
**LABOR IN THE TRANSPORTATION INDUSTRIES**

The transportation sector consumes about 20 percent of total annual expenditures for goods and services, and employs about 13 percent of the total U.S. labor force. Any interferences to production and consumption of transportation in the form of work stoppages and strikes pose serious threats to national well being. In recognition of this fact, the study examines a number of aspects of transportation labor.

Lieb, RC
Office of Systems Analysis and Information Feb. 1973, 144 pp

ACKNOWLEDGMENT: NTIS
ORDER FROM: NTIS

PB-217121

**046571**
**THE ECONOMICS OF AN ADVANCED HYDROFOIL CRAFT**

The Boeing Company has recently studied the application of modern hydrofoil technology as a solution to the critical transportation problems that exist in a number of the world's high traffic areas. One area studied was Hawaii, which is presented as an example herein. It is believed that Hawaii's transportation problem is not so unique that its solution would not be of interest to others.

Gonnella, AM Shultz, WM (Boeing Company) *Hovering Craft and Hydrofoil* Vol. 10 No. 2, Nov. 1970, 9 pp

ACKNOWLEDGMENT: Boeing Company
ORDER FROM: Kalerghi Publications, 51 Welbeck Street, London W1, England

**046575**
**HIGH-SPEED WATER TRANSPORTATION OF MAN**

A variety of advanced high speed marine craft have been proposed for the transport of people. Specific vehicles have been tried on a diversity of routes both with success and failure. Claims and counterclaims have been issued. Technical debates have ensued with regard to vehicle performance, reliability, costs, control, stability, propulsion, debris, noise and air pollution, etc. The literature contains numerous reports on these subjects. With notable exceptions, little has been said about one of the most basic of all considerations where the transportation of man is concerned, the effect of vehicle motions on the fare-paying passenger. To their credit, hovercraft and hydrofoil proponents have attempted to present information on this subject, usually related to what the motions are rather than to their effect on the passenger or the resulting economic impact on the operation. Generally, the problem is misunderstood and all too often ignored. No universally accepted method has been established to define the water conditions expected along

a route, the vehicle motions likely to result, or the reaction of the passengers to those motions. This paper focuses attention on these considerations.

Presented at ASCE-ASME National Transportation Engineering Meeting, Seattle, Washington, July 26-30, 1971.

Shultz, WM (American Institute of Aeronautics and Astronautics); Coffey, CS (Society of Naval Architects and Marine Engineers); Gornstein, RJ
Boeing Company 1971, 21 pp, 19 Ref

ACKNOWLEDGMENT: Boeing Company
ORDER FROM: Boeing Company, P.O. Box 3707, Seattle, Washington, 98124

**048065**
**A PARAMETRIC ANALYSIS OF FAST HYDROFOIL CONFIGURATIONS**

A parametric design study was conducted to determine the characteristics and performance of a family of high speed hydrofoil craft in the size range from 100 to 300 tons gross weight and in the speed range from 60 to 90 knots. The results are presented in tables and plots of characteristics, speed and range as a function of size, design speed and sea state. Sensitivity studies were conducted to determine the importance and influence of the assumed and calculated parameters on the craft characteristics and performance. The product of the lift drag ratio and the propulsion coefficient was the most important parameter affecting the performance and the one which could be calculated with the least precision. (Modified author abstract)

Miller, EJ Altmann, R Poquette, GM Lain, HW
Hydronautics, Incorporated Tech Rpt TR-7224-1, Nov. 1972, 166 pp

Contract N00600-72-D-0307

ACKNOWLEDGMENT: NTIS (AD-760355)
ORDER FROM: NTIS

AD-760355

**048078**
**HYDROFOILS AND HYDROFOIL CRAFT**

The successful achievements of hydrofoil craft to date and the possibility of high speeds at sea are due to the greatly increased understanding in recent years of the flow past hydrofoils and to the development of foil configurations and control systems for coping with the roughness of the sea surface. It seems appropriate, therefore, to link the discussion of hydrofoils with that of progress in the craft. The general characteristics of hydrofoil craft are reviewed together with some representative modern examples. Some physical aspects of the flow past hydrofoils are described, followed by a resume of some of the recent methods used in design and analysis of hydrofoils.

Sponsored in part by Office of Naval Research, Washington, D. C. and Naval Ship Research and Development Center, Washington, D. C. Availability: Pub. in Annual Review of Fluid Mechanics, v5 p161-184 1973.

Acosta, AJ
California Institute of Technology 1973, 24 pp

ACKNOWLEDGMENT: NTIS (AD-760230)
ORDER FROM: NTIS

AD-760230

**048108**
**FAST FERRIES FOR THE STATE OF WASHINGTON**

The Washington State Ferries system has been examined and its ability to cope with the increasing traffic has been assessed. The ferry capacity for passenger promises to be adequate to cope with the forecast growth over the next ten years but auto traffic capacity is already nearly saturated at peak times in summer. The distances involved on most of the routes are sufficiently large to make the time savings from introducing fast ferries of the hydrofoil or hovercraft type interesting, particularly to the commuter. The present study was required to investigate the possible application of these new types of craft to the ferry system. The characteristic features and behaviour of hovercraft and hydrofoils are described in general. The details of layout, cost and performance are given for all types of these craft at present available for civil ferry operations or now in course of construction. Examples of the terminal facilities required are discussed and the maintenance and operating procedures described. The economics of the possible operation of these new high speed craft on the Washington State Ferries is assessed and compared with the economics of the present conventional ferries.

This study was commissioned jointly by the Washington State Highway Commission and the Joint Committee on Highways.

Hoverprojects Limited 1969, 188 pp

ACKNOWLEDGMENT: DOT
ORDER FROM: Hoverprojects Limited, Bowering Building, Tower Place, London EC3, England

**048109**
**URBAN OVER THE WATER TRANSPORTATION**

This report assesses the potential of Over-The-Water (OTW) mass transit mode to satisfy American urban requirements. Volume I presents a summary of report results, an annotated bibliography and acknowledgements. A list of 161 references is given. Volume II considers the characteristics of the various presently available high-speed OTW craft, such as surface effect vehicles and hydrofoils, manufactured in the U.S. and abroad. Operator's experiences are reviewed. Vehicle data and noise problems are reviewed in appendices. Volume III presents a potential passenger demand and route study for ten cities. An estimate of 1980 demand is based on this data. Implications of capital required, operating costs, employment, automobiles displaced, and economic feasibility are outlined. Rationale and criteria for evaluation of proposals and demonstrations are presented. Volume IV presents a set of alternative demonstration programs for OTW urban mass transportation. These include suggested demonstrations and planning, research and development, synthesis and implementations, timing, organization and costs of three sizes of programs. Volume IV is an UMTA internal working document.

NTIS: Vol. 1, PB-216066; Vol. 2, PB-216067; Vol. 3, PB-216068.

Krzyczkowski, R Campbell, TS Henneman, SS Hufschmid, A Bekker, MG
Interplan Corporation Vol. 1-3 Dec. 1971, 307 pp, Refs, Apps

ACKNOWLEDGMENT: DOT
ORDER FROM: NTIS

**048117**
**OPTIMIZING SUPPLY OF INLAND WATER TRANSPORT**

This paper presents and explores a supply model for inland water transportation. The model is a technologic production function valid for all circumstances. It is used in combination with information about relative prices, to determine optimal configurations of tows. The major conclusions are: (1) The production function has diminishing marginal returns; (2) it has increasing returns to scale for lakes, but generally decreasing returns to scale for rivers, which implies that whereas it is desirable to build as large as possible for lake (or ocean) transport, there is a definite optimal size for any given river; and (3) fixed guidelines, in terms of horsepower/ton ratios, can be developed for lakes and other environments where currents are neglibible, but are generally impossible to determine for river navigation. The optimal design guidelines depend upon relative prices of materials and wages. Total costs are relatively insensitive to additional horsepower beyond that required for the most economical design.

Hoffmeister, JF, III De Neufville, R *ASCE Journal of Waterways, Harbors & Coast Eng Div* Proceeding Vol. 99 No. WW3, 9926, Aug. 1973, pp 293-308

ACKNOWLEDGMENT: ASCE
ORDER FROM: ASCE

**048122**
**WATER POLICIES FOR THE FUTURE**

The Commission has examined virtually the entire range of water resources problems facing the Nation, including the effects of water management on the Nation's economy and on its environment and how the differences between these two major objectives can be best resolved. The problems of reconciling Federal and State water law have been addressed, as have the problems of integrating ground water and surface water management. Each of the important purposes for which water is used has been studied, and appropriate policies have been drawn for improving both water-related programs and organizational arrangements. Ways in which existing water supplies can be used more efficiently and present supplies can be augmented have also been examined. Standards by which interbasin transfers of water and other kinds of water projects should be judged have been developed and ways in which water management decision making can be improved have been formulated. The report considers the problems of acquiring basic water

data and pursuing research so that management of the Nation's water resources can be more knowledgeably and effectively based. Finally, the financing of future water programs as well as the important question of how and by whom the cost of water programs should be paid are also addressed. An extensive presentation is made on the cost and development of inland waterways. Projections on the possible methods for putting inland waterways on a pay as you go basis is recommended.

Final report to the President and to the Congress of the United States.

National Water Commission June 1973, 579 pp

ACKNOWLEDGMENT: National Water Commission
ORDER FROM: GPO

5248-00006

**050287**
**HEART--HAWAII'S ENVIRONMENTAL AREA RAPID TRANSPORT SYSTEM**

A mass transport system based upon marine vehicles and technology is proposed for the island of Oahu, Hawaii. There are three general types of routes that are designed for the system, and these are described. System requirements, such as funding, construction, maintenance, and environmental concerns are also discussed, and the author believes that the cost of this system will be considerably less than any other system offering the same capability. This belief is reinforced by the figures which are included in the article.

Peterson, RA *Hovering Craft and Hydrofoil* Vol. 12 No. 8, May 1973, 6 pp

ACKNOWLEDGMENT: United States Merchant Marine Academy (N-647)
ORDER FROM: Kalerghi Publications, 51 Welbeck Street, London W1, England

**050318**
**PLANNING A NEW URBAN TRANSIT COMPANY**

The author outlines in detail the necessary steps in developing various voyage pro formas for the management of a proposed hydrofoil transportation network to serve the New York metropolitan area. Once operations begin, the pro forma figures constitute management's initial budget which can be altered as actual operation experience and costs become available.

Boyle, ET *Management Advisor* Sept. 1973, pp 15-26

ACKNOWLEDGMENT: Management Advisor
ORDER FROM: American Institute of Certified Public Accountants, 666 5th Avenue, New York, New York, 10019 Repr PC

**050903**
**A FEASIBILITY STUDY OF WATERBORNE DOMESTIC INTERCITY AUTO FERRY SYSTEMS**

This paper studies the economic feasibility of waterborne domestic intercity auto-ferry systems. In specific, the trade route between Portland, Maine, and New York City is analyzed. Costs are extensively analyzed and are compared with revenue projections. Several different alternatives for construction and operation are examined with emphasis toward their effect on potential investors.

Baker, TM
Massachusetts Institute of Technology MS Thesis Aug. 1973

ACKNOWLEDGMENT: Massachusetts Institute of Technology
ORDER FROM: Massachusetts Institute of Technology, Department of Ocean Engineering, Cambridge, Massachusetts, 02139 Repr PC

**050953**
**THE U.S. GETS SERIOUS ABOUT HYDROFOILS**

Descriptions are given of two types of hydrofoils, one a passenger carrier, and the other a military version. The bulk of the article deals with the design, operation, propulsion system, and instrumentation of the passenger carrying hydrofoil, while the military version is only briefly described.

Aronson, RB *Machine Design* Vol. 45 No. 25, Oct. 1973, pp 30-34

ACKNOWLEDGMENT: National Maritime Research Center, Kings Point (N-714)
ORDER FROM: Penton Publishing Company, Penton Building, 1111 Chester Avenue, Cleveland, Ohio, 44113

**051235**
**THE ODER RIVER: TRANSPORT AND ECONOMIC DEVELOPMENT**

This book presents the importance of transportation in regional development. The main emphasis is on the Oder River as an artery of transportation which is viewed by Polish planners as an important link between Upper Silesia and the maritime port of Szczecin. The river flows through the axis of a highly industrialized part of Poland which produces slightly more than half of the national output. Recently changing technology on the river is revolutionizing the efficiency of waterborne commerce.

Bierman, DE (Louisville University)
Northwestern University, Evanston 1973, 246 pp

ACKNOWLEDGMENT: Northwestern University, Evanston
ORDER FROM: Northwestern University, Evanston, 2001 Sheridan Road, Evanston, Illinois, 60201

**051697**
**ICEBREAKING BY TOW ON THE MISSISSIPPI RIVER**

A field investigation of icebreaking by the motor vessel Renee G, operating on the Mississippi River between Alton, IL, and Fort Madison, IA, is reported. The operation encountered a wide variety of ice conditions and was performed with a variety of barge configurations and arrangements. Important qualitative observations of the nature and difficulties encountered while icebreaking were made; and, by instrumenting the propeller shafts and using load cells between the towboat and the barges, quantitative information was obtained on the resistance encountered while icebreaking. Also described are the effects of repeated passage through an ice cover, navigation procedures peculiar to icebreaking, and minor damage sustained by the towboat. (Author)

Ashton, GD Den Hartog, SL Hanamoto, B
Cold Regions Research and Engineering Laboratory Specl Rpt CRREL-SR-192, Aug. 1973, 77p

ACKNOWLEDGMENT: NTIS (AD-768169/5)
ORDER FROM: NTIS.

AD-768169/5

**051721**
**RIVER-ICE PROBLEMS: A STATE-OF-THE-ART SURVEY AND ASSESSMENT OF RESEARCH NEEDS**

The problems associated with river ice are examined, the current state-of-the-art is reviewed, and recommendations for future research are made. The highest research priorities are assigned to the topics of formation processes of river ice, ice jams, ice forces, and heat exchange process and the effects of thermal enrichment. A number of other problems that merit attention are delineated and include ice formation on submerged surfaces, properties of ice, friction factors, sediment transport in rivers with ice, design of water intakes for ice conditions, formation of icings and river glaciations, glacial outbursts, and ice formation at navigation locks.

This is a report on Hydrodynamics of Ice by the Committee on Hydromechanics, Hydraulics Division, ASCE.

*ASCE Journal of the Hydraulics Division* Vol. 100 No. HY1, Jan. 1974, pp 1-15, 36 Ref

ACKNOWLEDGMENT: National Maritime Research Center, Kings Point (N-738)
ORDER FROM: ASCE

**052026**
**STATUS OF DOMESTIC HIGH-SPEED MARINE VEHICLES FOR MASS-TRANSIT**

There are some very significant benefits available to commuters, taxpayers and communities from the introduction of a truly effective high-speed marine vehicle into local transit applications, where the origin and destination movement of the people can be accommodated by a water route structure. Any such service must be fully inter-modal to be a success. The marine vehicle must have certain features and these are discussed. Of particular importance is acceptable craft behavior (with regard to speed and ride quality) when the weather deteriorates and the water gets rough, a situation which occurs more often and to a worse degree in protected bodies of water than most people appreciate. Environmental considerations are also covered in some detail. There is currently one vehicle in production for passenger service in the United States, based on proven advanced high-speed technology, the Boeing JETFOIL. The features of this vehicle are discussed

and its characteristics compared with other advanced marine vehicles. Finally an excerpt is presented from a report that summarizes the actual experiences of a head-to-head competition between hydrofoils and hovercraft during the summer of 1972 between Copenhagen, Denmark and Malmo, Sweden.

Presented at the 9th Annual Conference of the Marine Technology Society, Sept. 10-12, 1973.

Schultz, WM (Boeing Company)
Marine Technology Society Proceeding Sept. 1973, pp 409-419

ACKNOWLEDGMENT: Marine Technology Society
ORDER FROM: Marine Technology Society, 1730 M Street, NW, Washington, D.C., 20036

**052027**
**DISCUSSION ON THE POTENTIAL OF WATER TRANSPORTATION SYSTEMS TO TRANSPORT COMMUTERS WHILE REDUCING NOISE/AIR POLLUTION AND HAVING MINIMUM ADVERSE IMPACT ON LAND AREAS**

The purpose of this presentation is to examine the utilization of existing waterways in the Washington, D.C. and Honolulu, Hawaii areas to reduce the urban traffic congestion and associated air and noise pollution. The practical, technical, and economic feasibility have been examined and the potential advantages of water transportation are explained. A network of possible water transportation routes is designed, a potential commuter market is developed, and then the implementation and operating costs of these water transportation systems are evaluated. The ability of a water transportation system to reduce noise and air pollution, and not impact adversely on current use of land areas are of particular interest.

Presented at the 9th Annual Conference of the Marine Technology Society, Sept. 10-12, 1973.

Hargrove, JQ (Lulejian and Associates, Incorporated)
Marine Technology Society Proceeding Sept. 1973, pp 387-399

ACKNOWLEDGMENT: Marine Technology Society
ORDER FROM: Marine Technology Society, 1730 M Street, NW, Washington, D.C., 20036

**052028**
**MARINE MASS TRANSIT FOR HAWAII--A CASE STUDY**

The marine alternatives to land-based mass transit, as either a complementary or a major aspect of any given system, appear not to have been adequately explored. The use of waterways for urban mass transit has not escaped international recognition. This is particularly true in the Soviet Union where nearly 300 hydrofoil boats are in service for mass transit along rivers and canals. Honolulu was selected for analysis because most of its major population centers and its central business district are within the 10-foot elevation contour, and the city is heavily interlaced with drainage canals which are wide enough in most cases, and in many cases deep enough to accommodate a marine system. A system utilizing these canals, streams, and the open ocean has been proposed. The preliminary layout of the Hawaii Environmental Area Mass Transit (HEART) System utilizes the ocean as the expressway with boats operating on the existing canals and streams for the local loops. Engineering investigations have determined that it is technically feasible to implement the HEART System. The study investigated the feasibility of improving existing canals and streams to serve as inland navigation channels, with appropriate terminal stops connecting major population centers. The effects on the drainage waters in the canals, sediment transport and deposition, and water pollution, among other things, have been thoroughly investigated. An economic study based on these data has been performed and the estimated cost of water-based mass transit for Honolulu will cost approximately $200,000,000 and take 2 to 3 years to become operational.

Presented at the 9th Annual Conference of the Marine Technology Society, Sept. 10-12, 1973.

Lucas, MA (Hawaii University)
Marine Technology Society Proceeding Sept. 1973, pp 377-385

ACKNOWLEDGMENT: Marine Technology Society
ORDER FROM: Marine Technology Society, 1730 M Street, NW, Washington, D.C., 20036

**052058**
**HOVERCRAFT OPERATION IN THEORY AND PRACTICE**

In the present operation of hovercraft, there is a wide disparity between potential and practice, and myth and reality. The purpose of this paper is to attempt to clarify and explain certain facts and limitations attendant to the operation of hovercraft. In undertaking these objectives, the author 1) explains hovercraft characteristics and performance, describing three distinct types: fully amphibious, semi-amphibious, and rigid sidewall types; 2) discusses capital and operating costs of hovercraft; 3) describes the operation of hovercraft in specific environments-the open seas, lakes, rivers, intertidal zones, and on solid ground; and 4) discusses possible future developments in the hovercraft industry. The author concludes, as a result of his discussion and other evidence, that at this stage in its development, the amphibious hovercraft cannot be regarded as an important factor in increasing mobility.

Tolley, R (North Staffordshire Polytechnic) *Hovering Craft and Hydrofoil* Vol. 13 No. 2, Nov. 1972, pp 12-16, 12 Ref

ACKNOWLEDGMENT: National Maritime Research Center, Kings Point (N-754)
ORDER FROM: Kalerghi Publications, 51 Welbeck Street, London W1, England

**053914**
**RIVER AND HARBOR AID TO NAVIGATION SYSTEM (RIHANS), PHASE 1-R, SYSTEM DEFINITION. VOLUME 1. SYSTEM AND EQUIPMENT DESCRIPTION**

The Coast Guard has initiated development of the River and Harbor Aid to Navigation System (RIHANS), an all-weather, short-range precision navigation system for use in harbor and harbor entrances. The report covers the results of the proposed RIHANS Phase-1, System Refinement Analysis and Technical Definition. The results provide equipment configuration, deployment configuration, cost projections, and accuracy analysis of the approach proposed to meet RIHANS requirements. The approach uses active ranging from ship equipments to transponders on fixed shore-based stations. Data communication is superimposed on the ranging function and this can support a port information dissemination function. (Author)

See also Volume 2, Systems Analysis; AD-771859/6, Repr PC: $5.25; Microfiche: $1.45; and Volume 3, Appendices; AD-771860/4; Repr PC: $4.25; Microfiche: $1.45.

Jellinek, E Fabbioli, L Levinson, M Browder, J Hall, J
RCA Government and Commercial Systems, (CG-732120) Final Rpt Apr. 1972, 180 pp

Contract DOT-CG-24,773-A

ACKNOWLEDGMENT: NTIS (AD-771858/8)
ORDER FROM: NTIS

AD-771858/8

**053915**
**RIVER AND HARBOR AID TO NAVIGATION SYSTEM (RIHANS) PHASE 1-T: SYSTEM DEFINITION**

A low frequency radio navigation system was designed for use within ports, rivers and harbors. The system, operating on the principle of phase comparison much like OMEGA, sequentially radiates four frequencies in the 300 kHz region to provide service to a 50-mile square area. Theoretical analyses indicate that the low frequency RIHANS system is capable of providing position fixed accurate to 50-250 feet, the error dependent on the user's position relative to the transmitters. Limited experiments conducted on a single 12-mile baseline array yielded single LOP absolute accuracies of 30 feet with repeatability of 10-20 feet. (Author)

Baltzer, OJ Fraser, EC Harris, DP Shinn, LW
Tracor, Incorporated Final Rpt Phase 1, Aug. 1973, 413 pp

Contract DOT-CG-2477-A

ACKNOWLEDGMENT: NTIS (AD-771868/7)
ORDER FROM: NTIS

AD-771868/7

**054080**
**ALTERNATIVE METHOD FOR INCREASING THE EFFICIENCY OF THE INLAND WATERWAYS**

Traditional means of increasing the capacity of our inland waterways have focused on structural improvements such as the provision of bigger, better and more expensive locks. Little attention has been given to various operational changes that can significantly improve system efficiency. The major theme of this paper is that relatively inexpensive changes in the operation of our waterways are likely to be highly cost effective, and that this route to system efficiency should be vigorously investigated. Inefficient

use of congested facilities by tow operators stems from the divergence between individual costs and social delay costs which are incurred by all users as a group. It is argued that more economic individual decisions will be made if user charges are levied for the purpose of equating individual and social costs.

Presented at the SNAME Spring Meeting, Chicago, Ill., May 22-24, 1974.

Carroll, JL Rao, S Wilson, HG (Pennsylvania State University, University Park)
Society of Naval Architects and Marine Engineers Paper No. 3, June 1974, 17 pp, 26 Ref, Apps

ACKNOWLEDGMENT: SNAME
ORDER FROM: SNAME

**054083**
**DOMESTIC WATERBORNE COMMERCE, ITS ROLE AND FUTURE**

The domestic marine shipping industry, to take advantage of approaching opportunities, must carefully examine and reevaluate its basic characteristics, competition, constraints and future markets. This task must be done by the individuals and organizations who own, manage and operate the nation's domestic marine shipping industry. This paper is intended to offer a point of departure, note some constraints and point to some opportunities. Specifically, it characterizes the industry through a profile of operations, discussion of competitive and artificial advantages and disadvantages, projection of commodity tonnages to the year 2000, identification of government's role and a comparison of industry productivity rates. The result is an overview of the industry which will allow those concerned with its future to consider approaching opportunities.

Presented at the SNAME Spring Meeting, Chicago, Ill., May 22-24, 1974.

Kyle, B (Maritime Administration)
Society of Naval Architects and Marine Engineers Paper No. 1, May 1974, 20 pp, 14 Ref

ACKNOWLEDGMENT: SNAME
ORDER FROM: SNAME

**054150**
**BOEING'S HYDROFOIL PROGRAMS**

The hydrofoil construction programs, both military and commercial, being undertaken by the Boeing Aerospace Company of Seattle, Washington, are described. Background information of the first U.S. Navy hydrofoil to utilize waterjets instead of conventional propellers, the TUCUMCARI, including components of the power plant, is given. Discussion of the new Boeing Jetfoil follows, and dimensions, propulsion concept, and machinery installation are described. The Jetfoil's Automatic Control System (ACS) is also described and its capabilities given. The military construction program is also described, with elements of the propulsion system and control system of the Patrol Hydrofoil Missile Ship (PHM) fully discussed.

Krantz, R *Diesel and Gas Turbine Progress* Supplement Vol. 40 No. 3, Mar. 1974, pp S8-S11

ACKNOWLEDGMENT: National Maritime Research Center, Kings Point (N-769)
ORDER FROM: Diesel Engines Incorporated, P.O. Box 7406, Milwaukee, Wisconsin, 53213

**054229**
**HYDROFOIL PERFORMANCE IN ROUGH WATER**

Beginning with the history of speeds achieved by hydrofoils worldwide, this account deals with recent results of the U.S. Navy Advanced Development Program. This program has gathered information on platform performance and operational demonstrations from the HIGH POINT (PCH-1). PLAINVIEW (AGEH-1), FLAGSTAFF (PGH-1) and TUCUMCARI (PGH-2). Recent developments in hydrofoil platform technologies cover automatic control systems, propulsion and auxiliary machinery, strut-foil, and hull subsystems. Operations cover total operational and foilborne times, transit distances, debris collisions, mission equipment demonstrations, and underway transfer operations. A discussion of work leading to future larger and faster hydrofoils concludes the account.

Presented at the Advanced Marine Vehicles Conference, jointly sponsored by the American Institute of Aeronautics and Astronautics and the Society of Naval Architects and Marine Engineers, with the active cooperation and support of the United States Navy, San Diego, Calif., Feb. 25-28, 1974.

Jewell, DA (Naval Ship Research and Development Center)
AIAA/SNAME Advanced Marine Vehicles Conference Paper #74-307, Feb. 1974, 9 pp, 13 Ref

ACKNOWLEDGMENT: AIAA
ORDER FROM: AIAA

**054231**
**BOEING "JETFOIL" MODEL 929-100**

The Boeing JETFOIL is the world's most advanced commercial hydrofoil. With fully submerged foils, automatic stabilization, and waterjet propulsion, it will cruise at 45 knots in heavy seas with a ride unmatched by any other high-speed marine vehicle. In production in Renton, Wash., the first JETFOIL will be launched in the spring and undergo extensive tests and service simulations in the Puget Sound/Pacific Ocean areas. Scheduled commercial passenger services should commence in October 1974 in Hawaii and in Hong Kong. Important technical features are discussed and construction progress shown.

Presented at the Advanced Marine Vehicles Conference, jointly sponsored by the American Institute of Aeronautics and Astronautics and the Society of Naval Architects and Marine Engineers, with the active cooperation and support of the United States Navy, San Diego, Calif., Feb. 25-28, 1974.

Shultz, WW (Boeing Company)
AIAA/SNAME Advanced Marine Vehicles Conference Paper #74-308, Feb. 1974, 7 pp, 1 Ref

ACKNOWLEDGMENT: AIAA
ORDER FROM: AIAA

**054238**
**OPERATIONAL AND TECHNICAL PROBLEMS OF COMMERCIAL HOVERCRAFT**

This paper presents an account of operational and commercial problems experienced during four years' operations with the British Hovercraft Corporation's 200-ton amphibious SRN-4 hovercraft on the English Channel and, recently, of more conventional operations on the River Thames using the Hover-marine HM-2 MK 3 sidewall type hovercraft. Traffic growth and potential are discussed with reference to effects on hovercraft market share. Descriptions of operational, technical, and maintainance problems are listed and their effects on reliability and cost are assessed. Conclusions cover thoughts on future craft and their viability for commercial operations.

Presented at the Advanced Marine Vehicles Conference, jointly sponsored by the American Institute of Aeronautics and Astronautics and the Society of Naval Architects and Marine Engineers, with the active cooperation and support of the United States Navy, San Diego, Calif., Feb. 25-28, 1974.

Colquhoun, LR (Colquhoun (Leslie) and Associates)
AIAA/SNAME Advanced Marine Vehicles Conference Paper #74-321, Feb. 1974, 7 pp

ACKNOWLEDGMENT: AIAA
ORDER FROM: AIAA

**054293**
**THE OUTLOOK FOR LIGHTER STRUCTURES IN HIGH-PERFORMANCE MARINE VEHICLES**

Structural weights of existing high-performance marine vehicles, principally hydrofoil craft, are examined to determine the design or geometric parameters that have significant effect. For total structural weight, vehicle density and structural density are shown to be governing. Similarly, the governing parameters for individual weight groups are identified. These governing parameters and the loads which determine scantlings, where known, are compared to develop measures of efficient use of structural material. These figures of merit are applied to a number of existing high-performance marine vehicles and projections of what might be attainable in the future are made.

Presented at the Advanced Marine Vehicles Conference, jointly sponsored by the American Institute of Aeronautics and Astronautics and the Society of Naval Architects and Marine Engineers, with the active cooperation and support of the United States Navy, San Diego, Calif., Feb. 25-28, 1974.

Heller, SR (Catholic University of America); Clark, DJ (Naval Ship Research and Development Center)
AIAA/SNAME Advanced Marine Vehicles Conference Paper #74-330, Feb. 1974, 10 pp, 15 Ref

ACKNOWLEDGMENT: AIAA
ORDER FROM: AIAA

**056741**
**DOMESTIC WATERBORNE SHIPPING MARKET ANALYSIS: EXECUTIVE SUMMARY**
The report presents the executive summary of the entire study effort which assesses the present and probable future market prospects for domestic marine transportation. It covers three trade areas: Inland waterways, domestic ocean (coastwise and intercoastal, Puerto Rico, Hawaii and Alaska) and the Great Lakes. Eleven reports are available as part of this market analysis. That includes the Executive Summary, three trade area reports, two financial analyses, and appendices A,B,C,F,T.

See also: Inland Waterways Trade Area, COM-74-10412/6, $7.25; Domestic Ocean Trade Area, COM-74-10413/4, $9.00; Great Lakes Trade Area Report, COM-74-10414/2, $6.75; Financial Analysis of Inland Waterways Carriers, COM-74-10415/9, $4.00; Financial Analysis of Domestic Ocean Carriers, COM-74-10416/7. $4.75; Development of the Forecasting Data Base, COM-74-10417/5, $5.00; Forecasting Methodology, COM-74-10418/3, $3.25; Modal Share Estimates, COM-74-10419/1, $4.75; The Data Base for Marine Marketing, COM-74-10420/9, $19.00; Financial Data--Inland Waterways and Domestic Ocean Carriers, COM-74-10421, $4.50. Paper copy also available from NTIS $59.00/set of 11 reports as COM-74-10410-SET. Report prepared by A.T. Kearney in cooperation with Arthur D. Little, Incorporated; G.R.C. Data Corporation and J.J. Henry Company.

Kearney (AT) and Company Incorporated G-048, Feb. 1974, 36p

Contract C-2-36258

ACKNOWLEDGMENT: NTIS (COM-74-10411/8), Maritime Administration
ORDER FROM: NTIS

COM-74-10411/8

**057108**
**DESIGN OF MODULAR, INTERCHANGEABLE ACCOMMODATIONS FOR AUTO FERRY SYSTEMS**
This paper is divided into two distinct sections. The first section examines the requirements necessary to sustain passengers in a comfortable environment while traveling aboard an auto-ferry system. It specifically discusses items such as use, area requirements, structural systems, mechanical systems, lighting and electricity, and less quantifiable areas such as space quality and effective lighting. The second section is a proposed design for accommodations aboard an auto-ferry System. Detail plans, structural analysis, cost analysis, and construction sequence are discussed in detail. Also examined is the expansion of this system into the Industrialized Housing Market with emphasis upon the versatility of the building system in conjunction with the containerized transport mode.

McPherson, RN
Massachusetts Institute of Technology MS Thesis Jan. 1974

ACKNOWLEDGMENT: Massachusetts Institute of Technology
ORDER FROM: Massachusetts Institute of Technology, Department of Ocean Engineering, Cambridge, Massachusetts, 02139

**057467**
**RECOMMENDED PRACTICE FOR MARINE LIGHTING**
The first "Recommended Practice for Marine Lighting" was prepared in 1958 to meet the lighting needs of those involved in marine transportation. The present practice is a complete revision of that publication, and is intended as a guide to those responsible for providing shipboard lighting. The Subcommittee on Marine Transportation consists of members from government agencies, naval architects, ship owners and builders, lamp and lighting equipment manufacturers--all having years of experience in marine lighting. This practice contains recommendations for the lighting of specific tasks aboard ship as well as references to the requirements and standards of regulatory agencies. There are discussions on the objectives of shipboard lighting, involving quantity and quality of illumination, a section on the light sources most commonly used aboard ship, an outline of lighting distribution systems, and design considerations for specific areas in interior and exterior lighting. Appendix A has been provided as a guide to the proper procedures for the maintenance of lighting systems. For the reader who may be unfamiliar with the technical terms used, a Glossary of Lighting Terms will be provided in the reprint of this practice.

Prepared by the Subcommittee on Marine Transportation, Committee on Interior Lighting of Public conveyances, Illuminating Engineering Society.

See also MRIS #043966-06 for the first practice collected by the Illuminating Engineering Society.

*Illuminating Engineering Society, Journal of* Vol. 3 No. 4, July 1974, pp 397-410

ACKNOWLEDGMENT: DOT
ORDER FROM: ESL.

**057788**
**WATERJET PROPULSION FOR HIGH SPEED JETS**
Waterjet propulsion and its optimization for modern water crafts were considered and some comparisons were made between waterjets and propellers. The waterjet optimization process presented includes considerations of inlet drag, weight of the propulsor, and the effect of the head and flow rate design parameters of the waterjet on the range of the craft. The waterjet/propeller comparison showed that the waterjet is the preferred propulsor in applications of high and intermediate speed, applications requiring high maneuverability, and applications requiring shallow draft and immunity to water-borne debris.

Presented at SAE meeting Feb. 25-March 1, 1974.

Rudnicki, MI (Aerojet Liquid Rocket Company); Sjogren, RG
Society of Automotive Engineers Preprint SAE #740281, Feb. 1974, 11 pp

ACKNOWLEDGMENT: EI (EI 74 051593)
ORDER FROM: ESL

**057796**
**WORLD DREDGING CONFERENCE, 5TH, PROCEEDINGS OF WODCON, 1973**
Proceedings contains 34 papers that were presented at the Fifth World Dredging Conference. Among topics discussed were: dredging of river waterways, and ports; disposal of dredged spoil; design of dredges and optimization of their operation; supply of electric power; dredging for gold; and environmental effects of dredging. Individual papers are provided with bibliographic references. Selected papers are indexed separately.

Conference held at Hamburg, West Germany, June 11-15, 1973.

*World Dredging Conference, Proceedings of* 1974, 816 pp

ACKNOWLEDGMENT: EI (EI 74 047738)
ORDER FROM: World Dredging Association, P.O. Box 269, San Pedro, California, 90733

**057978**
**A HISTORY OF COMMUTER TRAVEL ON THE POTOMAC RIVER SERVING THE WASHINGTON, D.C. AREA**
The report traces the history of people and goods movement on the Potomac River in and around Washington, D.C. It begins with a description of early ferry boat services. Increasing demands for the movement of goods led to a proliferation of ferry operations before 1800. Coincidental with this development were demands for increased bridge construction, often as an alternative to prohibitive tolls charged by the private ferry owners. The author notes particularly the impact of certain bridges erected during this period on proximate river travel. The beginning of the 20th century is cited as a watershed after which improved rail and highway links across the Potomac caused a continuous erosion of demand for ferry service. Lastly, the report examines more recent attempts to establish highspeed commuter transportation on the river using hydrofoil craft. A 1962 demonstration of the concept was terminated after initial testing due to insufficient funds. A final attempt to revive ferry service was undertaken in 1965, but also closed down for financial reasons.

Glidden, HR
Consortium of Universities DC-URT-3, June 1971

ACKNOWLEDGMENT: UMTA
ORDER FROM: Consortium of Universities, Urban Transportation Center, 1717 Massachusetts Avenue, NW, Washington, D.C., 20036

**057979**
**THE ALASKA MARINE HIGHWAY SYSTEM**
An analysis is made of what is both the newest and the oldest element in Alaska's total transportation network. The "Marine Highway," inaugerated in its present form in Southeast Alaska in 1963 and in Southwest Alaska in 1964, is an attempt to provide Alaskans Residing in coastal and island areas of the state with something approximating the land highway system. The

ferry fleet presently is made up of seven vessels ranging from the 1,300 passenger M/V WICKERSHAM to the 59-passenger MV CHILKAT. A survey of the economics of the system shows that the resident per capita public cost of providing a surface mass public transportation system by land is seven times that of providing a similar integrated surface system by water. (Author)

*Alaska Revue of Business and Economic Conditions* Vol. 7 No. 5, Oct. 1970, pp 1-16

ORDER FROM: Alaska University, College, Institute of Social Economic and Government Research, College, Alaska, 99701

057980
**AN ECONOMIC IMPERATIVE, THE HIGH SPEED AUTO FERRY**

Over 90% of all intercity trips are made in private automobiles, indicating that the convenience, the mobility, and terminal flexibility offered by the automobile are of paramount importance in the eyes of the traveler. On the basis of present passenger densities, estimated construction costs, and assumed returns per passenger mile, it is argued that only a system which would provide for the transportation of the passenger and his automobile could attract sufficient business to justify the considerable amount of investment associated with any new ground transportation system. An illustration as to how such a system can be built is shown in the 'rollway' concept. (Author)

Clejan, D *High Speed Ground Transportation Journal* Vol. 1 Jan. 1967, pp 70-75

ACKNOWLEDGMENT: Federal Highway Administration
ORDER FROM: Planning-Transport Associates, Incorporated, Box 4824, Duke Station, Durham, North Carolina, 27706

071715
**RIVER AND HARBOR AID TO NAVIGATION SYSTEM (RIHANS) PHASE 1-C; SYSTEM DEFINITION. VOLUME I. SYSTEM DESCRIPTION**

The Coast Guard has initiated development of the River and Harbor Aid to Navigation System (RIHANS), an all-weather, short-range precision navigation system for use in harbors and harbor entrances. This report covers the results of the Collins-proposed RIHANS Phase 1, System Refinement Analysis and Technical Definition. The results provide equipment configuration, deployment configuration, cost projection, and accuracy analysis of the approach proposed to meet RIHANS requirements. The system described in this report is basically a short pulse microwave beacon system. Hyperbolic lines of position are generated by these beacons in a manner similar to the LORAN Systems. (Author) Portions of this document are not fully legible.

See also Volume 2, AD-780985, System Deployment
Volume 3, AD-780989, Design Requirements
Volume 4, AD-780986
and Volume 5, AD-780987, Reference Papers

Frye, E McLaughlin, R Dedich, J Laubengayer, W Sellers, G Collins Radio Company, (CG-732120) Final Rpt. 523-076520600181M-V1, Nov. 1973, 151 pp

Contract DOT-CG-21,411-A

ACKNOWLEDGMENT: NTIS (AD-780984/1)
ORDER FROM: NTIS, Repr. PC, Microfiche

AD-780984/1

071718
**INLAND WATERWAYS COMMUNICATIONS STUDY. VOLUME I. EXECUTIVE SUMMARY**

The report presents the results of a study of the communications requirements of the companies operating on the inland waterways, encompassing the Mississippi, Illinois, Ohio, Tennessee, Warrior and Missouri rivers and a portion of the Inter-coastal Waterway. Industry communications requirements are presented in detail, leading to the development of several alternative system concepts for an integrated Inland Waterways Communications System. A detailed evaluation of the hypothesized alternatives is presented and the preferred system concept is recommended. The implementation characteristics of the preferred system concept are described, as are the type of organization required to operate the system and the regulatory environment in which the system will operate.

Also available in paper copy, set of 3 reports as COM-74-11104, Set. Volume 2, COM-74-11106, Study Report, and Volume 3, COM-74-11103, Appendixes

ARINC Research Corporation Final Rpt. 0639-01-1-1295-Vol-1, Mar. 1974, 20 pp

Contract MA-3-36258

ACKNOWLEDGMENT: NTIS (COM-74-11105/5)
ORDER FROM: NTIS.

COM-74-11105/5

084430
**DECK AND ENGINE OFFICERS IN THE U.S. MERCHANT MARINE SUPPLY AND DEMAND, 1974-1984**

The study is the third in a continuing series to provide industry and government with information needed for effective manpower planning. The results of the third study suggest that if current trends continue, a shortage of both deck and engine officers is likely before the end of this decade. Because of the sensitivity of this conclusion to various assumptions made in the study, the analysis will continue on a regular basis, as new data become available, in order to check the validity of the current results and to update other information needed for planning purposes.

Luciano, PJ
Maritime Administration Final Rpt. MA-GEN-510-70008, May 1974, 80 pp

ACKNOWLEDGMENT: NTIS
ORDER FROM: NTIS.

COM-74-11530/4ST

084482
**A NOTE ON THE BASIC DESIGN OF LONG DISTANCE, LARGE, CAR FERRY BOATS**

The long distance car ferry service is drawing considerable public attention as a new means of intermodal transport to meet growing demands for diversified cargo transport in Japan. The long distance car ferry service is not a mere sea bridge connecting two points separated by a narrow sea. It has a feature in that it has been developed as a new means of intermodal transport to supplement the insufficient land transportation and also picking up the advantages of both the ship and the car, hauling large quantities of cargoes at a time and delivering them from door to door. Under such circumstances, special consideration is given to the basic design for this new traffic means. This article presents some notes and attentions on the basic design of long-Distance Large Car Ferry Boat such as selection of ships characteristics from view point of transportation economy under special economic circumstances in Japan, performance and appendage design together with ships motion among confused sea, valuation of subdivision from view point of survivability, strength of car deck, ferry terminal and cargo handling devices.

Takarada, N *Sumitomo Technical Review* Vol. 20 No. 5, Aug. 1972, pp 73-14

ACKNOWLEDGMENT: Japan Shipbuilding Industry Foundation Library
ORDER FROM: Japan Shipbuilding Industry Foundation Library, No. 35, Shiba-kotohiracho, Minatoku, Tokyo, Japan

084565
**DEVELOPMENT OF AN ALL-WEATHER HIGH PRECISION NAVIGATION SYSTEM FOR RIVERS AND HARBORS**

Two parallel efforts aimed at the development of an all-weather high precision navigation system (PNS) for rivers, harbors, and their entrances have been undertaken by the Coast Guard's Office of Research and Development. The first, RIHANS (River and Harbor Aid to Navigation System), is a program to design and implement a new highly accurate navigation system from several competing concepts through four well-defined development phases. The second effort is to examine the accuracy potential of LORAN-C, particularly in the differential mode, to determine if LORAN-C is a viable candidate for the precision navigation system. The selection of finalists for PNS is scheduled for fiscal year 1975.

Presented at the National Radio Navigation Symposium, Washington, D.C., November 13-15, 1973.

Millan, HE, Jr (United States Coast Guard)
Institute of Navigation Proc Paper 1973, pp 210-215, 20 Ref.

ACKNOWLEDGMENT: EI
ORDER FROM: ESL.

084813
**A GUIDE TO ASSESS THE OPERATIONAL IMPLICATIONS OF NEW SHIP DESIGN CONCEPTS. PART III**

This report covers concluding work performed for the Office of Naval Research, Naval Analysis Programs, under Contract N00014-70-C-0426. Two previous reports have been published under the same title: Part I, ORI TR 667, 11 June 1967, AD 728003; Part II, ORI TR 741, 22 March 1973, AD 759376. Part 3 provides basic guidance and understanding to the planning analyst in the area of inherent operational advantages and limitations of the three major high-performance ship concepts under development today: (1) Small-Waterplane-Area Twin-Hull (SWATH); (2) submerged-foil hydrofoil; and (3) Air Cushion Supported Vehicles (ACV and SES). Many other concepts are briefly introduced. Concept descriptions, basic trade-offs, basic operational qualities, size range limitations and operational implications/potential applications are included. Discussion tends to be subjective and is designed to alert the analyst to potential problem areas rather than provide quantitative assessment of the concepts. (Author)

See also Part 2, AD-759 376.

Holmboe, EL
Operations Research, Incorporated, Office of Naval Research, (NR-274-121) Final Rpt. ORI-TR-829, TR-829, Feb. 1974, 51 pp

Contract N00014-70-C-0426

ACKNOWLEDGMENT: NTIS
ORDER FROM: NTIS

AD-787664/2ST

084889
**BUILDING ALUMINUM FERRYBOATS**

With no published standards for building aluminum vessels, this San Diego shipbuilder worked out his own fit-up and welding procedure. These ferryboats are 165 feet and rated to carry 750 passengers, the world's largest of their type, all aluminum passenger vessels. The article outlines the general building procedures and includes a listing of the subject matter of the manufacturing process specification book. The fabrication and welding details are proprietary information.

Bangs, S *Welding Design and Fabrication* Vol. 48 No. 3, Mar. 1975, pp 33-37

ACKNOWLEDGMENT: Industrial Publishing Company
ORDER FROM: Industrial Publishing Company, 614 Superior Avenue, West, Cleveland, Ohio, 44113

090699
**COMMERCIAL NAVIGATION ON THE UPPER MISSISSIPPI RIVER: AN ECONOMIC REVIEW OF ITS DEVELOPMENT AND PUBLIC POLICY ISSUES AFFECTING MINNESOTA**

Inland waterway transport is a significant carrier of domestic cargo, accounting for about 14% of the total traffic. During the past decade cargo carried by the inland waterways increased by 46% (62% when the Great Lakes are excluded). By increasing the absolute amount of freight carried greater than the average (42%), the inland waterway's relative share of total freight traffic has also grown over the past decade. Also, development of the Upper Mississippi River into a major inland waterway has been even more significant for Minnesota and the Midwest than for much of the rest of the nation. A transportation model, based on competitive assumptions and employing a derived demand analysis, is presented. The model predicts that there will be an increase in demand for transportation services, especially barge services. The current issues in commercial navigation which affect Minnesota involve a resolution of the conflict between developmental and environmental values.

Christianson, RW
Minnesota University, Minneapolis, Office of Water Research and Technology, (OWRT-B-054-MINN) WRRC-Bull-75, Oct. 1974, 125 pp

Contract DI-14-31-0001-3601

ACKNOWLEDGMENT: NTIS
ORDER FROM: NTIS

PB-239962/4ST

095115
**DOMESTIC WATERBORNE SHIPPING MARKET ANALYSIS-LEGAL AND REGULATORY CONSTRAINTS-APPENDICES**

Contents: Methodology of construction of the legal model; The legal model; National transportation policy; The Motor Carrier Act of 1935 as amended; Legal citations of selected state pollution control lows; Goals and policies; Laws and regulations; Intermodal common ownership; Discrimination rail rates; User charges; Illness and injury claims by employees and third parties; Federal pollution control penalties; Union negotiating power; Disparate state pollution control laws; Disparate state tax laws; Exclusion of Virgin Islands from cabotage laws; U. S. vessel construction equipment.

See also Vol 2, Domestic Ocean, PC $3.25, MF $2.25; Vol 3, Inland Waterways, PC $3.75; MF $2.25; Vol 14, Great Lakes, PC $3.25, MF $2.25.

Little (Arthur D), Incorporated MA/RD-940-75017, Aug. 1974, 458 pp

ACKNOWLEDGMENT: NTIS
ORDER FROM: NTIS

COM-74-11712/8GA

095333
**INLAND WATERWAY TRADE ROUTE OPTIMIZATION STUDY**

Sample results from analyses of inland waterway barge operations are presented. The first of two parts of the analyses consider speed developed by tows, based on formulas Charles Howe, Purdue University. The second part analyzes the operations of a towboat company, with input from the first part, and from other data on company operations. Outputs of the analyses are number of tows and towboats required, the initial investment, total annual operating costs, annual income and profit, and the values of several measures of profitability.

Presented at the Great Lakes and Great Rivers Section Meeting of SNAME, Pittsburgh, Pennsylvania, October 10, 1974.

Shearer, EL
Society of Naval Architects and Marine Engineers No. 157, Sept. 1974, 20 pp, 19 Ref.

ACKNOWLEDGMENT: SNAME
ORDER FROM: SNAME

095347
**GLOSSARY FOR HIGH-SPEED SURFACE CRAFT**

This Glossary defines terms associated primarily with high-speed waterborne surface craft, i.e., hydrofoils, planing craft and air-cushion vehicles. Also included are references to other glossaries that define terms used in conjunction with these craft, but primarily associated with either marine or aeronautical techniques.

This report was prepared by Panel MS-1 (High Speed Surface Craft).

Society of Naval Architects and Marine Engineers T&R R-17, June 1974, 13 pp, 17 Ref.

ACKNOWLEDGMENT: SNAME
ORDER FROM: SNAME

097502
**PRIMARY ECONOMIC IMPACT OF THE GULF INTRACOASTAL WATERWAY IN TEXAS**

Study to identify and quantify marine-related activities of the Waterway that contribute directly to the economy of Texas is reported. In addition to analyses of current and future economic impact, particular emphasis was placed on history, land use, commodity flows, industrial users, and technological innovations relating to the Waterway.

Miloy, J Phillips, C
Texas A&M University TAMU-SG-74-211, Mar. 1974, 203 pp

ACKNOWLEDGMENT: Texas A&M University
ORDER FROM: Texas A&M University, Sea Grant Program, Center for Marine Resources, College Station, Texas, 77843

097520
**GAS TURBINE WATERJETS POWER 750-PASSENGER FERRY**

A description of a gas turbine powered ferryboat is presented. The selection of a gas turbine power plant over a diesel engine of the same power output is discussed, with advantages of the gas turbine given. The ferry is propelled by a waterjet instead of a regular propeller, and reasons for this are also explained. Brief descriptions of the gas turbines selected, the waterjets,

electrical generating system and fuel requirements are also included in the article.

*Gas Turbine World* Vol. 4 No. 6, 1975, pp 30-33

ACKNOWLEDGMENT: National Maritime Research Center, Kings Point (N-958)
ORDER FROM: Gas Turbine World, P.O. Box 494, Southport, Connecticut, 06490

**097523**
**DAMAGE STABILITY MODEL EXPERIMENTS**
The paper describes a series of experiments in waves with a flooded model of a typical passenger and vehicle ferry. The objective was to provide designers and approving authorities with data with which to assess ship safety in damaged conditions in a quantifiable manner relative to sea conditions. Safety in this context is not absolute, depending upon compliance with a regulation, but a continuous function related to environmental conditions. /Author/

Bird, H Browne, RP (National Physical Laboratory, England) *Naval Architect* No. 2, Apr. 1974, pp 69-91, 10 Ref.

ACKNOWLEDGMENT: National Maritime Research Center, Kings Point (N-963)
ORDER FROM: Royal Institution of Naval Architects. 10 Upper Belgrave Street, London SW1X 8BQ, England

**099945**
**ACV'S AND HYDROFOILS**
Provides a review of the latest type hydrofoils and air cushion vehicles (ACV's), both U.S. and foreign, and a report on their military and commercial service application.

*Marine Engineering/Log* Vol. 80 No. 9, Aug. 1975, pp 31-47

ACKNOWLEDGMENT: Simmons-Boardman Publishing Corporation
ORDER FROM: Simmons-Boardman Publishing Corporation, 350 Broadway, New York, New York, 10013

**126008**
**AIR CUSHION TECHNOLOGY RESEARCH AT UNIVERSITY OF TORONTO**
Research programs into air cushion vehicle technology presently being performed at a Canadian university are described. Among the areas being investigated are cushion and vehicle dynamics, skirt materials, noise, guidance and control, and guided vehicle suspension dynamics. The facilities which are available to conduct this research are described, and progress into each of the areas being investigated is also discussed. A brief discussion of other research activities is also included.

Sullivan, PA (Toronto University) *Hovering Craft and Hydrofoil* Vol. 14 No. 8, May 1975, pp 5-12, 8 Ref.

ACKNOWLEDGMENT: National Maritime Research Center, Kings Point (N-1023)
ORDER FROM: Kalerghi Publications, 51 Welbeck Street, London W1, England

**126370**
**RIVER POINT DIRECTORY FOR THE MISSISSIPPI RIVER-GULF COAST INLAND WATERWAYS SYSTEM**
The River Point Directory is a quick-reference working document for use by engineers and planners in the general fields of river navigation and waterborne commodity movements. All navigable rivers, bayous, streams, and other such waterways in the Mississippi River-Gulf Coast region are included. The rivers included in the Directory are, in general, listed in the order of their importance as commodity transportation arteries with regard to varying degrees of impact on the economic welfare of the United States. Most of the relatively minor streams and bayous are listed under the three responsible U.S. Army Corps of Engineers Districts: Mobile, New Orleans, and Galveston. The Directory is, in essence, a compilation of significant data relating to each commercial dock, town, landing, navigation lock, bridge, junction, and other such river points contained in selected portions of the U.S. Army Engineer Waterborne Commerce Statistical Center (WCSC) Port and Dock Code Manual (Parts 2 and 3), dated 1 January 1973.

Daggett, LL McCarley, RW
Waterways Experiment Station Final Rpt. AEWES-Misc-Pap-H75-6, May 1975, 224 pp

ACKNOWLEDGMENT: NTIS
ORDER FROM: NTIS
AD-A011267/2GA

**127028**
**COAST GUARD VHF-FM COMMUNICATIONS ON THE RIVERS**
In 1972 the Coast Guard undertook an ambitious two-year project to install a VHF-FM communications system on the Western Rivers. Completed on schedule, this system became fully operational in July, 1974. From some 30 high-level transmitting/receiving sites, the system provides VHF-FM radiotelephone coverage of the Mississippi and its principal tributary Rivers. For the first time, a commercial towboat pilot or a recreational boater can pick up his radiotelephone any where along these Rivers and contact the Coast Guard. The 30 High-level sites are grouped geographically, and remotely controlled through a network of leased landlines from five Coast Guard communication centers. Two of these control centers are located along the Mississippi River at St. Louis and Memphis. The other three are situated on the Ohio, Missouri, and Tennessee Rivers, respectively. The five control centers are linked by a common teletype circuit, and each control center has a "phone patch" capability.

Symposium Papers, RTCM St. Louis Assembly Meeting, April 28-29-30, 1975 with the participation of Water Resources Congress. Volume I-Marine Radio Telephony.

Johnson, RW (United States Coast Guard)
Radio Technical Commission for Marine Services Apr. 1975, 12 pp

ACKNOWLEDGMENT: Radio Technical Commission for Marine Services
ORDER FROM: Radio Technical Commission for Marine Services, P.O. Box 19087, Washington, D.C., 20036

**127029**
**AN INTEGRATED VHF COMMUNICATIONS SYSTEM FOR U.S. INLAND WATERS**
Describes an integrated VHF communications system responsive to the needs of the waterways industry as feasible both practically and economically. The preferred leased-line design is based on proven technology and in capable of providing greatly improved service to the industry while minimizing capital investment. The proposed system offers a new class of marine radio service with direct-dial capability. The system will provide a dramatic improvement in industry communications through automation and network switching. As designed, it can be expanded to accommodate office-to-office telephone traffic. A pilot program is recommended as the first phase of implementation to limit initial capital investment while demonstrating the feasibility of the system and encouraging industry participation.

Symposium Papers, RTCM St. Louis Assembly Meeting, April 28-30, 1975, with the participation of Water Resources Congress. Volume I-Marine Radio Telephony.

Feigleson, HA (Maritime Administration); Kolb, WM (ARINC Research Corporation)
Radio Technical Commission for Marine Services Apr. 1975, 13 pp

ACKNOWLEDGMENT: Radio Technical Commission for Marine Services
ORDER FROM: Radio Technical Commission for Marine Services, P.O. Box 19087, Washington, D.C., 20036

**127035**
**VESSEL TRAFFIC MANAGEMENT-A CHALLENGE ON THE MISSISSIPPI**
A vessel traffic system for the Mississippi River presents a new challenge to the Coast Guard. As a part of the effort to design an appropriate vessel traffic system, one that will consider vessels using the river from the Head of Passes through New Orleans and up to Baton Rouge, the Coast Guard has begun an extensive data collection, analysis, and design task. This paper relates some of the results of the data collection effort that involved the use of radar surveillance of river traffic from Port Allen to the Head of Passes with several sites in between. Communications data on the utilization of VHF-FM channel 13 was also collected and is presented. Using this information the Coast Guard has configured a vessel traffic system to be located in New Orleans. This proposed system is described along with its anticipated impact on vessel traffic on the Mississippi River.

Symposium Papers, RTCM St. Louis Assembly Meeting, April 28-30, 1975, with the participation of water Resources Congress, Volume 3, Ship Collision Avoidance Techniques and Maritime Satellite Communication Systems.

Starkweather, DW Hobson, AF (United States Coast Guard)
Radio Technical Commission for Marine Services Apr. 1975, 10 pp

ACKNOWLEDGMENT: Radio Technical Commission for Marine Services
ORDER FROM: Radio Technical Commission for Marine Services, P.O. Box 19087, Washington, D.C., 20036

**127057**
**STRUCTURAL DEVELOPMENTS: INLAND WATERWAY TOWBOATS AND BARGES**
The harsh, exacting environment of the inland waterways requires a continual search for safer, more efficient and more reliable equipment and methods. While traditional research and development efforts have accounted for much of the progress thus far, parallel headway has been made by innovative operators seeking higher levels of productivity and reliability. Many improvements have occurred in the past and many are yet to come, but this goal can be reached far more expeditiously by free and easy exchange of information between designers, builders and operators. It is incumbent upon designers and builders to follow their creations into the rivers and canals to view them in service, looking for flaws and weaknesses. It is equally important that we operators share experiences and ideas, not only with one another, but with the design and building community, as well. With an open and receptive exchange of information we can effectively utilize real-world operations as a research and development environment for future growth.

Presented at the Ship Structure Symposium, Washington, D.C., October 6-8, 1975.

Gundlach, JO (Canal Barge Company, Incorporated)
Society of Naval Architects and Marine Engineers Paper K, Oct. 1975, 8 pp

ACKNOWLEDGMENT: SNAME
ORDER FROM: SNAME

**127058**
**DEVELOPMENTS IN TECHNOLOGY AS APPLIED TO RIVER EQUIPMENT**
A substantial program of structural research has been carried out in the United States during the past thirty years. The marine transportation system operating on the inland rivers represents a significant portion of the domestic marine business, yet none of this research has been aimed specifically at problems associated with the river business. This paper relates some of the reasons for this phenomenon and describes how some of the research done for others has been applied to river problems. A brief discussion of how research and development is carried out within the industry is also included.

Presented at the Ship Structure Symposium, Washington, D.C., October 6-8, 1975.

Courtsal, DP (Dravo Corporation)
Society of Naval Architects and Marine Engineers Paper J, Oct. 1975, 10 pp, 18 Ref.

ACKNOWLEDGMENT: SNAME
ORDER FROM: SNAME

**127560**
**THE DOMAIN OF THE SURFACE EFFECT SHIP**
The development of the surface-effect ship is traced from its inception to the present day, and its accomplishments and problems are discussed. The SES is compared with other advanced marine craft from all aspects of design and operation. It is determined that the SES is the only advanced craft that does not suffer from either size or speed limitations. The variation of speed and ride characteristics in a sea state are explored to develop the probable operating domain of the SES. Continued subsystem development in seals, propulsion, lift and structural systems is discussed and estimates are made of improved operating efficiencies that could result. Specific application in both naval and commercial service are reviewed. The values of direct operating costs associated with a wide range of operations are presented. These substantiate the competitive status of SES. It is concluded that the SES has a good operating potential for designs of varying length/beam ratio.

Presented at the Annual Meeting of the Society of Naval Architects and Marine Engineers, New York, New York, November 13-15, 1975.

Eggington, WJ (Rohr Industries, Incorporated); Kobitz, N (NAVSEA)
Society of Naval Architects and Marine Engineers #11, Nov. 1975, 18 pp, 8 Ref.

ACKNOWLEDGMENT: SNAME
ORDER FROM: SNAME

**128785**
**ROLE OF WATERWAYS IN THE NATION'S TRANSPORTATION SYSTEM**
The significant role that inland waterways play in the domestic transportation system is discussed. The influence of federal agencies is examined. The unregulated status of the waterway system and the attempt by the U.S. Congress to impose user charges on the carriers of bulk commodities are emphasized.

Broemser, GM (Department of Transportation) *Transportation Research Record* No. 545, 1975, pp 1-5, 3 Ref.

ORDER FROM: TRB Publications Off

**128791**
**WATERWAYS AS A SYSTEM FOR OPERATIONS AND PLANNING**
The characteristics of inland navigation and the purpose of various types of improvements to river navigation are described briefly. A newly implemented performance monitoring system of data collection is explained in some detail. How the operation of waterways influences the design of future improvements is also described.

Koch, DA (Army Corps of Engineers) *Transportation Research Record* No. 545, 1975, pp 29-32, 2 Fig., 1 Ref.

ORDER FROM: TRB Publications Off

**128792**
**PERSONNEL DEVELOPMENT FOR INLAND WATERWAYS**
The purpose of this paper is to show the necessity of solving the problem of the personnel needs of the inland waterway industry. The only way in which the challenge can be effectively met is optimizing training results through the application of modern techniques, effective administration, unique training aids, and institutional and on-board training.

Becker, PR (National River Academy) *Transportation Research Record* No. 545, 1975, pp 33-35

ORDER FROM: TRB Publications Off

**128822**
**PROCEEDINGS OF THE NATIONAL SYMPOSIUM ON MARINE TRANSPORTATION MANAGEMENT**
A series of open, candid discussions among a diverse group of maritime interests to identify all the major problem areas in the marine transportation system and define the conflicting interests that may have to be resolved to develop effective solutions. The main areas of discussion were Marine Traffic Management, Personnel Training and Evaluation, Federal Roles in Maritime Transportation System Management. Reports on the following workshops are included: Waterway Operations; Systems Safety and Maintenance; Management and Training; and New Technology Assessment and System Design.

Sponsored by U.S. Coast Guard with Army Corps of Engineers and Maritime Administration.

Delaware University, Newark Nov. 1975, 132 pp

Contract DOT-CG-52946-A

ACKNOWLEDGMENT: Delaware University, Newark
ORDER FROM: Delaware University, Newark, College of Marine Studies, Newark, Delaware

**128968**
**SEAKEEPING TRIALS OF THE BH.7 HOVERCRAFT**
Full-scale seakeeping trials of a 50-ton British hovercraft, the BH.7, were conducted off Cape Henry, Virginia in August 1973. Ship motions and wave height data were measured and recorded. The data was subsequently analyzed statistically. The craft, instrumentation systems and trials program are described and the results of the data analysis are presented and discussed. Response amplitude operators in pitch, heave and roll were computed from the power spectra and the results were interpreted using an equivalent damped oscillator model for pitch and heave motions.

Magnuson, AH
David Taylor Naval Ship R&D Center SPD-574-01, Aug. 1975, 131 pp

ACKNOWLEDGMENT: NTIS
ORDER FROM: NTIS

AD-A016 240/4GA

**129696**
**FACTORS TO BE CONSIDERED IN SETTING FUTURE POLICY FOR USE OF INLAND WATERWAYS**
This report presents factors which the Congress will need to consider in establishing a national policy for funding inland waterways improvements and operations and in considering proposals for imposition of waterways user charges.

United States General Accounting Office RED-76-35, Nov. 1975, 58 pp

ACKNOWLEDGMENT: United States General Accounting Office
ORDER FROM: United States General Accounting Office, 441 G Street, NW, Room 4522, Washington, D.C., 20548

**130524**
**THE ECONOMIC IMPACT OF WATERBORNE TRANSPORTATION ON THE UPPER MISSISSIPPI RIVER BASIN**
Gives history of navigation and the 9-foot channel project, barging and the upper Mississippi basin in perspective, discussion of principal commodities, competing modes, alternate demands on river usage and future projections effecting transportation. Demonstrates the effect of barge transportation on the economy of the Upper Midwest. The principle impact of river commerce on the Upper Mississippi affects North and South Dakota, Minnesota, Wisconsin, Iowa, Northwestern Illinois, and Northeastern Missouri. This study brings the economics of waterborne commerce into sharp focus as those economics bear on the general public.

Lambert, JW Hougland, RW
Upper Mississippi Waterway Association July 1975, 195 pp

ACKNOWLEDGMENT: Upper Mississippi Waterway Association
ORDER FROM: Upper Mississippi Waterway Association, P.O. Box 3032, Saint Paul, Minnesota, 55165

**130525**
**INLAND WATERWAY TRANSPORTATION**
The following eight papers examine aspects of inland waterways which should be of value to transportation planners: Role of Waterways in the Nation's Transportation System; Economic Policy of Waterway Transportation; Transportation on Inland Waterways; Internal and External Shipping on the Great Lakes; Multipurpose Projects on the Tennessee River; Maintaining the Nation's Waterways; Waterways as a System for Operations and Planning; Personnel Development for Inland Waterways.

Reports prepared for the 54th Annual Meeting of the Transportation Research Board.

*Transportation Research Record* No. 545, 1975, 36 pp, Refs.

ACKNOWLEDGMENT: TRB Publications Off
ORDER FROM: TRB Publications Off

**130992**
**ANALYSIS OF RISK IN THE WATER TRANSPORTATION OF HAZARDOUS MATERIALS**
This report was prepared by the Risk Analysis and Hazard Evaluation Panel of the Committee on Hazardous Materials, Office of Chemistry and Chemical Technology, Assembly of Mathematical and Physical Sciences in response to a request from the U. S. Coast Guard for an assessment of the utility and feasibility of risk analysis as a set of techniques for assisting management decisions regarding the regulation of water transportation of bulk hazardous materials. The Panel surveyed a number of risk analysis studies, selected barge transportation on inland waterways for special study, and selected a probabilistic model of risk. In the course of the Panel's ongoing review of risk analyses, it became apparent that to develop a completely general risk model would require an impractical amount of time and resources. The Panel concluded that the greatest utility of the methodology, and perhaps the only practical one, lies in answering specific questions with output of a specific pre-determined nature. The report is an assessment of the utility of risk analysis as an aid in decision-making for transport of hazardous materials.

National Academy of Sciences-Natl Research Council 1976, 190 pp, 49 Ref.

Contract DOT-CG-41680-A

ACKNOWLEDGMENT: National Academy of Sciences
ORDER FROM: National Research Council, Committee on Hazardous Materials, Washington, D.C., 20418

**131093**
**TECHNICAL AND OPERATIONAL CHARACTERISTICS OF HIGH PERFORMANCE WATERCRAFT**
This report catalogues high performance watercraft and their capabilities for Coast Guard personnel. It provides general operational and technical information regarding hydrofoils, hovercraft, mono-hull and multi-hull high performance vehicles and is divided into three sections for ease of reference. The first section deals with the technical and operational characteristics of the generic craft themselves while the second section compares craft capabilities. The third section abstracts available HPWC literature.

Hamilton, FM Pritchett, CW Hudgins, HH
United States Coast Guard, (USCG-D-193-75) CGR/DC-6/75, Feb. 1975, 214 pp

ACKNOWLEDGMENT: NTIS
ORDER FROM: NTIS

AD-A018 948/0GA

**131501**
**CROSS CHANNEL VIABILITY OF SRN4 OWES MUCH TO BR'S IN SERVICE DEVELOPMENT**
Pioneered by Seaspeed, a British Rail subsidiary, in 1968, the first SRN 4 hovercraft produced by British Hovercraft Corporation (BHC) was soon afterwards also operated by Hoverlloyd. The two companies now carry 30% of short route cross-channel car and passenger traffic. Cancellation of the channel tunnel will inevitably throw an increasing burden onto existing cross-channel services. Most of this will be passengers and cars, the very traffic that hovercraft services have proved best able to handle and this is expected to double by 1990. This article briefly reviews some of the major problems encountered and solutions found to reduce down the time due to engineering problems from 28.6% in 1968 to 1.98% in 1974. Areas covered are skirts, propellers, main engines, systems and controls, transmissions, fuel supply and the main hull structure.

Challis, H *Engineering* Vol. 216 No. 2, Feb. 1976, pp 92-95

ACKNOWLEDGMENT: Design Council
ORDER FROM: Design Council, 28 Haymarket, London SW1Y 4SU, England

**135844**
**RECENT DEVELOPMENTS IN HOVERCRAFT PERFORMANCE TESTING**
Performance testing of hovercraft is necessary for a number of reasons and the spectrum of hovercraft to be tested extends from small hovercraft such as the Pindair Skima 2 to the large British Hovercraft Corporation (BHC) SR.N4. Recent instrumentation developments include a craft trim indicator which utilizes a sensitive accelerometer, water speed indication using Doppler and automatic data recording systems; examples of these developments are described. Hovercraft performance trials often require accurate measurement of environmental conditions, in particular wave measurement; the use of the Datawell Waverider is outlined.

International Hovering Craft, Hydrofoil and Advanced Transit System Conference, Brighton, Sussex, England, May 13-16, 1974.

Russell, BJ (Interserv Hovercraft Unit)
Kalerghi Publications 1974, pp 147-156, 9 Ref.

ACKNOWLEDGMENT: EI
ORDER FROM: ESL

**135848**
**HOVERCRAFT FROM A SHIPBUILDER**
The VT1 introduced several new features on what is even now a fairly large craft, about 100 ft overall length and 90 tons displacement. The cushion system, including the air feed and stability devices, were new and were developed using ship tank models; the skirt followed closely the system developed by Hovercraft Development Ltd (HDL) and successfully demonstrated on craft fitted with air propulsion; the VT1, however, used a modern but conventional marine propulsion system. Skegs to carry the propeller shafts were introduced as a new feature to give the craft a semi-amphibious capability while retaining the marine screw, the combination giving as low airborne noise level, good directional stability and high thrust at low speeds.

International Hovering Craft, Hydrofoil and Advanced Transit System

Conference, Brighton, Sussex, England, May 13-16, 1974.
Bingham, AF (Vosper Thornycroft Limited)
Kalerghi Publications 1974, pp 421-428, 1 Ref.

ACKNOWLEDGMENT: EI
ORDER FROM: ESL,

**135850**
**INFLATABLE HOVERCRAFT**
This is a paper written from experience; no theoretical study is attempted. The author looks at past, present and future inflatable hovercraft. He describes in detail a current production example giving an insight to its design philosophy. Comparisons are made with other types of construction and other forms of transport. Performance details and specifications are given for a range of inflatable hovercraft and their various applications are discussed. Special emphasis is placed on the low first cost and running costs and the exceptional versatility, reliability and safety of inflatable hovercraft.

International Hovering Craft, Hydrofoil and Advanced Transit System Conference, Brighton, Sussex, England, May 13-16, 1974.

Pinder, MA (Pindair Limited)
Kalerghi Publications 1974, pp 325-335

ACKNOWLEDGMENT: EI
ORDER FROM: ESL

**135851**
**PROPOSED 1,000 TON RIVER HOVERCRAFT**
A completely unobstructed loading deck is adaptable to a great variety of loads. The deck is roofed, with a clearance height of 14 ft, and either drive-on drive-off arrangements or overhead loading through hatches is provided for. The craft could lie alongside a quay or climb a beach (gradient up to 80%) to a convenient loading area. The structure consists of two units articulated about the transverse center line and with detachable end sections. The articulation is primarily intended to provide a degree of flexibility when the craft moves from a level to an inclined surface but also enables the craft to be split into two operationally independent units.

International Hovering Craft, Hydrofoil and Advanced Transit System Conference, Brighton, Sussex, England, May 13-16, 1974.

Shaw, RA Barker, JE Waters, DM
Kalerghi Publications 1974, pp 377-389, 15 Ref.

ACKNOWLEDGMENT: EI
ORDER FROM: ESL

**135856**
**DECADE OF DEVELOPMENT--THE SR.N6 FAMILY OF HOVERCRAFT**
The first SR.N5 hovercraft was launched in 1964, an event which signified the start of a development program already spanning a period of ten years and which seems likely to continue for several more yet. Within the first year the small 15 seat N5 had been transformed into the now familiar 38 seat SR.N6 and this craft was subsequently to become the workhorse in the hovercraft field. SR.N6 craft pioneered passenger services across the Solent and the Channel and have seen service in many parts of the world in a variety of both civil and military roles. As far as the future is concerned, the success of the more recent variants suggests that further developments are possible, for example by combining the features of the Mks 5 and 6. Other possible developments involve the widening of the center body and also the application of axial ducted fans as a means of reducing the noise level still further.

International Hovering Craft, Hydrofoil and Advanced Transit System Conference, Brighton, Sussex, England, May 13-16, 1974.

Wheeler, RL (British Hovercraft Corporation Limited)
Kalerghi Publications 1974, pp 345-364

ACKNOWLEDGMENT: EI
ORDER FROM: ESL

**142633**
**USSR RIVER CATAMARAN TESTED**
The new river catamaran Anatoliy Uglovskiy has sailed from Archangel for trials in the White Sea. The project of the passenger catamaran was developed by the Central Technical Design Bureau of the Ministry of the River Fleet of the RSFSR in cooperation with scientists of the Gor'kiy and Leningrad institutes of water transport engineers. The prototype vessel was built at the ship repair yards of Velikiy Ustyug. The catamaran was made of aluminum- magnesium alloys. Because of the twin hulls, the vessel has a wide deck area where passenger cabins and a lounge are located. An open promenade deck is located at the stern. The vessel can accommodate 150 passengers for a trip lasting eight hours. On runs lasting half that time the number of passengers may be doubled. The new motorship is not affected by weather and can safely cruise along rivers and lakes during storms. Its shallow draught makes it possible for the vessel to navigate rivers with a water depth of 1.1 meters. The vessel has a top speed of 42 kilometers per hour.

*Transport Development News* 1976, p 20

ACKNOWLEDGMENT: Transportation Development Agency
ORDER FROM: Transportation Development Agency, 1000 Sherbrooke Street, West, Montreal, Quebec H3A 2R3, Canada

**148836**
**SEATTLE-VICTORIA SERVICE**
Experimental six-week Boeing Jetfoil service from Seattle to Victoria, B.C., has been agreed to by Boeing and the British Columbia Steamship Co. The operation, designed to test the market for such service, is a cooperative effort of the two companies. The vehicle, an advanced hydrofoil design that operates with foils fully submerged, will depart Seattle each morning and return from Victoria in the early evening. The vehicle will accommodate 224 passengers on two decks, with two-abreast seating at the sides and four across in the middle. It will cruise at speeds up to 50 mph. and make the 80-mi. trip in 1 hr. 50 min., at a fare of $30 round trip or $16 one way.

*Aviation Week and Space Technology* Aug. 1976

ACKNOWLEDGMENT: Transportation Development Agency
ORDER FROM: Transportation Development Agency, Ministry of Transport, Canada; 1000 Sherbrooke Street West, Montreal, Quebec H3A 2R3, Canada

**148859**
**HANDE-A TOOL FOR INTEGRATING THE HYDROFOIL SHIP PRELIMINARY DESIGN CYCLE**
This paper describes the capabilities of a computer program which facilitates and integrates the hydrofoil ship preliminary design cycle. The Hydrofoil Analysis and Design (HANDE) program was designed and developed to provide design teams with a fast, consistent, and easily used new tool for designing hydrofoil ships which meet desired mission requirements. To accommodate a wide range of preliminary design studies, this program allows three levels of detail of analysis to be computed. The first consists of parametric and empirical sizing methods which produce high level results. The second level consists of detailed iterative calculations through a series of technology modules. The result of this iterative process is a converged, technically consistent ship design. The third level provides a more detailed analysis of this converged design. A data bank of ship information facilitates program use and guarantees data consistency.

Presented at the Pacific North West Section of SNAME. After May 1, 1977 Address for SNAME is: 1 World Trade Center New York, NY 10048.

Brennan, AJ Burroughs, JD Wacker, DH
Society of Naval Architects and Marine Engineers 1976, 42 pp, 3 Ref.

ACKNOWLEDGMENT: SNAME
ORDER FROM: SNAME

**149738**
**TECHNICAL SUMMARY OF AIR CUSHION CRAFT DEVELOPMENT**
A brief review is given of the technical status of the state-of-the-art in air cushion craft as it exists today. The designation "air cushion craft" is all encompassing, in that it covers all craft operating close to the surface and relying on a cushion of air to generate significant portions of their lift. It includes both the amphibious craft known as air cushion vehicles (ACV) or hovercraft and the nonamphibious craft known as surface effect ships (SES). Where applicable, the technology of other special uses of the air cushion is called upon to illustrate a point.

Mantle, PJ
David Taylor Naval Ship R&D Center Eval. Rpt. DTNSRDC 4727, Oct. 1975, 151 Ref.

ACKNOWLEDGMENT: EI
ORDER FROM: GPO

149750
**GAS TURBINE POWER FOR LARGE HOVERCRAFT**
The choice of a power unit for large hovercraft is dictated by many of the factors which affect aircraft, but also some of the considerations applicable to ships. Power to weight ratio is an important factor; overall size is equally important but perhaps the overriding consideration is that most hovercraft operations are over sea ways and likely to be in economic competition with ships. This paper reviews the history and highlights the problems associated with the use of gas turbined-powered hovercraft. In particular, the author discusses the effect of salt water spray and the measures taken to control it. Particular reference is made to the endeavors on the part of the craft designers to provide a filtration system to cope with the salt laden atmosphere and the problems presented to the engine designer necessitating the use of different materials with greater corrosion resistance.

Gas Turbines-Status and Prospects, Symposium, London, England, February 4-5, 1976.

Yerbury, PA (British Rail Hovercraft Limited)
Mechanical Engineering Publications Limited Pap C13/76, 1976, pp 117-124

ACKNOWLEDGMENT: EI
ORDER FROM: ESL

150418
**THE SELECTION AND INSTALLATION OF MACHINERY FOR A HIGH SPEED UTILITY-CREWBOAT**
This paper describes the selection and installation of propulsion machinery of a high speed utility-crewboat. Included are three independent shaftlines (outboard propulsion diesel powered and center shaftline gas turbine powered), water jet propulsion, speed reducing gearbox, preselected gas turbine (Allison 501-KF0), and ancillary subsystems. Work boats or military boats were chosen as the type and size vessel that could benefit from the light weight and high power of the gas turbine.

Presented at the New Orleans chapter of SNAME, 2 April 1976.

Howard, LS (George Engine Company, Incorporated)
Society of Naval Architects and Marine Engineers Apr. 1976, 12 pp

ACKNOWLEDGMENT: SNAME
ORDER FROM: SNAME

152481
**APPLICATION OF WATERJET PROPULSION TO HIGH-PERFORMANCE BOATS**
A review of history and development of waterjet technology and its application to military and commercial use is presented. A review of waterjet characteristics and current performance is summarised, and influencing elements of a waterjet system affecting overall performance are identified. The issue of propulsion efficiency and its proper place in evaluating waterjet propulsors is discussed. A summary of current craft utilising waterjets is presented and designs of waterjets used for several different applications and horses-powers are presented. Specific designs for the Boeing Jetfoil and the crewboat, American Enterprise, are reviewed.

Barham, HL (Rockwell Institute) *Hovering Craft and Hydrofoil* Vol. 15 No. 9, June 1976, pp 33-43, 7 Ref.

ACKNOWLEDGMENT: EI
ORDER FROM: ESL

152882
**VANCOUVER'S ANSWER TO THE RUSH HOUR-BURRARD BEAVER AND BURRARD OTTER**
A description is given of the Burrard Beaver and the Burrard Otter, the first two of a series of catamaran waterbus passenger ferries for service on Vancouver's Burrard Inlet. The double-ended vessels, designed by Case Existological Laboratories, allow maximum capacity for a given length and good resistance to heel without the need to turn round at the terminals. The ferries have six pairs of power-operated doors port and starboard and the time taken to embark a full load of passengers is minimal.

*Canadian Shipping and Marine Engineering* Vol. 48 Oct. 1976, 3 pp

ACKNOWLEDGMENT: BSRA
ORDER FROM: BSRA

BSRA No. 45,257

154904
**FEASIBILITY OF THE USE OF WATERBORNE PROPULSION FOR LARGE AIR CUSHION VEHICLES**
Propulsive performance predictions are made for large (1,000, 2,000 and 3,000 ton) Air Cushion Vehicles (ACV) with design speeds of 60, 80 and 100 knots. Several gear train arrangements are investigated and a Z drive with dual downshafts and speed reduction in the pod is selected. Minimum required gear envelopes are used to estimate strut pod sizes. The drag of the resultant base vented strut pod system is estimated. The performance of a supercavitating propeller is calculated at hump and design speed. Based on hump and design speed performance, certain craft configurations are selected. (Author)

Karafiath, G Csaky, T
David Taylor Naval Ship R&D Center, (SSH15) SPD-746-01, Feb. 1977, 80 pp

ACKNOWLEDGMENT: NTIS
ORDER FROM: NTIS

AD-A036976/9ST

156537
**RIVERS '76: SYMPOSIUM ON INLAND WATERWAYS FOR NAVIGATION, FLOOD CONTROL AND WATER DIVERSIONS**
Proceedings in two volumes include 106 papers that deal with flood routing models, waterway policy concepts, navigation considerations, marine dredging, river basin planning and management, channel morphology and hydraulics, hydrodynamics, erosion and sedimentation, hydraulic structures and river response. Selected papers are indexed separately.

Third Annual Symposium, Colorado State University, Fort Collins, August 10-12, 1976.

*ASCE Journal of Waterways, Harbors & Coast Eng Div* 2 Vols., 1976, 1793 pp

ACKNOWLEDGMENT: EI
ORDER FROM: ESL

156917
**WATER TRANSPORTATION AND INLAND WATERWAYS INFORMATION: BASIC CONSIDERATIONS**
This bibliography includes 158 citations concerning canals and rivers, inland waterways, ports and harbors, transportation planning and transportation policy.

Worsham, JP, Jr
Council of Planning Librarians Bibliog. No. 1168, Nov. 1976, 16 pp

ACKNOWLEDGMENT: Council of Planning Librarians
ORDER FROM: Council of Planning Librarians, P.O. Box 229, Monticello, Illinois, 61856

157869
**ADVANCED SURFACE CRAFT ECONOMIC MODEL**
A full revelation of a computer program prepared at Louisiana State University for Panel MS-1 of the Marine Systems Committee. It is a complete computer analysis of any number of shipping operations using advanced surface craft such as hydrofoils or air-cushion vehicles. Ten years in the making, this milestone publication can aid a prospective operator in choosing which type of craft to utilize, either in a high-speed cargo and/or passenger service. Making use of the material contained in Bulletin 5-1 can give an operator a hypothetical dollars and cents "bottom line" using any type of marine transportation. The entire methodology, which consists of an explanation of the program, the hand-calculated version and the computer version in an abbreviated program is contained in the 75-page book. The detailed economic model, "Appendix D," is reproduced on three microfiche included with each copy. The program is said to work well with displacement craft also.

For those who wish to incorporate this study into their own computer program, the computer card deck is also available at a price of $150.00.

Pruett, JM
Society of Naval Architects and Marine Engineers T&R Bulletin 5-1, Dec. 1976, 75 pp, 3 Fig., 12 Ref., 3 App.

ACKNOWLEDGMENT: SNAME
ORDER FROM: SNAME

157878
**INLAND WATERBORNE COMMERCE STATISTICS, 1974**

The barge and towing industry's share of the nation's transportation output totalled 599,219,554 net tons in 1974, nearly 16% of the nation's U.S. domestic commerce. Data in this report graphically illustrate the importance of the industry to the nation's economy and well-being. They also illustrate the dependence of production industry and the consuming public on low-cost, efficient, energy-saving, safe, reliable barge transportation. In spite of inflationary pressures which have lead to spiraling operating costs and a low margin of profit, the industry managed to hold the line on the overall cost of barge transportation. (The average cost remained at four to five mills per ton-mile). Included in this report on inland waterborne commerce statistics are total tonnages moved and total ton-miles of service performed nationally, and by individual waterways. The report also shows the total number of vessels in operation and a comparison of transport services performed by the various modes. The data are compiled from the latest reports issued by the Waterborne Commerce Statistics Center of the Army Corps of Engineers. The compilations and comparisons are published annually as a public information service. (Author)

Also available from NTIS.

American Waterways Operators Oct. 1975, 41 pp

ACKNOWLEDGMENT: Transportation Energy Conservation Data Book
ORDER FROM: GPO

157880
**SUMMARY OF NATIONAL TRANSPORTATION STATISTICS**

These periodic reports are compendiums of selected national- level transportation statistics. Included are cost, inventory, and performance data describing the passenger and cargo operations of the following modes: air carrier, general aviation, automobile, bus, truck, local transit, rail, water, and oil pipeline. The report includes basic descriptors of U.S. transportation, such as operating revenues and expenses, number of vehicles and employees, vehicle-miles and passenger miles, etc. As the name implies, these reports are summaries of a larger data base, consisting of time-series collected from a variety of government and private statistical handbooks. In the 1975 and 1976 editions, the selected data cover the periods 1963 through 1973 and 1964 through 1974, respectively.

Annual Report, Report No. PB-25410, DOT-TSC-OST-75-18, 160 pages for June 1975 report; Report No. DOT-TSC-OST-76-11, 120 pages for June 1976 report. Also available from NTIS.

Gay, WF
Transportation Systems Center No Date

ACKNOWLEDGMENT: Transportation Energy Conservation Data Book
ORDER FROM: GPO

157882
**TRANSPORT STATISTICS IN THE UNITED STATES FOR THE YEAR ENDED DECEMBER 31, 1974. PART 1: RAILROADS, THEIR LESSORS AND PROPRIETARY COMPANIES, REA EXPRESS, INC., AND ELECTRIC RAILROADS. PART 2: MOTOR CARRIERS. PART 3: FREIGHT FORWARDERS. PART 4: PRIVATE CAR LINES. PART 5: CARRIERS BY WATER. PART 6: PIPE LINES**

These annual statistics provide data on Railroads (Part 1), Motor Carriers (Part 2), Freight Forwarders (Part 3), Private Car Lines (Part 4), Carriers by Water (Part 5), and Pipelines (Part 6). Part One presents data on income, total assets and liabilities, operating expenses, capital improvement, and freight revenues. Detailed financial statements are given, including operating and revenue data for freight and passenger service by geographic area. Part Two on motor carriers provides financial data, statistics on employees, and operating statistics. Three tables are found in Part Three on Freight Forwarders: summary of operating revenues and expenses; selected balance sheet data and number of motor vehicles owned, by individual freight forwarders; selected income statement data, number and compensation of employees, and selected operating statistics, by individual freight forwarders. Part Four, Private Car Lines, presents the following data in tabular form: selected statistics; financial and operating statistics--refrigerator car lines owned or controlled by railroads; selected data--owners of 1,000 or more cars (excluding refrigerator car lines owned or controlled by railroads). Statistics on carriers by inland and coastal waterways are given in Part Five, including financial and operating data, number of carriers, tons of freight carried, and passengers carried. Part Six contains data reported by 103 pipeline companies in tables, which summarize financial and operating data, pipeline mileage, number of barrels of oil transported and barrel miles, a condensed balance sheet, a condensed income statement, operating revenues and expenses, number of employees and their compensation, and corporate changes.

Cost is $2.50, Stock No. 026-000-01032-2, Superintendent of Documents No. IC1.25:974.pt.1 for Part 1; $0.80, Stock No. 026-000-01039-0, Superintendent of Documents No. IC1.25:974/Pt.2 for Part 2; $0.50, Stock No. 026-000-01027-6, Superintendent of Documents No. IC1:25:974/pt.3 for Part 3; $0.50, Stock No. 026-000-01026-8, Superintendent of Documents No. IC1.25:974/pt.4 for Part 4; Superintendent of Documents No. IC1;25:974/pt.5 for Part 5; $0.70, Stock No. 026-000-01031-4, Superintendent of Documents No. IC1.25:974/pt.6 for Part 6. Also available from NTIS.

Interstate Commerce Commission 1975, 327 pp

ACKNOWLEDGMENT: Transportation Energy Conservation Data Book
ORDER FROM: GPO

163437
**CHARGE-AIR TEMPERATURE CONTROL IN FERRY SHIPS**

Ferries, which dispense with tugs at the terminal ports, must be able to vary their propulsion power between 10 and 100% very quickly, a requirement that introduces problems in the regulation of the charge-air temperature of the main Diesel engines. Thermal overloading of the engine is possible, and, in particular, there is a danger of damage to the air cooler. The Authors briefly describe a theoretical and experimental study for the selection of control arrangements for obviating these difficulties. The study was made for the Rugen, A twin-screw ferry with four medium-speed engines. The control requirements, and different methods of meeting them, are dicussed and compared under the headings:--1. Determination of Characteristics for the Charge-Air Cooling Control System (i--Determination of static transfer behaviour; ii--Determination of transient response functions). 2. Charge-Air Temperature Regulation (i--Single-loop control system with proportional action controller; ii--Single-loop control system with proportional/integral action controller; iii--Control system with disturbance-variable feed-forward action). 3. Use of Electronic Controllers. Test results showed that a disturbance-variable feed-forward control system fulfilled all the requirements for controlling the charge-air temperature in ferries, an advantageous practical solution being the non-steady electronic controller with steady feedback, in conjunction with an integrally operating final-control element. [German]

Hein, D *Seewirtschaft* Vol. 9 Mar. 1977, 3 pp, 5 Ref.

ACKNOWLEDGMENT: BSRA
ORDER FROM: BSRA

BSRA No. 46,268

165464
**COMPREHENSIVE UPSTATE NEW YORK PORTS STUDY: EXECUTIVE SUMMARY**

This document summarizes the main findings and recommendations contained in three volumes of the Comprehensive Upstate Public Ports Study. As such it presents a condensed description of a year-long effort carried out by the New York Department of Transportation, Frederic R. Harris, Inc., and the Advisory and Liaison Committee. The aim of this effort has been to fulfill the State wide Master Plan mandate for a "Reexamination of upstate port responsibilities, including possible revisions in regional authority boundaries for financial support, port charges, and programs for port development." The purpose of this study has been to identify and address all problems and to properly guide the future development of the public Ports of Albany, Buffalo, Ogdensburg, Oswego, and Rochester through a Comprehensive Upstate Port Plan. Firm recommendations were to be developed in three interrelated areas: 1. Coordinated port development--to identify service, equipment and facility needs for effective handling of existing and potential freight traffic; 2. Financing--to define the appropriate levels of user charges, the regional economic benefit and the level of public financial support and the distribution of the cost of this support among state and local governments; and 3. Upstate port management--to select the organizational structure and staffing patterns that will most effectively meet the requirements of present and future port operations. While the Department of Transportation has specifically defined the scope and purpose of this study and has continuously monitored its execution, the recommendations contained in this summary are solely those of Frederic R. Harris, Inc.

Limited copies available.
Harris (Frederic R), Incorporated Sept. 1976, 51 pp

ACKNOWLEDGMENT: Harris (Frederic R), Incorporated
ORDER FROM: New York State Department of Transportation, 1220 Washington Avenue; State Campus, Albany, New York, 12226

167335
**A STUDY OF WASTEWATER HANDLING, HOLDING AND DISPOSAL FROM WASHINGTON STATE FERRIES**
Alternatives to control wastewater odors on board Washington State ferries and during discharge of the wastewater to sewerage systems were formulated, evaluated and tested. Holding tank aeration, using compressed air injection to a recycle line is an effective method. Sulfide is microbially oxidized, and anaerobic sulfate reducing bacteria are suppressed. Engineering and lab studies and a simulation model of the process were used to estimate suitable design parameters and costs. A prototype installation is recommended for optimization of operation. The addition of slug dosages of H2O2 was also found to be effective in laboratory and on-board vessels. The twice daily dose of about 50 mg/l should be stirred into the holding tank using recycle mixing. Peroxide was found to oxidize sulfide, increase dissolved oxygen and suppress sulfate reducing bacteria. Other alternatives, including chlorine addition, pH increase, iron sulfide precipitation and toxic odor control compounds, were found ineffective and/or uneconomic.

Also pub. as Washington State Dept. of Highways, Olympia Research Program report 27.1. Sponsored in part by Federal Highway Administration, Washington, D.C.

Ferguson, JF Parrish, KB Browne, DW Lellilid, S Sylvester, RO
Washington University, Seattle, Washington State Department of Highways, Federal Highway Administration, (HPR) Final Rpt. July 1977, 124 pp

ACKNOWLEDGMENT: NTIS
ORDER FROM: NTIS

PB-272457/3ST

170259
**FULLY SUBMERGED FOIL**
Surprisingly little interest has been shown in applying simple control methods to the fully submerged hydrofoil and the simplest requirements seem always to be handed over to the electronics engineer. Electronics are not necessarily costly per se but their use does involve the use of micro-signals which have to be amplified and provided with servo power. The resulting product tends to be enormously costly, while a world-wide industry of smaller boats is totally neglected except for some military uses. The writer was first able to solve the air entrainment problem and this made incidence control possible. Its unfortunate selection for a U.S. Navy Landing Craft, for which it was not suited, had tended to cloud the issues at stake, and this paper is an attempt to clarify the matter.

Proceedings of Second International Waterborne Transportation Conference, October 5-7, 1977, New York City. Available April, 1978, approximately 750 pages, Cost: to ASCE members $15.00; non-members $30.00.

Hook, C (New Hydrofin)
American Society of Civil Engineers Proceeding 1977

ACKNOWLEDGMENT: ASCE
ORDER FROM: ASCE

170261
**WATERBORNE ACCESS TO GATEWAY NATIONAL RECREATION AREA**
This paper discusses the various alternatives for waterborne transportation access to Gateway National Recreation Area. It includes a listing of goals and objectives for such waterborne service. The various types of vessels applicable to this type of service are discussed, including operational arrangements, vessel types, speeds, and passenger capacities. New technology vessels are included in the discussion. Various origin and destination docking facilities are analyzed. Criteria utilized in the analysis of origins include land transportation access, proximity to residential concentrations, other-use potentials, minimization of adverse community impacts, technical feasibility, and adequate channel depths. For destinations, factors considered include proximity to Gateway activity centers, technical and jurisdictional feasibility, and compatibility with National Park Service Gateway development plans. Scenarios for service are discussed and analyzed, using combinations of origins and destinations and vessel types. Speeds comparable to land modes and passenger-delivery capabilities are included. A brief description of the 1976 Gateway Bicentennial Waterborne Program is included with an outline of the information gained from the program. A review matrix of all origin and destination sites is included, providing graphic presentation of analysis in the text. The paper concludes with a summary of two-phase recommendations for waterborne service to Gateway: the first phase implementable with existing docking facilities and vessels, the second phase requiring some docking facility construction/upgrading and purchase of new vessels.

Proceedings of Second International Waterborne Transportation Conference, October 5-7, 1977, New York City. Available April, 1978, approximately 750 pages, Cost: to ASCE members $15.00; non-members $30.00.

Baer, FS Zelefsky, H (New York City Department of City Planning)
American Society of Civil Engineers Proceeding 1977

ACKNOWLEDGMENT: ASCE
ORDER FROM: ASCE

170262
**MID-AMERICA PORTS STUDY FACILITY PLANNING**
The Mid-America Ports Study is a 16-month research and development effort, jointly funded by the Maritime Administration (MarAd), U.S. Department of Commerce, and 17 participating states to study the port facilities and waterborne commodity flows of 17 states in the Mississippi River Basin and the Gulf Coast area. The overall objectives of this study are to: identify and assess conditions, problems and needs associated with the development of approximately 15,000 miles of waterways comprising the inland river port system; recommended solutions to river port and related problems; and formulate policies, programs, general plans, and specific recommendations for federal, state and local governmental action. The study got underway in May 1977. This paper addresses that portion of the study dealing with port facility needs and development. The procedure employed in developing the MarAd computerized inventory of approximately 2,000 port facilities are described, along with the field techniques used in site visits to terminal facilities. The data contained in the facility inventory, supplemented by operational data obtained during the field visits, will be used to estimate the existing capacity of the port system to handle, separately, 17 different facility types. Towards this end, computer programs for estimating port handling capacity are being prepared. A primary objective of these efforts is to develop a methodology and system which can handle a large database for study forecasting and is suitable for subsequent updating purposes by interested parties.

Proceedings of Second International Waterborne Transportation Conference, October 5-7, 1977, New York City. Available April, 1978, approximately 750 pages, Cost: to ASCE members $15.00; non-members $30.00.

Carman, J (Maritime Administration); Rosselli, AT Miller, ML Van Cook, CF (Tippetts-Abbett-McCarthy-Stratton)
American Society of Civil Engineers Proceeding 1977, 20 pp

ACKNOWLEDGMENT: ASCE
ORDER FROM: ASCE

170263
**DEVELOPING A VIABLE WATERBORNE TRANSPORTATION SYSTEM--A STATE'S VIEW**
This paper identifies the role that state departments of transportation can play in developing their inland waterways as an element of their total transportation plan. A review of Tennesee's activities is given to illustrate an approach to developing the water transportation element of the total system. The example includes a discussion of Tennessee Rivers Information Planning System (TRIPS) along with the various data bases that make up the TRIPS computer based file. Because Federal, state and local levels of government and private industry are involved with inland waterways planning, development, and use, the paper describes the coordination that is necessary to achieve a viable waterborne transportation system.

Proceedings of Second International Waterborne Transportation Conference, October 5-7, 1977, New York City. Available April, 1978, approximately 750 pages, Cost: to ASCE members $15.00; non-members $30.00.

Goodwin, WA (Tennessee Department of Transportation)
American Society of Civil Engineers Proceeding 1977

ACKNOWLEDGMENT: ASCE
ORDER FROM: ASCE

**170264**
**THE FORGOTTEN RESOURCE...URBAN WATERBORNE TRANSPORTATION**
This paper proposes a system, including high-speed ferries, feeder barges and satellite terminals, which would be integrated into the existing transportation patterns and result in many benefits at a relatively low cost. Making use of right-of-ways, which would require practically no cost to establish and maintain, the ferries could provide many time-saving shotcuts for the public. Also commuters could travel in more pleasant, less crowded surroundings. These ferries, in some instances, could be used to relieve the pressure on existing transportation systems, and thereby ease the need for costly expansions. Cargo movements between the major marine terminals and strategically located, satellite terminals could reduce the truck traffic through the cities by using self-propelled barges, or barge tows, to deliver cargo (preferably containerized). Trucking of the cargo could then be confined to the local regions served by the satellite terminals. Besides the cost saving features, other benefits of using these waterways would include reductions of city traffic, accidents, road maintenance, air pollution and possibly hijackings. These benefits should not be overlooked in planning urban transportation systems.

Proceedings of Second International Waterborne Transportation Conference, October 5-7, 1977, New York City. Available April, 1978, approximately 750 pages, Cost: to ASCE members $15.00; non-members $30.00.

Colleran, RJ Funge, WJ (Dravo Van Houten, Incorporated)
American Society of Civil Engineers Proceeding 1977

ACKNOWLEDGMENT: ASCE
ORDER FROM: ASCE

**170265**
**THE STATE'S ROLE IN WATERBORNE TRANSPORTATION**
Waterborne commerce is an important part of New York State's transportation system and is essential to the state's position as an economic leader in natural and world markets. A study of upstate New York public ports, completed last year, demonstrated the great value of these ports for New York State's economy. It showed that the trend towards increasing public port deficits can be reversed. Investments in facilities needed for each port to develop its special potential will yield high benefits to the state, as well as to individual ports. A state department of transportation can assist small ports by undertaking planning, marketing and engineering studies which such ports seldom can afford on their own. For the ports to provide necessary services and facilities on a timely basis, they must have a sound financial foundation. The study showed that increased user charges can and should provide this foundation.

Proceedings of Second International Waterborne Transportation Conference, October 5-7, 1977, New York City. Available April, 1978, approximately 750 pages, Cost: to ASCE members $15.00; non-members $30.00.

Campbell, EW (New York State Department of Transportation)
American Society of Civil Engineers Proceeding 1977

ACKNOWLEDGMENT: ASCE
ORDER FROM: ASCE

**170266**
**THE ROLE OF WATERBORNE TRANSIT IN THE NEW YORK METROPOLITAN AREA**
Provides an estimate of what the author's company believes is needed to provide adequate commuter and recreational transportation between the North Jersey Coast and Lower Manhattan. With the present congested highways, the only reasonable alternative lies in the waterways. A current analysis indicates the need for an overall integration of ferry services so as to meet the weekly and seasonal variations in passenger travel patterns with the minimum capital investment. The economic realities of the current times compel an examination of the most cost effective means of waterborne transportation. Rather than employ high energy consumers such as SES and hydrofoils, it is believed that semi-planing displacement hull offer the best solution. Currently in the planning stage is the design of a 30 mph semi-planing catamaran ferry with a capacity of 1500 passengers. An alternate, more conventional design of equal capacity and speed based on the Nickum & Spaulding GOLDEN GATE high speed water-jet commuter boats is a serious candidate. In the future, consideration should be given to ferry boats that can handle up to 10,000 passengers and travel at a speed of 20 miles per hour. Some of the conceptual designs are presented so that one can get a better picture of the types of ferries that the studies have produced to date.

Proceedings of Second International Waterborne Transportation Conference, October 5-7, 1977, New York City. Available April, 1978, approximately 750 pages, Cost: to ASCE members $15.00; non-members $30.00.

Cox, AE (Henry (JJ) Company, Incorporated)
American Society of Civil Engineers Proceeding 1977

ACKNOWLEDGMENT: ASCE
ORDER FROM: ASCE

**170267**
**SEABUS**
The passenger-catamarans "Burrard Otter" and "Burrard Beaver" are the focal point of an integrated land-marine transportation link across Burrard Inlet, British Columbia. The water route is 1.75 nautical miles and links North Vancouver, a bedroom community with some industry, to Vancouver, the business center of British Columbia. The surrounding population is approximately 1,179,000. The official population of North Vancouver is 60,000, and the population of Vancouver is 500,000. The North Vancouver marine terminal is also a land bus interchange, while the Vancouver side forms a land bus pick-up up-drop off point only. The Seabus system includes, besides an operating organization of 65 people; two 400-passenger ferries, two floating flow-through terminals, each of which is "E" shaped with two slips, an administration-maintenance building, and maintenance and overhaul berths. The system has been designed to expand to a total of 8 ferries when required. Average usage per day is approximately 14,000 with the expected morning and afternoon peaks and an unexpected evening peak. These usage figures are based on two months of initial service which commenced on June 17, 1977. A private ferry operation closed down 19 years previously and the cross inlet traffic has been handled by two bridges until this point in time. Design of the system and hardware, by Case Existological Laboratories Ltd., began in October of 1974. Operation of the system began 32 months later. Seven contracts worth $35,000,000, and the organizing and training of the personnel occurred during this intense 32-month period. Even more interesting during this period was a radical change of government half way throught the design and construction phase and three months of construction strikes. Public acceptance has been excellent, and an attractive marine option to the automobile has been firmly estabilished in the North Vancouver-Vancouver area.

Proceedings of Second International Waterborne Transportation Conference, October 5-7, 1977, New York City. Available April, 1978, approximately 750 pages, Cost: to ASCE members $15.00; non-members $30.00.

Case, JN (Case Existological Laboratories Limited)
American Society of Civil Engineers Proceeding 1977

ACKNOWLEDGMENT: ASCE
ORDER FROM: ASCE

**170268**
**EDUCATION PROGRAMMING AND WATERBORNE TRANSPORTATION**
During the summer of 1976, as part of the Bicentennial celebration, Gateway National Recreation Area sponsored ten day-long boat trips from Manhattan and Hoboken, New Jersey to the park. In an attempt to begin the park experience aboard the ship, various programming techniques were tried including narrations, poetry, music, dance, arts and crafts, and information packets. The effectiveness of these techniques are discussed as well as possibilities for more in-depth programming including classes and audio-visual centers that may be adaptable to commuter situations.

Proceedings of Second International Waterborne Transportation Conference, October 5-7, 1977, New York City. Available April, 1978, approximately 750 pages, Cost: to ASCE members $15.00; non-members $30.00.

Fox, T
American Society of Civil Engineers Proceeding 1977

ACKNOWLEDGMENT: ASCE
ORDER FROM: ASCE

**170269**
**WATERBORNE TRANSPORTATION SYSTEM IN HAWAII**
Because of its importance, the State of Hawaii is actively promoting the expansion of waterborne transportation and has recently completed studies for an inter-island car ferry system and for high-speed commuter service in metropolitan Honolulu. Large monohull vessels, similar to those on the Alaskan Marine Highway, and new technology stable semi-submerged platform (SSP) vessels were evaluated for the car ferry service. Conventional

displacement vessels, hydrofoils and hovercraft were evaluated for the intra-island commuter service. The car ferry studies found that an SSP system would be more feasible, operationally and financially, than a large monohull system. As a result, the State intends to further evaluate the SSP by designing a prototype vessel and by possibly implementing a pilot demonstration program. The studies for intra-island commuter service evaluated alternatives to supplement land-based transit systems in Honolulu. Environmental studies have been completed and steps are currently being taken to implement this service using hovercraft on an initial 13-mile route between Hawaii Kai and downtown Honolulu. These studies have illustrated that problems and opportunities associated with the existing waterborne systems in Hawaii would also apply to the proposed new systems. In particular, while improvements in technology would minimize the environmental problems of waterborne transportation, they would have to be achieved with minimum increases in cost to maintain economic and political feasibility. It is suggested that this requirement for waterborne transportation in Hawaii is one of the more important considerations in the implementation of new systems elsewhere.

Proceedings of Second International Waterborne Transportation Conference, October 5-7, 1977, New York City. Available April, 1978, approximately 750 pages, Cost: to ASCE members $15.00; non-members $30.00.

Bergelin, VJ (Parsons Brinckerhoff Quade & Douglas, Inc)
American Society of Civil Engineers Proceeding 1977

ACKNOWLEDGMENT: ASCE
ORDER FROM: ASCE

**170270**
**TUG AND BARGE COMBINATIONS FOR MARINE PASSENGER TRANSPORTATION**

The development of large scale recreation complexes on the nation's waterfronts portends a return to waterborne transit as a means of access. In the New York City Metropolitan Region, Gateway, Liberty Park and the Palisades Interstate Park systems exemplify these sizable recreation/open space resources with waterborne Transit potential. Reinforcing the concept of barges for passenger transportation is the emergence of new technology barge/tug linkage systems. At least five or six of these systems have a direct application to passenger movement. Because of the relative slow speed (10-15 knots), the barge/tug system is acceptable for recreation trips but not for journey to work. Cost savings are achievable over comparable sized conventional self-propelled excursion boats. Cost savings are estimated in the magnitude of 20% for operating costs and 12% for capital costs. Scenarios have been prepared for a fleet of 3 tugs and 4 barges providing transit capacity of some 10,000 daily person trips. Regulatory, safety, operating and capital cost estimates and a host of other considerations and criteria point to the use of barge/tug combinations for large scale waterborne access. The paper recommends that this concept be demonstrated.

Proceedings of Second International Waterborne Transportation Conference, October 5-7, 1977, New York City. Available April, 1978, approximately 750 pages, Cost: to ASCE members $15.00; non-members $30.00.

Phraner, SD (Tri-State Regional Planning Commission)
American Society of Civil Engineers Proceeding 1977

ACKNOWLEDGMENT: ASCE
ORDER FROM: ASCE

**170271**
**NAVY ADVANCED SHIP PROGRAMS**

The paper starts by defining advanced ship programs to include both totally new concepts such as hydrofoils and hovercraft as well as some more conventional ship forms employing advanced technologies. The major emphasis is on the advanced concepts and the unusual features which make them attractive for Naval purposes. The combination of speed, seakeeping and maneuverability of small hydrofoils; the truly amphibious capabilities of the air cushion vehicle; the combination of speed and low cost of the planing craft, are discussed. The paper also includes a discussion of some interesting hybrid concepts such as the Small Waterplane Area Twin-Hull (SWATH) ship. In each case, the background and rationale for Navy interest is provided as a basis for discussing the status and direction of ongoing developments. Particular subsystems such as struts, foils, automatic control, lift systems and flexible understructures are described. The Navy is currently conducting an Advanced Naval Vehicle Concept Evaluation (ANVCE). The assumptions, approach, and status of this study are described. The ANVCE Study is an extensive two-year effort to define the "state-of-the-art," quantify the financial and operational benefits of these concepts, and derive recommendations for future Research and Development. The paper concludes by noting some implications for commercial marine transportation systems. Some issues related to the transfer of technology among military and commercial activities, both foreign and domestic, are also addressed.

Proceedings of Second International Waterborne Transportation Conference, October 5-7, 1977, New York City. Available April, 1978, approximately 750 pages, Cost: to ASCE members $15.00; non-members $30.00.

Ellsworth, WM (David Taylor Naval Ship R&D Center)
American Society of Civil Engineers Proceeding 1977

ACKNOWLEDGMENT: ASCE
ORDER FROM: ASCE

**170272**
**JETFOILS**

The JETFOIL is a second generation hydrofoil which employs gas turbine driven waterjets for propulsion, fully submerged hydrofoils to develop lift, and an automatic stabilization and control system to produce an excellent ride quality in rough water. In commercial passenger service throughout the world, the JETFOILS have carried two million passengers approximately 100 million passenger miles reliably and dependably. Passenger acceptance of the wide body comfort, smooth ride and cruise speed of 50 miles an hour has been extremely high and load factors have continued to increase. The JETFOIL is environmentally clean, it is quiet and it can be used in congested areas safely and without imposing itself in any way on other users of the marine environment either pleasure or commercial. The primary emphasis of this presentation is to describe the in-service experience of this relatively new and highly advanced marine vehicle and to show how the craft could be used in Metropolitan transit operations. Several specific analyses of operations presently under consideration are shown and the economic aspects discussed. The presentation also deals with some of the key technical considerations which are likely to determine the economic viability of any advanced marine system and therefore determine the ultimate success or failure of the system. (Extensive use was made of films and slides.)

Proceedings of Second International Waterborne Transportation Conference, October 5-7, 1977, New York City. Available April, 1978, approximately 750 pages, Cost: to ASCE members $15.00; non-members $30.00.

Schulz, WM
American Society of Civil Engineers Proceeding 1977

ACKNOWLEDGMENT: ASCE
ORDER FROM: ASCE

**170273**
**RECENT NAVIGATION DEVELOPMENTS OF THE TENNESSEE VALLEY AUTHORITY**

The latest operating and economic development results are presented along with current physical improvements. Plans for keeping the waterway's capacity commensurate with the region's economic needs are discussed.

Proceedings of Second International Waterborne Transportation Conference, October 5-7, 1977, New York City. Available April, 1978, approximately 750 pages, Cost: to ASCE members $15.00; non-members $30.00.

Foster, MI (Tennessee Valley Authority)
American Society of Civil Engineers Proceeding 1977

ACKNOWLEDGMENT: ASCE
ORDER FROM: ASCE

**170274**
**THE HONGKONG & YAUMATI FERRY OPERATIONS IN HONG KONG**

The Company has a network of ferry routes to cover practically all urban and suburban areas within reach from the sea. The fleet is comprised of 89 vehicular and passenger ferries, and carried a total of 135 million passengers and 3.5 million vehicles in 1976. The Topics covered include the Types of Ferry Vessels: (1) Double Ended Ferries, these include ferries with double vehicular deck, passenger spaces above vehicular deck and passengers on both decks. (2) Conventional Single Ended Ferry Vessels with carrying capacities ranging from 500 to 1400 passengers. Air-conditioned passenger deck spaces and cruising at 15 knots. (3) Fibre glass mini-ferries on developing or feeder routes. (4) Sidewall hoverferries with air-conditioned passenger spaces for 92 persons and cruising at 30 knots. Types of Propulsion System: (1) Conventional single or twin screw propulsion. (2) Voith Schneider Propulsion. (3) Surface effect ship with fixed sidewall, air

cushion and marine screw propulsion. Integrated Water Transport System: This includes the design study of high density passenger and vehicular ferries and shore support facilities to form an efficient, economic co-hensive transport system and how to Increase Ferry Utilization: (1) Methods to improve service frequency with existing hardware. (2) Cross utilization of different types of ferry vessels to meet fluctuation in weekly or seasonal demand. (3) New ferry construction with built-in maintenance free or low maintenance features to reduce down time. (4) Standardization of machinery components wherever possible to effect unit change-over, spare parts availability, service and operation familiarity, etc.

Proceedings of Second International Waterborne Transportation Conference, October 5-7, 1977, New York City. Available April, 1978, approximately 750 pages, Cost: to ASCE members $15.00; non-members $30.00.

Young, ECK
American Society of Civil Engineers Proceeding 1977

ACKNOWLEDGMENT: ASCE
ORDER FROM: ASCE

**170275**
**WATERFRONT PRECEDENTS**

Waterfront redevelopment is plainly different from other inner city neighborhoods in terms of form, constituencies and governmental jurisdictions, and poses questions which most cities appear ill-equipped to deal with. How should these lands be developed? What land uses are appropriate? And, how can we reinforce the viability of our waterfront industries? This is where a growing body of waterfront precedents can be instructive to cities wishing to take advantage of their post-industrial waterfront. In order to maximize the advantage of these resources and increase public amenities, a number of steps can be taken: (1) develop the area as an educational resource; (2) maintain an historical connection through the reuse of buildings, ships, etc, and the continuance of certain water trade related activities; and (3) consider land and water uses together in the planning and design processes. The recent Waterfront Precedents Study completed for the City of Toronto has proved invaluable in stirring the imagination of planners and the public, alike. It has already led to the preservation of some of this Waterfront's more important resources. It is anticipated that the Strategic Plan for Toronto's Waterfront, expected later this year will embody these crucial concepts.

Proceedings of Second International Waterborne Transportation Conference, October 5-7, 1977, New York City. Available April, 1978, approximately 750 pages, Cost: to ASCE members $15.00; non-members $30.00.

Wilson, D (Toronto City Planning Board)
American Society of Civil Engineers Proceeding 1977

ACKNOWLEDGMENT: ASCE
ORDER FROM: ASCE

**170276**
**FERRY BUS/TRANSIT SYSTEM**

The presentation describes the growing automobile congestion within the Golden Gate Corridor, which is located across the Golden Gate bridge to the north of San Francisco, and reviews the innovative approach undertaken by the Golden Gate Bridge, Highway and Transportation District to solve the problem with a mass transit system consisting of a combination of ferries and buses. A brief review is given of the planning and design criteria used in the selection of vessel type and related terminal facilities. Three new high-speed, 165-foot, 750-passenger, vessels are presently in operation between San Francisco and central Marin County. These vessels are of aluminum construction, with a 28-knot power package consisting of gas turbine engines coupled to water jet pumps. Two new modern marine passenger terminals are also discussed, one of which is now in operation, and the other to be completed in the Spring of 1978.

Proceedings of Second International Waterborne Transportation Conference, October 5-7, 1977, New York City. Available April, 1978, approximately 750 pages, Cost: to ASCE members $15.00; non-members $30.00.

Kowleski, SM (Golden Gate Bridge, Highway and Trans Division)
American Society of Civil Engineers Proceeding 1977

ACKNOWLEDGMENT: ASCE
ORDER FROM: ASCE

**170277**
**HOVERMARINES--THE DEVELOPMENT AND STATUS OF THE HM.2 AND HM.5**

The paper describes the development of the sidewall hovercraft or surface effect ship as a commercial high-speed passenger hoverferry or "Hovermarine". Early work in the U.K. and U.S. is traced to the introduction in 1968 of the first Hovermarine--the 60 passenger HM.2. That prototype craft with limited sea state capacity developed through eight years of passenger service and two distinct "model changeovers" into the current 84-92 passenger Mark 4 waterbus with greatly improved passenger comfort and system reliability, while maintaining the initially conceived high-speed operational efficiency. This HM.2 development in increased payload, extended sea state capability and improved ride quality is reviewed and quantified. The now standard 40 mph HM.2 has an 18,000 disposable load capability which lends itself readily to roles other than pure passenger carrying. Designs using the standard hull but configured for crew boat, survey and firefighting missions are presented. The 200 million in-service passenger miles experience gained on the 28 ton HM.2 served as the principal development background to the 220 passenger, 80 ton HM.5 Hovermarine, the prototype of which is now in construction. The characteristics of the HM.5 are presented, and the Hovermarine series craft are reviewed on basic parametric terms with other types of high-speed marine vehicles. This review extends the Hovermarine concept to the 500 ton region. Hovermarines are finally discussed in regard to their capability as "waterbuses" in alleviating the currently favored, but tremendousy expensive land-based roadway and fixed guideway solutions to the U.S. mass transit problem in spite of the fact that waterways serving most large cities remain underutilized.

Proceedings of Second International Waterborne Transportation Conference, October 5-7, 1977, New York City. Available April, 1978, approximately 750 pages, Cost: to ASCE members $15.00; non-members $30.00.

Davison, EF (Hovermarine Corporation)
American Society of Civil Engineers Proceeding 1977

ACKNOWLEDGMENT: ASCE
ORDER FROM: ASCE

**170278**
**AGGRESSIVE AND MEASURABLE MARKETING PROGRAMS FOR THE NATIONS LARGEST FERRY SYSTEM**

The tools of private business--namely the tools of marketing--can and are helping the Washington State Ferry System to better control the numerous, disparate issues which arise in handling 16,000,000 rides annually. The WSFS, as with other land-based transit systems which serve a large commuter audience twice daily, suffers a significant operational disutility during off-peak periods each day. Increased tourism during the prime summer months can be actively stimulated through the mass and other media to compensate for the off-peak maintenance costs of a commute-designed system. However, during the other nine months of each year, there is the further, more requiring need to create other, discretionary ridership from among those residents of the operations area--Puget Sound--to help reduce the operational deficit of the USFS. Furthermore, those Washington State citizens who are not conveniently situated to Puget Sound, yet who contribute to the tax funds which underwrite the system deficit, must be considered as a critically important audience for the overall communications and marketing program for the WSFS; a primary message element which must be communicated to this latter audience is the ability of the marketing program to actually offset (or at least attempt to hold level) the operational subsidy. The paper will consist of two highly practical parts: (1) the 1977 marketing plan, and (2) the 1978-79 marketing plan, both with budgets, work timetables, research, rationales, etc. The first of these parts is a "pioneering" effort, while the second part will summarize the practical achievements and marketing plan adjustments which stem from marketplace reaction and result.

Proceedings of Second International Waterborne Transportation Conference, October 5-7, 1977, New York City. Available April, 1978, approximately 750 pages, Cost: to ASCE members $15.00; non-members $30.00.

Darland, SA (Concept Management Incorporated)
American Society of Civil Engineers Proceeding 1977

ACKNOWLEDGMENT: ASCE
ORDER FROM: ASCE

**170786**
**THE ECONOMICS OF WATER TRANSPORTATION FOR SOUTH SHORE WORK TRIP COMMUTERS TO BOSTON**

In this paper an economic analysis is undertaken to examine the feasibility of utilizing two-HM. 2 Hoverferry(s) or an S-120 displacement vessel in order to satisfy the travel demand of work trip commuters between Hingham and Boston, Mass. Level-of-service, system costs, cost and demand curves,

financing arrangements and potential risks are discussed. It is indicated that the implementation of either one of the watercraft solely for work trip commuters to Boston is a high risk venture.

Proceedings of Second International Waterborne Transportation Conference, October 5-7, 1977, New York City. Available April, 1978, approximately 750 pages. Cost: to ASCE members $15.00; non-members $30.00.

Curtis, F (Queen's University, Canada)
American Society of Civil Engineers Proceeding 1977

ACKNOWLEDGMENT: ASCE
ORDER FROM: ASCE

**170787**
**THE COAST GUARD'S VESSEL TRAFFIC SERVICES PROGRAM**

This presentation outlines action that is being taken by the U.S. Coast Guard to promote marine safety in certain major U.S. ports and waterways through the Vessel Traffic Service (VTS) program. A VTS employs various components including VHF-FM communications, radar, low light level television and in some cases automatic data processing equipment to coordinate vessel movements to reduce congestion and casualties. The main elements of the three operational VTSs are summarized, and emphasis is given to the development of the VTS for New York Harbor, scheduled to begin operations in mid 1978. This presentation demonstrates how VTSs can contribute to marine safety, environmental protection, and increased efficiency in the waterborne transportation system.

Proceedings of Second International Waterborne Transportation Conference, October 5-7, 1977, New York City. Available April, 1978, approximately 750 pages. Cost: to ASCE members $15.00; non-members $30.00.

Bauman, RA (United States Coast Guard)
American Society of Civil Engineers Proceeding 1977

ACKNOWLEDGMENT: ASCE
ORDER FROM: ASCE

**170788**
**DEVELOPMENT OF PRODUCT TANKERS IN WORLD TRADE**

The paper outlines the development of the sophisticated product tanker and its operation. With the development of new, source-located refining capacity the product tanker will become increasingly important in world trade balancing short falls and surpluses in product availability as well as the primary distribtuion role. The modern product tanker is equipped to handle both "dirty" and "clean" cargoes on demand. The more complex units are also able to handle many different mixes of product at one time. The older product carriers are relatively simple vessels of the 5,000 to 20,000 DWT size range and are of considerable age, at least 25% of the fleet being over 20 years old. Newly built product tankers, now operating, are in the 20,000 to 50,000 DWT size range. More stringent oil pollution and safety regulations and more vigorous enforcement of these regulations will make obsolete an even larger proportion of the product tankers and the developments in world trade. The paper deals with sufficient technical details of the construction and operation of specially coated tankers now trading in the world market, to make these aspects understood. The paper also briefly describes some current thinking on the prospects for development of other designs of tankers for product transportation.

Proceedings of Second International Waterborne Transportation Conference, October 5-7, 1977, New York City. Available April, 1978, approximately 750 pages. Cost: to ASCE members $15.00; non-members $30.00.

Joplin, AF (Canadian Pacific (Bermuda) Limited)
American Society of Civil Engineers Proceeding 1977

ACKNOWLEDGMENT: ASCE
ORDER FROM: ASCE

**170789**
**MARKETING WATERBORNE TRANSPORTATION**

The paper first defines the nature and scope of the waterway system with an emphasis on the necessity of adequate surface modes of transportation as a factor in riverport location. This is done in order to stress the fact that riverports should be considered as transfer points rather than terminals in developing a marketing strategy. The use of the transfer point concept emphasizes the fact that waterborne transportation is part of a distribution system rather than an isolated, self-contained mode. This point is used to develop the proposition that a systems approach is the most logical method for developing the proper marketing channels. In this connection, the paper develops the concept that marketing water-borne transportation is a long-term strategic plan rather than a short-term tactical decision. In other words, you must have a package to sell rather than a single mode of transportation. The paper then develops the general components of the package in terms of the physical, service and organizational facilities that are necessary for a community to market waterborne transportation. There is also a discussion of the procedures that seem to be best suited for effective presentation and implementation of the package. The paper concludes with case examples and recommendations for improving the waterborne transportation market environment.

Proceedings of Second International Waterborne Transportation Conference, October 5-7, 1977, New York City. Available April, 1978, approximately 750 pages. Cost: to ASCE members $15.00; non-members $30.00.

Hendrix, FL (Tennessee University, Knoxville)
American Society of Civil Engineers Proceeding 1977

ACKNOWLEDGMENT: ASCE
ORDER FROM: ASCE

**170790**
**CANADIAN AIR CUSHION VEHICLE LEGISLATION AND REGULATION**

This paper reviews Canadian experience in the legislation and regulation of air cushion vehicles. In particular, it discuss the work of the Canadian Federal Government Interdepartmental Committee on Air Cushion Legislation, the various recommendations made by this Committee with respect to registration, certification of vehicles, licensing of crew and maintenance engineers, economic licensing and others will be outlined. It also explains the type of detailed regulations which the writer believes are required to allow this new technology to develop without undue constraints and at the same time provide essential safeguards to the public. The paper considers the work of the Inter-Governmental Maritime Consultative Organization (IMCO) Working Group on dynamically supported craft. This Group was established with representation from the United Kingdom, United States, Canada, France, Union of the Soviet Socialist Republic, West Germany, Italy and Norway to consider safety requirements for operating high-speed marine craft such as air cushion vehicles and hydrofoils.

Proceedings of Second International Waterborne Transportation Conference, October 5-7, 1977, New York City. Available April, 1978, approximately 750 pages. Cost: To ASCE members $15.00; non-members $30.00.

Doherty, J (Transport Canada)
American Society of Civil Engineers Proceeding 1977

ACKNOWLEDGMENT: ASCE
ORDER FROM: ASCE

**170791**
**CONTAINER EXCHANGE-AN OPPORTUNITY UNREALIZED**

One of the most significant costs to the operator of a containerized freight service is that of container equipment rental--either explicitly via the medium of leasing companies, or implicitly as the cost of invested capital. If the cost of equipment rental can be reduced without an accompanying reduction in revenue, then the realized saving will go almost totally to profit. Such efficient utilization of equipment is the goal of what is generally called "equipment control", and entire departments and sophisticated computer systems have been devoted to it. Unfortunately, one of the most promising methods for increasing equipment utilization is not used. That method is the free exchange of equipment among owners. Such a system has been in use by the railroads for decades and there is no theoretical reason why such a system should not work for ocean carriers. To this date, it has not worked (in general) and the opportunity losses are enormous. This paper explores the reasons why no viable container exchange system has evolved. A design for a workable container exchange system, taking into account the previously stated objections, is presented.

Proceedings of Second International Waterborne Transportation Conference, October 5-7, 1977, New York City. Available April, 1978, approximately 750 pages. Cost: to ASCE members %15.00; non-members $30.00.

Levine, SP (Shipping Intelligence, Incorporated)
American Society of Civil Engineers Proceeding 1977

ACKNOWLEDGMENT: ASCE
ORDER FROM: ASCE

**170792**
**PRE-PAID FARE COLLECTION**

There are various means to collect revenues from users of transportation services. One of the most convenient and cost-effective manner is by

pre-collecting revenues. When revenues are pre-collected, there are several benefits to be gained. Quicker boarding and alighting times, reduced manpower costs to collect and count revenue, increased security and public convenience are several key benefits derived when pre-paid, self-service systems are implemented.

Proceedings of Second International Waterborne Transportation Conference, October 5-7, 1977, New York City. Available April, 1978, approximately 750 pages. Cost: to ASCE members $15.00; non-members $30.00.

Fischer, BE (Vapor Corporation)
American Society of Civil Engineers Proceeding 1977

ACKNOWLEDGMENT: ASCE
ORDER FROM: ASCE

**170793**
**RESULTS OF OPTIMUM SHIP ROUTING**

This paper introduces the topic of "Optimum Ship Routing" Services, provided for vessels engaged in Trans-Ocean Trades. It identifies the various goals of Ship Routing Services, outlines the World-Wide Data gathering Systems utilized, and indicates the various types of Service performed to aid Vessel Operating Companies achieve efficient results. A review of several case histories is accomplished to offer results of a "Safety Crossing", and "Least Time Transit, and "Economic Fuel Burn". Presentation of statistical results-of-service data are offered with a discussion of the economic benefits available to service subscribers.

Proceedings of Second International Waterborne Transportation Conference, October 5-7, 1977, New York City. Available April, 1978, approximately 750 pages. Cost: to ASCE members $15.00; non-members $30.00.

Raguso, RA (Bendix Corporation)
American Society of Civil Engineers Proceeding 1977

ACKNOWLEDGMENT: ASCE
ORDER FROM: ASCE

**170794**
**WATERBORNE TRANSPORTATION FOR RECREATION**

Waterborne transport is often environmentally preferable to other travel modes. Such systems are becoming necessary because use of surface transit, especially the private auto, is being discouraged in many seashore recreation areas including the Fire Island National Seashore. A recently completed transportation study of ferry transport to Fire Island from alternative embarkation points on Long Island is discussed. Three public recreation areas are to be developed on Fire Island for 5,000 daily visitors. Existing ferry service will be expanded requiring the acquisition of mainland property for visitor parking, reception facilities, and ferry loading docks. Several sites along the shoreline were identified and evaluated for possible use. The primary criteria in the final site selection were environmental suitability and public acceptance. Alternative vessel types were considered but environmental constraints suggested moderate-sized, slow-speed conventional hull crafts. Round-trip costs per passenger are estimated to be $1.60 to $3.75, depending on the route, for the most cost-effective system. The National Park Service is now finalizing the plan and will soon initiate its development.

Proceedings of Second International Waterborne Transportation Conference, October 5-7, 1977, New York City. Available April, 1978, approximately 750 pages. Cost: to ASCE members $15.00; non-members $30.00.

Monte, PC (Vollmer Associates)
American Society of Civil Engineers Proceeding 1977

ACKNOWLEDGMENT: ASCE
ORDER FROM: ASCE

**170795**
**PASSENGER FERRY TERMINALS ON SAN FRANCISCO BAY**

Three new passenger ferryboats are plying the waters of San Francisco Bay to provide high-speed commuter service between San Francisco and the north bay communities in Marin County. In addition, two new passenger ferry terminals have been developed and supplement an existing facility. This program by the Golden Gate Bridge, Highway and Transportation District was requested by the California State legislature to provide an integrated transit system in the Golden Gate Corridor to supplement the Golden Gate Bridge. The Larkspur Ferry Terminal Project in Central Marin County, consisted of dredging a two-mile navigation channel, construction of pile supported structures and vessel docking facilities, erection of an 18,000 square foot terminal space frame, and development of a 1,000 capacity parking lot. The San Francisco Ferry Terminal Project is presently under construction for downtown San Francisco, located adjacent to the historic Ferry Building, thus returning a portion of this structure to its original use. The District's third terminal facility is located in Sausalito in southern Marin County. Both new terminals are designed and constructed in conformance with regional environmental and conservation regulations, as well as for seismic and public safety provisions. As a mitigating measure for dredging the Larkspur navigation channel, various environmental and water quality agencies required that land disposal operations be utilized for portions of the spoils. In addition, a five-year marsh restoration program is underway to restore 125 acres of previously diked land to a tidal marsh condition.

Proceedings of Second International Waterborne Transportation Conference, October 5-7, 1977, New York City. Available April, 1978, approximately 750 pages. Cost: to ASCE members $15.00; non-members $30.00.

Rexrode, GP (San Francisco Highway & Transportation District)
American Society of Civil Engineers Proceeding 1977

ACKNOWLEDGMENT: ASCE
ORDER FROM: ASCE

**170798**
**THE SEMI-SUBMERGED AIR CUSHION VEHICLE (SSACV)**

The essential characterisitcs of the Semi-Submerged Air Cushion Vehicle (SSACV) concept are first explained. This concept relies on the optimal division of the total sustention of a marine vehicle above the water surface into the aerostatic lift of the air cushion and the hydrostatic buoyancy of the submerged hulls, thus hopefully combining the high speed capability of the air cushion vehicle with the inherent stability and course keeping ability of the semi-submerged ship. The SSACV Straddle Cargo Transporter is a particular application of the SSACV concept enabling the rapid transport of marine cargo and other stores and equipment in inshore waters. It involves the direct picking up of floating loads (of loads carried by low floating vehicles), their rapid transport in the underslung position and setting down without the use of cranes, helicopters or other expensive equipment. This type of vehicle can provide a fast feeder service for LASH barges and act as an efficient supply vessel for the offshore oil industry. The SSACV Oil Skimmer has the speed capability to hasten from base to the scene of an oil spill much faster than conventional displacement vessels. It is specially equipped for the skimming of the oil by adopting two distinct procedures, both making use of the air cushion system, which is an integral part of the vessel. Some details are given of the proposal of the CANAL SSACV submitted to the authorities in Venice in 1975 for the improvement of passenger transport operations in the lagoon of Venice without further detriment to the ecology. Brief details are also given of the new concept of the SSACV Ice-Breaking LNG/Oil Tanker.

Proceedings of Second International Waterborne Conference, October 5-7, 1977, New York City. Available April, 1978. approximately 750 pages. Cost: to ASCE members $15.00; Non-members $30.00.

Murthy, KS
American Society of Civil Engineers Proceeding 1977

ACKNOWLEDGMENT: ASCE
ORDER FROM: ASCE

**170799**
**PORT DEVELOPMENT PLANNING IN THE NEW YORK METROPOLITAN AREA**

This paper reviews the current status of port development planning in the New York Metropolitan Area, with particular emphasis on the work underway to assure that the Port of New York can complete effectively with other major ports in the nation. The paper discusses trends in larger vessels, particularly containerships and supertankers, and the changing channel and terminal facility requirements developing therefrom. The status of the U.S. Coast Guard program for establishing a Harbor Vessel Traffic Service is reviewed. The paper also reviews the potential in the bi-State Port of New York for significant waterfront redevelopment, including a number of environmental considerations, as related particularly to coastal zone requirements. The paper also stresses the intermodal aspects of port activities, including ongoing plans for improved truck and rail access to serve port facilities, and the continuing need to develop fully competitive rail freight service in the Port. Finally, the economic importance of port activity is stressed in terms of jobs, payroll, industrial development potential and the like.

Proceedings of Second Internatioal Waterborne Transportation Conference, October 5-7, 1977, New York City. Available April, 1978, approximately 750 pages. Cost: to ASCE members $15.00; non-members $30.00.

Olcott, ES (Port Authority of New York and New Jersey)
American Society of Civil Engineers Proceeding 1977

ACKNOWLEDGMENT: ASCE
ORDER FROM: ASCE

170800
**SES PROGRAMS, CIVILIAN APPLICATION**
Waterborne transportation has long played an important role in the United States. It has not, however, taken advantage of technical advancements achieved in the past 20 years in the development of amphibious air cushion vehicles (ACV) and surface effect ships (SES). These craft employ the air cushion principle where a volume of pressurized air is contained beneath the structure of a craft and the water surface thereby reducing resistance, improving ride quality and passenger comfort, and enabling higher speed. The amphibious fully-skirted air cushion vehicles have evolved in both England and the United States. The United States, however, has clearly led in the development of the partially-skirted, solid-sidewall surface effect ship, primarily oriented to military requirements. This paper examines the implications of this type vessel for civil applications. The fundamental characteristics of SESs are examined in comparison to planing hulls and hydrofoils. Those characteristics of the SES that should be of interest to owners and operators are reviewed and commented upon. Specific performance capabilities of SES boats of 65, 85, 110, and 133 feet are presented, as well as discussions regarding the associated machinery. Fundamental information regarding hull material selection for SESs is also presented.

Proceedings of Second International Waterborne Transportation Conference, October 5-7, 1977, New York City. Available April, 1978, approximately 750 pages. Cost: to ASCE members $15.00; non-members $30.00. Also available from NTIS, PB-273672/6ST.

Kelly, JJ (Bell-Halter)
American Society of Civil Engineers Proceeding 1977

ACKNOWLEDGMENT: ASCE
ORDER FROM: ASCE

170801
**SCR CONTROLLED ELECTRICAL PROPULSION**
Briefly explains an SCR (Silicon Control Rectifier) as it specifically applies to vehicular and passenger ferries, pointing out such advantages as: (a) Increased fuel economy--engines are allowed to run at their peak efficiency. (b) Greatly increased maneuverability--quicker, more finite control of propulsion. (c) Increased engine life--engines run at constant speed and never overload. (d) Quieter operation--engines are acoustically isolated from the vessel's structure. (e) Elimination of vessel downtime due to main engine failure. (f) Multiple vessel function--the vast amount of electricity available onboard can supply large pumps to fight harbor fires or even a small city during a catastrophe. (g) Less pollution--electric power is constant--increased diesel engine efficiency results in less lube oil and fuel oil "blow-by" from the exhaust.

Proceedings of Second International Waterborne Transportation Conference, October 5-7, 1977, New York City. Available April, 1978, approximately 750 pages. Cost: to ASCE members $15.00; non-members $30.00.

O'Brein, H (Halter Marine Service, Incorporated)
American Society of Civil Engineers Proceeding 1977

ACKNOWLEDGMENT: ASCE
ORDER FROM: ASCE

170802
**ECONOMIC IMPACT OF WATERBORNE TRANSPORTATION OF THE PORT OF BALTIMORE ON THE STATE OF MARYLAND**
This paper examines several concepts that should allow port planners to conduct economic impact studies for their respective port areas. Economic impact studies are useful to aid public bodies in investment decisions. That is to say, help them decide how best to allocate scarce resources in the public investment decisions since various types of cargoes are competing for scare space and investment dollars. Economic development has been related to the development of waterborne commerce. This snapshot approach gives the planner a data base from which to project economic development impacts of future investment decisions. This paper examines the types of imports (direct and indirect), as well as primary and induced imports. It further looks at the various types of imports and their measurement.

Proceedings of Second International Waterborne Transportation Conference, October 5-7, 1977, New York City. Available April, 1978, approximately 750 pages. Cost: to ASCE members $15.00; non-members $30.00.
Hills, SJ (Alabama University, Birmingham)
American Society of Civil Engineers Proceeding 1977

ACKNOWLEDGMENT: ASCE
ORDER FROM: ASCE

170803
**PORT DEVELOPMENT**
Recent developments in port and shipping technology are discussed and modern approaches to port planning for effective port development are reviewed. Methods of fore-casting demand in intermodal goods movements, including distribution network demand, are evaluated. Port planning is considered as an integral part of urban and regional transport planning with due consideration to the environmental and economic impact of port development on its hinterland. Various ways of quantifying these impacts are discussed and typical benefit/cost analysis will be proposed. Next we will discuss the conversion of port planning to port developments. Port sites, layouts and facility alternatives evaluation and trade off is structural and a method for selection of a preferred port development plan is suggested. Finally, port and terminal configurations under various urban environments are studied and the relation of modern intermodal terminal port and the urban system established.

Proceedings of Second International Waterborne Transportation Conference, October 5-7, 1977, New York City. Available April, 1978, approximately 750 pages. Cost: to ASCE members $15.00; non-mebers $30.00.

Frankel, EG (Massachusetts Institute of Technology)
American Society of Civil Engineers Proceeding 1977

ACKNOWLEDGMENT: ASCE
ORDER FROM: ASCE

170804
**FINANCIAL NEEDS OF THE U.S. INLAND WATERWAYS SYSTEM: PROSPECTS AND PROFILE**
The inland waterways system is largely in place. Therefore, major future needs involve construction and maintenance of certain individual projects to eliminate bottlenecks and provide more uniform capacity within major elements of the system. The American Transportation Advisory Council (ATAC) estimates that these construction costs are to be approximately $480 million/yr. during the time period 1977-1986. The Council further estimates that maintenance and operation costs will average about $420 million/yr. during the same period of time. In an attempt to address these financial needs in a timely fashion the paper covers the issues from an umbrella approach and correlates the assessment with the findings obtained from having made contact with twelve transportation lines (barge, tow, and shipping) extending from Minneapolis, Minnesota to Cape Girardeau, Missouri.

Proceedings of Second International Waterborne Transportation Conference, October 5-7, 1977, New York City. Available April, 1978, approximately 750 pages. Cost: to ASCE members $15.00; non-members $30.00.

Roy, LA
American Society of Civil Engineers Proceeding 1977

ACKNOWLEDGMENT: ASCE
ORDER FROM: ASCE

170805
**A TOTAL SYSTEMS APPROACH TO REVENUE CONTROL FOR THE STATEN ISLAND FERRY SYSTEM**
The Implementation of Computerized Revenue Control for the Staten Island Ferry System will be discussed in two phases: 1) Why it is an idea whose time has come. 2) Designing the System, and the impact of the Microcomputer. Phase 1 discusses the economic savings that could be realized through Computerized Revenue Control, as well as acquiring a valuable tool for closing the loop around the system itself, and using it to improve the efficiency of the Total Operation. Phase 2 looks at a model of the system, and the unique problems of each of its components and how the component problems are solved using state of the art technology (i.e. microcomputers, etc.) Finally all of the components are tied together into a system that performs Control and Reporting Functions in Real Time tied into a Central Computer.

Proceedings of Second International Waterborne Transportation Conference, October 5-7, 1977, New York City. Available April, 1978, approximately 750 pages. Cost: to ASCE members $15.00; non-mebmers $30.00.

Hass, H (Applied Fluidics, Incorporated)
American Society of Civil Engineers Proceeding 1977

ACKNOWLEDGMENT: ASCE
ORDER FROM: ASCE

**170806**
**FACILITY PLANNING AND DEVELOPMENT-MID AMERICAN PORTS STUDY**

The Mid America Ports Study is a 16-month research and development effort to study the port facilities and waterborne commodity flows of 17 states in the Mississippi River Basin and the Gulf Coast area. The overall objectives of this study are to: identify and assess conditions, problems and needs associated with the development of approximately 15,000 miles of water-ways comprising the inland river port system; recommend solutions to river port and related problems; and formulate policies, programs, general plans, and specific recommendations for federal, state and local governmental action. This planning effort is unique in as much as it will evaluate, in a comprehensive fashion, the port facility needs and other modal considerations for an area comprising approximately one-third the U.S. land mass. This paper addresses that portion of the study dealing with port facility needs and development. The procedure employed in developing the MarAd computerized inventory of approximately 2,000 port facilities are described, along with the field techniques used in site visits to about 150 facilities in 17 states. The data contained in the facility inventory, supplemented by operational data (i.e. gang size, hours worked) obtained during the field visits through an "Operations Survey Questionnaire", will be used to estimate the existing capacity of the port system to handle, separately, 20 different commodity groupings. Toward this end, computer programs containing the key parameters and logic for estimating port commodity capacity are being prepared. A primary objective of these efforts has been to design a methodology and system which can handle a large data base for forecasting and subsequent updating purposes.

Proceedings of Second International Waterborne Transportation Conference, October 5-7, 1977, New York City. Available April, 1978, approximately 750 pages. Cost: to ASCE members $15.00; non-members $30.00.

Carman, J (Maritime Administration); Rosselli, AT Miller, ML Van Cook, CF Hupp, RC
American Society of Civil Engineers Proceeding 1977

ACKNOWLEDGMENT: ASCE
ORDER FROM: ASCE

**170807**
**INTEGRATED SMALL PORT PLANNING**

The study and preparation of the Long-Range Development Plan for the Port of Longview, Washington was determined as a necessity to insure that the port continued to serve the Longview area as a marine port and maintain a competitive position in the pacific coast trade. Recent changes in the flow of cargo over the port docks with a resultant reduction in revenue coupled with a need to evaluate changes in port and shipping technology stimulated the decision for this analysis. The study team was organized using the multidiscipline concept for the following major areas of expertise participating; civil engineering, international trade and economics, land use planning, and port facilities planning. The key to the development plan was careful integration of the analysis and information developed by each one of the above expertise in providing a program that included a capital improvement plan, a trade development plan, financial plan and an organizational plan. The key concerns in the analysis was the evaluation of facilities and cargo handling equipment to respond to the demands of trade and future technology. It was also necessary to evaluate the land requirements for the port, including best utilization of existing ownership requirements as well as possible expansion areas.

Proceedings of Second International Waterborne Transportation Conference, October 5-7, 1977, New York City. Available April, 1978, approximately 750 pages. Cost: to ASCE members $15.00; non-members $30.00.

Bell, TT
American Society of Civil Engineers Proceeding 1977

ACKNOWLEDGMENT: ASCE
ORDER FROM: ASCE

**170808**
**LINER SERVICE IN A CHANGING MARKET STRUCTURE**

The planning of marketing programs for international ocean carrier service has traditionally been of the most complex and dynamic of any industry. However, the current market environment for these carriers has seen evidence of substantial institutional and technological changes which may well change the focus of marketing efforts in the years to come. The list of such changes is considerable, and the purpose of this paper is to identify the more crucial issues and to examine their implications for market plans by carrier. The paper examines the traditional focus and role of market planning and programs for international carriers and its relationship to modern market methodology. Those issues which are examined deal with the changing competitive situation, particularly the entrance of Russian and developing country fleets in the liner trades, the establishment of cargo preference laws by many countries, and the changing technological service available such as the mini-land bridge.

Proceedings of Second International Waterborne Transportation Conference, October 5-7, 1977, New York City. Available April, 1978, approximately 750 pages. Cost: to ASCE members $15.00; non-members $30.00.

Dicer, GN (Tennessee University, Knoxville)
American Society of Civil Engineers Proceeding 1977

ACKNOWLEDGMENT: ASCE
ORDER FROM: ASCE

**172378**
**INTRODUCING P & O'S JETFOIL SERVICE**

On June 1, 1977 P & O introduced Europe's first Boeing Jetfoil service, chartering Flying Princess for a period of trial on the London-Zeebrugge daily return service. The author, General Manager of P & O Jet Ferries, explains some of the problems encountered, and the differences between a Jetfoil and a conventional ferry operation.

Coster, M (P & O Jet Ferries) *Hovering Craft and Hydrofoil* Vol. 17 No. 1, Oct. 1977, pp 24-28

ACKNOWLEDGMENT: Hovering Craft and Hydrofoil
ORDER FROM: Kalerghi Publications, 51 Welbeck Street, London W1, England

**172382**
**MARGINAL COST PRICING OF FERRY TRANSPORTATION: A PRACTICAL APPLICATION**

In this paper, in wich the author attempts to redress the lack of attention by economists to ferry operation, a simple pricing model, based on marginal cost pricing, is developed.

Roueche, LR (British Columbia Ferry Corporation, Canada) *Maritime Policy and Management* Vol. 5 No. 1, Jan. 1978, pp 19-29

ACKNOWLEDGMENT: Maritime Policy and Management
ORDER FROM: Taylor and Francis Limited, P.O. Box 9137, Church Street Station, New York, New York, 10049

**172391**
**THE DESIGN OF THE JETFOIL**

The design of a hydrofoil is a combination of two widely different technologies. The hull of course must be seaworthy in any sea conditions expected to be encountered. The foil system and the controls must be capable of raising that hull above the water level and maintaining a safe, stable and comfortable ride. Added to the foregoing challenges, the Jetfoil designer selected a number of additional requirements which needed to be satisfied to provide the kind of a boat that was felt to be necessary at this time. These requirements were numerous, but among the more important were the following three considerations. First, a concept that the Jetfoil should be a vehicle which would provide the kind of a ride the hydrofoil basically is intended to provide in ocean waters. Second, it should avoid the conventional power-driven propulsion system with the attendant difficulties which would be encountered on a boat designed to endure ocean surface conditions. As a third consideration it would be necessary to provide a boat that would be very versatile in passenger carrying arrangements so that a varied number of passengers could be accommodated in various types of seating arrangements. The article reviews the structural design and development of the hull, struts and foils, propulsion system, automatic control system, outfitting and furnishings and finally the classification and certification.

Jones, DC Kenny, LD (Boeing Marine Systems) *Hovering Craft and Hydrofoil* Vol. 17 No. 1, Oct. 1977, pp 38-44

ACKNOWLEDGMENT: Hovering Craft and Hydrofoil
ORDER FROM: Kalerghi Publications, 51 Welbeck Street, London W1, England

172392
**PHM/JETFOIL RELIABILITY AND SERVICE EXPERIENCE**
Jetfoil and PHM are two hydrofoil vessels designed and built in generally the same time frame. One was designed as a commercial passenger-carrying vessel; the other, of twice the displacement, a missile-carrying patrol craft. Both models have acquired a substantial amount of operational experience. This paper reviews similarities and differences in the evolution of these two vessels from a reliability/maintainability viewpoint. Jetfoil was designed to American Bureau of Shipping (ABS), U.S. Coast Guard, and Hong Kong authority requirements. PHM is a joint Boeing/U.S. Navy design based upon a Memorandum of Understanding among three NATO nations. Examples of similarity and differences in design and operation experience are described in this paper. For example, failure mode analyses and tests for the fully submerged hydrofoil automatic control system were similar for both models. The same fix was successful in correcting initial operational problems with that system's height sensor in both models. Each of the designs used a different approach for the vessel's seawater system and different problems were encountered.

Griswold, JW (Boeing Marine Systems) *Hovering Craft and Hydrofoil* Vol. 17 No. 1, Oct. 1977, pp 45-52, 10 Ref.

ACKNOWLEDGMENT: Hovering Craft and Hydrofoil
ORDER FROM: Kalerghi Publications, 51 Welbeck Street, London W1, England

172577
**BOEING JETFOIL**
The JETFOIL is an advanced design high speed hydrofoil that was developed to provide competitive commercial transport on either protected or open ocean water routes. Presently in service on the waters of four continents, the JETFOILS have carried 2-1/2 million passengers 120 million passenger miles since they began operation in April 1975. The wide body comfort and smooth ride have generated great passenger appeal and load factors have continued to rise. This passenger appeal, ability to go in all kinds of seas and weather, combined with a fast ride, are offered by no other competitive craft.

Shultz, WM
Boeing Company 1977, 13 pp

ACKNOWLEDGMENT: Boeing Marine Systems
ORDER FROM: Boeing Company, Boeing Marine Systems, P.O. Box 3707, Seattle, Washington, 98124

# Source Index


A

**AIAA/SNAME ADVANCED MARINE VEHICLES CONFERENCE** 1290 Avenue of the Americas; New York, New York, 10019
054229, 054231, 054238, 054293

**ALASKA REVUE OF BUSINESS AND ECONOMIC CONDITIONS** Alaska University; Institute of Social, Economic and Government Research; College, Alaska, 99701
057979

**AMERICAN INSTITUTE OF AERONAUTICS AND ASTRONAUTICS** 1290 Avenue of the Americas; New York, New York, 10019
035176

**AMERICAN SOCIETY OF CIVIL ENGINEERS** 345 East 47th Street; New York, New York, 10017
170259, 170261, 170262, 170263, 170264, 170265, 170266, 170267, 170268, 170269, 170270, 170271, 170272, 170273, 170274, 170275, 170276, 170277, 170278, 170786, 170787, 170788, 170789, 170790, 170791, 170792, 170793, 170794, 170795, 170798, 170799, 170800, 170801, 170802, 170803, 170804, 170805, 170806, 170807, 170808

**AMERICAN SOCIETY OF CIVIL ENGINEERS JOURNAL** American Society of Civil Engineers; New York, New York, 10017
014891

**AMERICAN WATERWAYS OPERATORS** Suite 502, 1250 Connecticut Avenue, NW; Washington, D.C., 20036
035111

**AMERICAN WATERWAYS OPERATORS** 1600 Wilson Boulevard, Suite 1101; Arlington, Virginia, 22209
157878

**ARINC RESEARCH CORPORATION** 2251 Riva Road; Annapolis, Maryland, 21401
071718

**ARMY ENGINEER WATERWAYS EXPERIMENT STATION** Vicksburg, Mississippi
024765

**ASCE JOURNAL OF THE HYDRAULICS DIVISION** American Society of Civil Engineers; 345 East 47th Street; New York, New York, 10017
051721

**ASCE JOURNAL OF WATERWAYS AND HARBORS DIVISION** American Society of Civil Engineers; 345 East 47th Street; New York, New York, 10017
015184

**ASCE JOURNAL OF WATERWAYS, HARBORS & COAST ENG DIV** American Society of Civil Engineers; 345 East 47th Street; New York, New York, 10017
048117, 156537

**AVIATION WEEK AND SPACE TECHNOLOGY** McGraw-Hill, Incorporated; 1221 Avenue of the Americas; New York, New York, 10020
148836

B

**BATTELLE MEMORIAL INSTITUTE** 505 King Avenue; Columbus, Ohio, 43201
041269

**BOEING COMPANY** Boeing Marine Systems, P.O. Box 3707; Seattle, Washington, 98124
172577

**BOEING COMPANY** Naval Systems Division; Seattle, Washington, 98124
046575

C

**CALIFORNIA INSTITUTE OF TECHNOLOGY** Pasadena, California
048078

**CANADIAN SHIPPING AND MARINE ENGINEERING** Maclean-Hunter Limited; 481 University Avenue; Toronto, Ontario M5W 1A7, Canada
152882

**CHARLES RIVER ASSOCIATES INCORPORATED** 16 Garden Street; Cambridge, Massachusetts, 02138
019676

**COLD REGIONS RESEARCH AND ENGINEERING LABORATORY** United States Army; Hanover, New Hampshire, 03755
051697

**COLLINS RADIO COMPANY** 5225 C Avenue, NE; Cedar Rapids, Iowa, 52406
071715

**CONSORTIUM OF UNIVERSITIES** Urban Transportation Center, 1717 Massachusetts Avenue, NW; Washington, D.C., 20036
057978

**CONSULTEC INCORPORATED** 2351 Research Boulevard; Rockville, Maryland, 20850
019167

**COUNCIL OF PLANNING LIBRARIANS** P.O. Box 229; Monticello, Illinois, 61856
156917

D

**DAVID TAYLOR NAVAL SHIP R&D CENTER** Ship Performance Department; Bethesda, Maryland, 20084
128968, 154904

**DAVID TAYLOR NAVAL SHIP R&D CENTER** System Development Department; Bethesda, Maryland, 20084
149738

**DELAWARE UNIVERSITY, NEWARK** College of Marine Studies; Newark, Delaware
128822
**DIESEL AND GAS TURBINE PROGRESS** 11225 West Bluemound Road, Box 7406; Milwaukee, Wisconsin, 53213
054150

E

**ENGINEERING** Design Council; 28 Haymarket; London SW1Y 4SU, England
131501
**ENGINEERING** Engineering, Chemical and Marine Press Limited; 33-39 Bowling Green Lane; London EC1P 1AH, England
043971

F

**FEDERAL HIGHWAY ADMINISTRATION** 400 7th Street, SW; Washington, D.C., 20590
167335
**FRANKLIN INSTITUTE RESEARCH LABORATORIES** Philadelphia, Pennsylvania
019391

G

**GAS TURBINE WORLD** P.O. Box 494; Southport, Connecticut, 06490
097520
**GIDROMEKHANIKA** USSR
015387

H

**HARRIS (FREDERIC R), INCORPORATED** 300 East 42nd Street; New York, New York, 10017
165464
**HIGH SPEED GROUND TRANSPORTATION JOURNAL** Planning-Transport Associates, Incorporated; Box 4824, Duke Station; Durham, North Carolina, 27706
057980
**HOVERCRAFT WORLD** Air Age Publications, Ltd; 1 Temple Chambers, Temple Avenue; London EC4, England
019609
**HOVERING CRAFT AND HYDROFOIL** Kalerghi Publications; 51 Welbeck Street; London W1, England
032649, 043973, 046571, 050287, 052058, 126008, 152481, 172378, 172391, 172392
**HOVERING CRAFT AND HYDROFOIL** Kalerghi Publications, Inc.; 51 Welbeck Street; London W1, England
019239, 019530
**HOVERPROJECTS LIMITED** Bowering Building, Tower Place; London EC3, England
048108

**HYDRONAUTICS, INCORPORATED** Pindel School Road; Laurel, Maryland, 20810
048065, 001945

I

**ILLUMINATING ENGINEERING SOCIETY, JOURNAL OF** Illuminating Engineering Society; 345 East 47th Street; New York, New York, 10017
057467
**INSTITUTE OF NAVIGATION** 815 15th Street, NW; Washington, D.C., 20005
084565
**INTERPLAN CORPORATION**
048109
**INTERSTATE COMMERCE COMMISSION** 1112 ICC Building; Washington, D.C., 20423
157882

J

**JOURNAL OF SOUND AND VIBRATION** Academic Press Incorporated; Berkeley Square House, Berkeley Square; London SW1, England
028926
**JOURNAL OF SOUND AND VIBRATION** Academic Press Incorporated; 24-28 Oval Road; London NW1, England
034915, 028926
**JOURNAL OF TRANSPORT ECONOMICS AND POLICY** London School of Economics and Political Science; Houghton Street, Aldwych; London WC2A 2AE, England
039894

K

**KALERGHI PUBLICATIONS** 51 Welbeck Street; London W1, England
135844, 135848, 135850, 135851, 135856
**KEARNEY (AT) AND COMPANY INCORPORATED** 100 South Wacker Drive; Chicago, Illinois, 60606
056741

L

**LITTLE (ARTHUR D), INCORPORATED** 25 Acorn Park; Cambridge, Massachusetts, 02140
095115

M

**MACHINE DESIGN** Penton Publishing Company; Penton Building; Cleveland, Ohio, 44113
050953
**MANAGEMENT ADVISOR** American Institute of Certified Public Accountants; 666 5th Avenue; New York, New York, 10019
050318
**MARINE ENGINEERING/LOG** Simmons-Boardman Publishing Corporation; P.O. Box 350; Bristol, Connecticut, 06010
099945
**MARINE TECHNOLOGY** 74 Trinity Place; New York, New York, 10006
007493, 012006
**MARINE TECHNOLOGY SOCIETY** 1730 M Street, NW; Washington, D.C., 20036
035975, 052026, 052027, 052028
**MARITIME ADMINISTRATION** Department of Commerce; Washington, D.C., 20230
041503
**MARITIME ADMINISTRATION** Office of Maritime Manpower; Washington, D.C., 20230
084430
**MARITIME POLICY AND MANAGEMENT** Taylor and Francis Limited; 10-14 Macklin Street; London WC2B 5NF, England
172382
**MASSACHUSETTS INSTITUTE OF TECHNOLOGY** Department of Ocean Engineering; Cambridge, Massachusetts, 02139
050903, 057108
**MECHANICAL ENGINEERING PUBLICATIONS LIMITED** New York, New York
149750
**MINNESOTA UNIVERSITY, MINNEAPOLIS** Water Resources Research Center; Minneapolis, Minnesota, 55455
090699
**MOTOR SHIP** Engineering, Chemical and Marine Press Limited; 33-39 Bowling Green Lane; London EC1P 1AH, England
015199

N

**NATIONAL ACADEMY OF SCIENCES-NATL RESEARCH COUNCIL** 2101 Constitution Avenue, NW; Washington, D.C., 20418
130992
**NATIONAL BUREAU OF STANDARDS** 14th Between E Street and Constitution Avenue, NW; Washington, D.C., 20231
019258
**NATIONAL TRANSPORTATION SAFETY BOARD** Department of Transportation; Washington, D.C., 20591
034661
**NATIONAL WATER COMMISSION** 800 North Quincy Street; Arlington, Virginia, 22203
048122
**NAVAL ARCHITECT** Royal Institution of Naval Architects; 10 Upper Belgrave Street; London SW1X 8BQ
097523
**NORTHWESTERN UNIVERSITY** Econometrics Center; Chicago, Illinois
015267, 015268, 015269
**NORTHWESTERN UNIVERSITY, EVANSTON** Transportation Center; Evanston, Illinois, 60201
051235

O

**OFFICE OF NAVAL RESEARCH** 800 North Quincy Street; Arlington, Virginia, 22217
084813
**OFFICE OF SYSTEMS ANALYSIS AND INFORMATION** Department of Transportation; Washington, D.C.
046116
**OFFICE OF WATER RESEARCH AND TECHNOLOGY** Washington, D.C.
090699

**OPERATIONS RESEARCH, INCORPORATED** 1400 Spring Street; Silver Spring, Maryland, 20910
084813

## R

**RADIO TECHNICAL COMMISSION FOR MARINE SERVICES** P.O. Box 19087; Washington, D.C., 20036
033705, 127028, 127029, 127035
**RCA GOVERNMENT AND COMMERCIAL SYSTEMS** Camden, New Jersey
053914
**RECHNOY TRANSPORT** Osipenko 73; Moscow Zh-127, USSR
007580
**ROYAL INSTITUTION OF NAVAL ARCHITECTS** 10 Upper Belgrave Street; London SW1, England
015035

## S

**SEEWIRTSCHAFT** VEB Verlag Technik; Oranienburger Strasse 13-14; 102 Berlin, East Germany
163437
**SHIPBUILDING AND SHIPPING RECORD** Transport and Technical Publications Limited; 161-166 Fleet Street; London EC4, England
015455
**SHIPPING WORLD AND SHIPBUILDER** Benn Brothers Marine Publications Limited; Lyon Tower, 125 High Street, Colliers Wood; London SW19, England
003142
**SOCIETY OF AUTOMOTIVE ENGINEERS** 2 Pennsylvania Plaza; New York, New York, 10001
057788
**SOCIETY OF NAVAL ARCHITECTS AND MARINE ENGINEERS** One World Trade Center, Suite 1369; New York, New York, 10048
028633, 039326, 054080, 054083, 095333, 095347, 127057, 127058, 127560, 148859, 150418, 157869

**SOUTHERN ILLINOIS UNIVERSITY** Carbondale, Illinois
015004
**STANFORD RESEARCH INSTITUTE** Menlo Park, California
026416
**SUDOSTROYENIYE** Leningrad, USSR
014924
**SUMITOMO TECHNICAL REVIEW** Sumitomo Shipbuilding and Machinery Company, Ltd; 2-2-1, Ohtemachi, Chiyodaku, New Ohtemachi Building; Tokyo, Japan
084482

## T

**TEXAS A&M UNIVERSITY** College Station, Texas, 77843
041545
**TEXAS A&M UNIVERSITY** Sea Grant Program, Center for Marine Resources; College Station, Texas, 77843
097502
**TRACOR, INCORPORATED** 6500 Tracor Lane; Austin, Texas, 78721
053915
**TRANSPORT DEVELOPMENT NEWS** Transportation Development Agency; 1000 Sherbrooke Street, West; Montreal, Quebec H3A 2R3, Canada
142633
**TRANSPORTATION RESEARCH RECORD** Transportation Research Board; 2101 Constitution Avenue, NW; Washington, D.C., 20418
128785, 128791, 128792, 130525
**TRANSPORTATION SYSTEMS CENTER** 55 Broadway; Cambridge, Massachusetts, 02142
157880
**TRUDY LENINGRADSKIY INSTITUTA VODNOGO TRANSPORTA** Leningrad, USSR
014617

## U

**UNITED STATES COAST GUARD** New London, Connecticut
015500
**UNITED STATES COAST GUARD** Research and Development Center; Groton, Connecticut
131093
**UNITED STATES GENERAL ACCOUNTING OFFICE** 441 G Street, NW, Room 4522; Washington, D.C., 20548
129696
**UPPER MISSISSIPPI WATERWAY ASSOCIATION** P.O. Box 3032; Saint Paul, Minnesota, 55165
130524

## W

**WASHINGTON STATE DEPARTMENT OF HIGHWAYS** 1A23 Highway Administration Building; Olympia, Washington, 98504
167335
**WASHINGTON UNIVERSITY, SEATTLE** Department of Civil Engineering; Seattle, Washington, 98195
167335
**WATERWAYS EXPERIMENT STATION** Army Corps of Engineers; Vicksburg, Mississippi, 39180
126370
**WELDING DESIGN AND FABRICATION** Industrial Publishing Company; Division of Pittway Corporation, 614 Superior Avenue, West
084889
**WORLD DREDGING CONFERENCE, PROCEEDINGS OF** World Dredging Association; P.O. Box 269; San Pedro, California, 90733
057796
**WYOMING UNIVERSITY** Laramie, Wyoming
034732

# Author and Investigator Index


ACOSTA, AJ
048078
ALLEN, WB
015267, 015268, 015269
ALTMANN, R
048065
ANDERTON, D
034915
ANKLAM, FM
024765
ARONSON, RB
050953
ASHTON, GD
051697

B

BAER, FS
170261
BAKER, TM
050903
BALTZER, OJ
053915
BANGS, S
084889
BARHAM, HL
152481
BARKER, JE
135851
BARR, RA
001945
BAUMAN, RA
170787

BECKER, PR
128792
BEKKER, MG
048109
BELL, TT
170807
BERGELIN, VJ
170269
BEUTHE, MV
015267, 015268, 015269
BIERMAN, DE
051235
BINGHAM, AF
135848
BIRD, H
097523
BLOOD, DM
034732
BOYLE, ET
050318
BRENNAN, AJ
148859
BROEMSER, GM
128785
BROWDER, J
053914
BROWNE, DW
167335
BROWNE, RP
097523
BUCKLE, AK
043973
BURROUGHS, JD
148859

C

CAMPBELL, EW
170265
CAMPBELL, TS
048109
CAPPEL, K
019391
CARMAN, J
170262, 170806
CARROLL, JL
054080
CASE, JN
170267
CASE, LS
039894
CHALLIS, H
131501
CHEANEY, ES
041269
CHERNYSH, AF
015387
CHRISTIANSON, RW
090699
CLARK, DJ
054293
CLEJAN, D
057980
COFFEY, CS
046575
COLLERAN, RJ
170264
COLQUHOUN, LR
015455, 054238
COLVER, H
019609
COOK, FGR
015035
COSTER, M
172378
COURTSAL, DP
028633, 127058
COX, AE
170266
CREELMAN, WA
012006
CSAKY, T
154904
CURTIS, C
019609
CURTIS, F
170786

D

DAGGETT, LL
126370
DARLAND, SA
170278
DAVISON, EF
170277
DE NEUFVILLE, R
048117
DEDICH, J
071715
DEMENTYEV, VA
014924
DEN HARTOG, SL
051697
DICER, GN
170808
DOHERTY, J
170790
DRABIK, A
035975

E

EGGINGTON, WJ
127560
ELLSWORTH, WM
170271

F

FABBIOLI, L
053914
FABER, E
019239
FEIGLESON, HA
127029
FERGUSON, JF
167335
FISCHER, BE
170792
FOSTER, MI
170273
FOX, T
170268
FRANKEL, EG
170803
FRASER, EC
053915
FRODSHAM, RD
043971
FRYE, E
071715
FUNGE, WJ
170264

G

GAUM, CH
014891
GAY, WF
157880
GLIDDEN, HR
057978
GONNELLA, AM
046571

GOODWIN, WA
170263
GORNSTEIN, RJ
046575
GRAY, CH
033705
GRECO, JR
035176
GRISWOLD, JW
172392
GUNDLACH, JO
127057

H

HALL, J
053914
HAMILTON, FM
131093
HANAMOTO, B
051697
HANEY, DG
026416
HARGROVE, JQ
052027
HARRIS, DP
053915
HARRISON, J
024765
HASS, H
170805
HEIN, D
163437
HELLER, SR
054293
HENDRIX, FL
170789
HENNEMAN, SS
048109
HILLS, SJ
170802
HOBSON, AF
127035
HOFFMEISTER, JF, III
048117
HOLMBOE, EL
084813
HOOK, C
170259
HOUGLAND, RW
130524
HOWARD, LS
150418
HUDGINS, HH
131093
HUFSCHMID, A
048109
HUPP, RC
170806

J

JACOBSON, IB
015500
JELLINEK, E
053914
JEWELL, DA
054229
JOHNSON, RW
127028
JONES, DC
172391
JOPLIN, AF
170788
JORDAN, RH
019258

K

KAPALOV, DD
014617
KARAFIATH, G
154904
KELLY, JJ
170800
KENNY, LD
172391
KENT, TA
015184
KOBITZ, N
127560
KOCH, DA
128791
KOLB, WM
127029
KOWLESKI, SM
170276
KRANTZ, R
054150
KRZYCZKOWSKI, R
048109
KYLE, B
054083

L

LAIN, HW
048065
LAMBERT, JW
130524
LAMKIN, JT
041545
LANDREMAN, DM
041269
LAUBENGAYER, W
071715
LAVE, LB
039894
LAVE, LB
015267, 015268, 015269
LEIS, RD
041269
LELLILID, S
167335
LEVINE, SP
170791
LEVINSON, M
053914
LIEB, RC
046116
LOVESEY, EJ
028926
LOWERY, WR
041545
LUCAS, MA
052028
LUCIANO, PJ
084430

M

MAGNUSON, AH
128968
MANTLE, PJ
149738
MCCARLEY, RW
126370
MCLAUGHLIN, R
071715
MCPHERSON, RN
057108
MILLAN, HE, JR
084565
MILLER, EJ
048065
MILLER, ER
001945
MILLER, ER, JR
007493
MILLER, ML
170262, 170806
MILOY, J
097502
MONTE, PC
170794
MOSES, LN
015267, 015268, 015269
MURTHY, KS
170798
MURTHY, TKS
019530

N

NEUYMIN, YG
014617

O

O'BREIN, H
170801
OLCOTT, ES
170799

P

PARRISH, KB
167335
PERELMAN, BS
014924
PETERSON, RA
050287
PHILLIPS, C
097502
PHRANER, SD
170270
PINDER, MA
135850
POQUETTE, GM
048065
PRITCHETT, CW
131093
PRUETT, JM
157869

R

RAGUSO, RA
170793
RAO, S
054080
REXRODE, GP
170795
ROSSELLI, AT
170262, 170806
ROUECHE, LR
172382
ROY, LA
170804
RUDNICKI, MI
057788
RUSSELL, BJ
135844

S

SANSONE, WT
039326
SCHERER, JO
001945
SCHOFIELD, RB
043971
SCHULTZ, WM
052026
SCHULZ, WM
170272
SCHUSTER, S
032649
SELLERS, G
071715
SHAW, RA
135851
SHEARER, EL
095333
SHINN, LW
053915
SHULTZ, WM
046571, 046575, 172577
SHULTZ, WW
054231
SILVERLEAF, A
015035
SIMMONS, HB
024765
SJOGREN, RG
057788
SMITH, SR
026416
STARKWEATHER, DW
127035
STINSON, BG
024765
STUCKER, JP
015267, 015268, 015269
SULLIVAN, PA
126008
SYLVESTER, RO
167335

T

TAKARADA, N
084482
TOLLEY, R
052058

V

VAN COOK, CF
170262, 170806

W

WACKER, DH
148859
WAGGNER, JP
019391
WATERS, DM
135851
WHEELER, RL
135856
WILSON, D
170275
WILSON, HG
054080
WORSHAM, JP, JR
156917

Y

YERBURY, PA
149750
YOUNG, ECK
170274

Z

ZELEFSKY, H
170261

# Subject Term Index


## A

**ACCIDENT PREVENTION**
034661
**AERATION**
167335
**AIR CUSHION TECHNOLOGY**
126008, 135856
**AIR CUSHION VEHICLE PERFORMANCE**
099945, 131501, 135844
**AIR CUSHION VEHICLES**
015455, 019530, 043973, 084813, 095347, 099945, 126008, 128968, 131093, 135848, 135850, 135851, 149738, 154904, 157869, 170271, 170790, 170798, 170800
**AIR TEMPERATURE REGULATORS**
163437
**ALL WEATHER NAVIGATION**
053914, 084565
**ALUMINUM HULL CONSTRUCTION**
084889
**ALUMINUM WELDING**
084889
**AMERICAN WATERWAYS OPERATORS**
035111
**AMPHIBIOUS OPERATIONS**
054238
**AUDIO VISUAL AIDS**
170268
**AUTOMATIC CONTROL**
170271
**AUTOMATIC CONTROL SYSTEMS**
172391, 172392, 172577
**AUTOMATIC STEERING CONTROL**
014617

## B

**BANK EROSION**
156537
**BARGE CARRIERS**
035111
**BARGE DESIGN**
127057
**BARGE ECONOMICS**
015004, 039894, 048117, 157878
**BARGE OPERATIONS**
095333, 127057
**BARGE STRESSES**
127058
**BARGE TRAFFIC**
012006, 014891, 015004, 028633, 128785, 157878, 157880
**BARGE TRANSPORTATION**
130992
**BARGE TRANSPORTATION SYSTEMS**
048117, 090699
**BIBLIOGRAPHIES (MARINE TRANSPORTATION)**
156917
**BRITTLE FRACTURE**
127058

## C

**CANAL CONSTRUCTION PLANNING**
024765
**CANAL LOCK OPERATIONS**
054080
**CANAL NAVIGATION**
024765, 033705, 043971
**CANAL TRANSIT CAPACITY**
024765
**CAR CARRIERS**
050903
**CARGO FLOW**
041545
**CARGO HANDLING EQUIPMENT**
170807
**CARGO MOVEMENT**
170264
**CARGO PREFERENCE**
170808
**CARGO TRANSPORTATION**
041269, 170798
**CATAMARANS**
007580, 131093, 142633, 152882, 170266, 170267
**CAVITATING HYDROFOILS**
048078
**CAVITATION**
032649
**CHANNEL TRAFFIC**
156917
**CLOSED CIRCUIT TELEVISION**
033705
**COASTAL TRAFFIC**
157880, 157882

**COMBUSTION CONTROL**
163437
**COMMODITY STATISTICS**
041545, 054083, 097502, 170806
**COMMUNICATION SATELLITES**
071718
**COMMUNICATION SYSTEMS**
127028, 127029
**COMPUTER AIDED DESIGN**
001945
**COMPUTER APPLICATIONS**
019609
**COMPUTER PROGRAMS (HYDROFOILS)**
148859
**COMPUTER PROGRAMS (PORT PLANNING)**
170806
**COMPUTER PROGRAMS (PORTS)**
170262
**COMPUTERIZED COST CONTROL**
170805
**CONTAINER INTERCHANGE**
170791
**CONTAINER POOLING**
170791
**CONTAINER UTILIZATION**
170791
**CONTAINERIZED CARGO**
019258
**CONTROL SYSTEMS**
170259, 170801
**COOLING SYSTEMS**
163437
**CORROSIVE ENVIRONMENTS**
149750
**COST ANALYSIS**
170803, 172382
**COST COMPARISON**
050903
**COST EFFECTIVENESS**
012006, 170792, 170794
**CREW BOATS**
150418

## D

**DAMAGE STABILITY**
097523
**DATA ACQUISITION**
170793
**DESIGN CRITERIA**
170276
**DIESEL CONTROL SYSTEMS**
163437
**DIESEL ELECTRIC PROPULSION**
170801
**DIESEL OPERATION**
170801
**DIESEL PERFORMANCE**
163437
**DIRECTORIES (RIVER FACILITIES)**
126370
**DOCK FACILITIES**
170261
**DOMESTIC ICE OPERATIONS**
019391
**DOMESTIC SHIPPING ANALYSIS**
095115
**DOMESTIC SHIPPING POLICIES**
039326, 041503, 054083, 056741, 129696
**DREDGE DESIGN**
057796
**DREDGE PERFORMANCE**
057796
**DREDGING**
156537
**DREDGING SPOIL DISPOSAL**
057796

## E

**ECONOMIC ANALYSIS (BARGE OPERATIONS)**
095333
**ECONOMIC ANALYSIS (CARGO TRANSPORTATION)**
090699
**ECONOMIC ANALYSIS (COMPUTERIZED COST CONTROL)**
170805
**ECONOMIC ANALYSIS (FERRY TRANSPORTATION)**
172382
**ECONOMIC ANALYSIS (HYDROFOIL CRAFT)**
026416, 046571, 170272
**ECONOMIC ANALYSIS (INLAND WATERWAYS)**
015267, 015268, 015269, 039894, 090699, 097502, 130524, 130525, 157878, 170804
**ECONOMIC ANALYSIS (PORTS)**
165464, 170265, 170799, 170802, 170803, 170807
**ECONOMIC ANALYSIS (SES)**
007493, 157869
**ECONOMIC ANALYSIS (SHIP ROUTING)**
170793
**ECONOMIC ANALYSIS (TRANSPORTATION SYSTEMS)**
057979
**ECONOMIC ANALYSIS (WATERWAY TRANSPORTATION)**
170264, 170266, 170269, 170786
**ECONOMIC DEVELOPMENT**
170273
**EDUCATION PROGRAMS**
035111, 170268
**ELECTRIC PROPULSION**
170801
**EMPLOYEE RELATIONS**
046116
**ENGINE OVERLOADING**
163437
**ENVIRONMENTAL SURVEYS (COASTAL ZONE)**
170799
**ENVIRONMENTAL SURVEYS (PORT PLANNING)**
170803
**EXPORT FLOW**
041545

## F

**FAILURE ANALYSIS**
172392
**FARE COLLECTION**
170792, 170805
**FEEDER SERVICES**
015199, 170798
**FEEDER SHIPS**
170264
**FERRY BOATS**
003142, 015199, 048108, 048109, 050903, 057108, 057978, 057979, 057980, 084482, 084889, 097520, 097523, 148836, 152882, 163437, 167335, 170264, 170266, 170267, 170269, 170274, 170276, 170278, 170786, 170794, 170795, 170801, 170805, 172378, 172382, 172391, 172392, 172577
**FINANCIAL MANAGEMENT**
170804
**FINANCING PLANS**
170786
**FLEET STATISTICS**
157878
**FLUTTER**
032649
**FOILS**
170271, 172378, 172391, 172392, 172577
**FREIGHT HANDLING**
041269
**FREIGHT TRAFFIC ANALYSIS**
157880
**FUEL CONSUMPTION**
015387, 170801

## G

**GAS TURBINE CORROSION**
015455
**GAS TURBINE PERFORMANCE**
149750
**GAS TURBINE PROPULSION**
097520, 150418
**GEAR BOXES**
154904
**GREAT LAKES OPERATIONS**
041503, 056741, 130525

## H


**HARBOR OPERATIONS**
156917
**HARBOR TRAFFIC CONTROL**
071715
**HAZARDOUS CHEMICALS TRANSPORTATION**
012006
**HAZARDOUS MATERIALS TRANSPORTATION**
034661, 130992
**HIGH PERFORMANCE SHIP EVALUATION**
084813, 152481
**HIGH PERFORMANCE SURFACE SHIPS**
127560, 131093
**HIGH SPEED CRAFT**
007493, 043973, 050287, 052026, 054150, 054229, 054293, 057788, 095347, 127560, 150418, 157869, 170277, 170790, 172577
**HOLDING TANKS**
167335
**HOVERCRAFT**
170269, 170271
**HOVERCRAFT DESIGN**
019530, 032649, 126008, 135851, 170277
**HOVERCRAFT ECONOMICS**
048108, 052058, 054238, 135850
**HOVERCRAFT EVALUATION**
015035, 149738
**HOVERCRAFT MOTIONS**
019530, 128968
**HOVERCRAFT NOISE**
028926, 034915
**HOVERCRAFT OPERATIONS**
015455, 019609, 043973, 048108, 052058, 054238, 131501, 135856
**HOVERCRAFT PROPELLERS**
131501, 135848
**HOVERCRAFT PROPULSION**
149750
**HOVERCRAFT SKIRTS**
126008
**HOVERCRAFT TESTING**
135844
**HOVERPORTS**
019609
**HULL DESIGN**
170800, 172391, 172392
**HULL VIBRATION**
127058
**HYDROFOIL CONTROL**
054229
**HYDROFOIL CRAFT**
001945, 014924, 015035, 019239, 026416, 032649, 035176, 043973, 046571, 048065, 048078, 048109, 050953, 054150, 054229, 054231, 054293, 084813, 095347, 099945, 127560, 131093, 148859, 152481, 170269, 170271, 170272, 172378
**HYDROFOIL CRAFT ECONOMICS**
048108, 050318, 157869
**HYDROFOIL CRAFT OPERATIONS**
050318, 052026, 052027, 052028, 057978, 099945, 148836, 170272, 170800
**HYDROFOIL DESIGN**
032649, 035176, 048078, 050953, 054150, 172391, 172392, 172577
**HYDROFOIL PERFORMANCE**
046571, 046575, 048065, 048108, 048109, 054229, 054231
**HYDROFOIL PROPULSION MACHINERY**
050953, 054150, 054229
**HYDROFOILS**
014924, 026416, 048078, 050953, 054150, 148859, 170259
**HYPERBOLIC NAVIGATION**
071715


## I


**ICE BREAKUP**
051721
**ICE FORCES ON STRUCTURES**
051721
**ICE FORMATION**
051721
**ICE PROPERTIES**
051721
**ICE REMOVAL TECHNIQUES**
019167, 019391
**ICEBREAKER PERFORMANCE**
051697
**ICEBREAKERS**
019167
**ICEBREAKING**
019391, 051697
**ICEBREAKING FEASIBILITY STUDIES**
019391
**ICEBREAKING TANKERS**
170798
**ILLUMINATION**
057467
**IMPORT FLOW**
041545
**IMPORTS**
170802
**INFORMATION SYSTEMS**
170263
**INLAND NAVIGATION**
043971, 053914, 053915, 071715, 126370
**INLAND TERMINALS**
019258
**INLAND WATERWAY VESSELS**
014617, 015387
**INLAND WATERWAYS**
156537, 156917, 170804
**INLAND WATERWAYS COMMUNICATIONS**
071718, 127028, 127029
**INLAND WATERWAYS DREDGING**
057796
**INLAND WATERWAYS ECONOMICS**
019676, 024765, 034732, 039894, 041269, 048117, 054080, 054083, 090699, 095115, 130525, 157878, 170804
**INLAND WATERWAYS INFORMATION**
035111
**INLAND WATERWAYS NAVIGATION**
015267, 015268, 015269, 043971, 126370
**INLAND WATERWAYS PERSONNEL**
128792
**INLAND WATERWAYS TRAFFIC**
012006, 015184, 028633, 034661, 034732, 041545, 056741
**INLAND WATERWAYS TRANSPORTATION**
039326, 041503, 127057, 127058, 128785, 128791, 130525, 130992, 142633, 157880, 157882, 170262, 170263
**INLAND WATERWAYS VESSELS**
007580
**INTEGRATED NAVIGATION SYSTEMS**
071718
**INTERMODAL SYSTEMS**
170789, 170803
**INTERMODAL TRAFFIC ANALYSIS**
015267, 015268, 015269
**INTERMODAL TRANSPORTATION**
041269, 054083, 170799
**INTERNATIONAL TRADE**
170807, 170808
**INVESTMENT PLANNING**
170802


## J


**JET PROPULSION**
172378


## L


**LABOR PRODUCTIVITY**
046116
**LABOR RELATIONS**
046116
**LAND BRIDGE OPERATIONS**
170808
**LANDING CRAFT**
170259
**LASH BARGES**
170798
**LEGAL CONSTRAINTS**
095115
**LICENSED PERSONNEL TRAINING**
128792

**LICENSING REQUIREMENTS**
170790
**LIGHTING DESIGN**
057467
**LINER SERVICES**
170808
**LORAN NAVIGATION**
084565
**LOW LIGHT LEVEL TELEVISION**
170787

## M

**MAINTENANCE COSTS**
170278
**MANEUVERABILITY**
019530, 170271, 170801
**MANNING REQUIREMENTS**
084430
**MANPOWER REQUIREMENTS**
084430
**MANPOWER STUDIES**
046116
**MARINE MASS TRANSIT**
052026, 052027, 052028, 170786, 170792, 170794, 170795, 170798, 170800
**MARINE TERMINALS**
170264
**MARINE TRANSIT**
001945, 003142, 007493, 007580, 012006, 014617, 014891, 014924, 015004, 015035, 015184, 015199, 015267, 015268, 015269, 015387, 015455, 015500, 019167, 019239, 019258, 019391, 019530, 019609, 019676, 024765, 026416, 028633, 028926, 032649, 033705, 034661, 034732, 034915, 035111, 035176, 035975, 039326, 039894, 041269, 041503, 041545, 043971, 043973, 046116, 046571, 046575, 048065, 048078, 048108, 048109, 048117, 048122, 050287, 050318, 050903, 050953, 051235, 051697, 051721, 052026, 052027, 052028, 052058, 053914, 053915, 054080, 054083, 054150, 054229, 054231, 054238, 054293, 056741, 057108, 057467, 057788, 057796, 057978, 057979, 057980, 071715, 071718, 084430, 084482, 084565, 084813, 084889, 090699, 095115, 095333, 095347, 097502, 097520, 097523, 099945, 126008, 126370, 127028, 127029, 127035, 127057, 127058, 127560, 128785, 128791, 128792, 128822, 128968, 129696, 130524, 130525, 130992, 131093, 131501, 135844, 135848, 135850, 135851, 135856, 142633, 148836, 148859, 149738, 149750, 150418, 152481, 152882, 154904, 156537, 156917, 157869, 157878, 157880, 157882, 163437, 165464, 167335, 170259, 170261, 170262, 170263, 170264, 170265, 170266, 170267, 170268, 170269, 170270, 170271, 170272, 170273, 170274, 170275, 170276, 170277, 170278, 170786, 170787, 170788, 170789, 170790, 170791, 170792, 170793, 170794, 170795, 170798, 170799, 170800, 170801, 170802, 170803, 170804, 170805, 170806, 170807, 170808, 172378, 172382, 172391, 172392, 172577
**MARINE TRANSPORTATION SYSTEMS**
046575, 050287, 128822
**MARKET DEVELOPMENT**
056741
**MARKET STUDIES**
041545, 095115
**MARKETING**
170265, 170278, 170789, 170808
**MATERIALS SELECTION**
170800
**MICROPROCESSOR APPLICATIONS**
170805
**MICROWAVE COMMUNICATION**
033705
**MODAL ANALYSIS**
056741, 157880, 157882
**MODEL TESTING**
043971, 097523

## N

**NARROW CHANNEL FLOW**
043971
**NATIONAL TRANSPORTATION POLICY**
129696
**NAVIGATION OBSTRUCTIONS**
015500
**NAVIGATION PROCEDURES**
156537
**NAVIGATIONAL AIDS**
084565
**NOISE REDUCTION**
028926, 034915

## O

**OBSTRUCTIONS TO NAVIGATION**
015500
**OFFICER TRAINING**
084430
**OFFSHORE SUPPLY BOATS**
170798
**OIL SKIMMERS**
170798
**OPERATING COSTS**
170270, 170278, 172382
**OPERATIONAL RELIABILITY**
172392
**ORIGIN DESTINATION STUDIES**
170261
**OUTFITTING**
172391

## P

**PASSENGER TERMINALS**
170795
**PASSENGER TRANSPORTATION**
003142, 046571, 046575, 050903, 142633, 170261, 170263, 170264, 170266, 170267, 170268, 170269, 170270, 170271, 170272, 170274, 170276, 170277, 170278, 170786, 170792, 170794, 170795, 170798, 172378, 172382, 172577
**PASSENGER VESSELS**
152882, 170261, 170266, 170267, 170269, 170272, 170274, 170276, 170277, 170792, 170794, 170795, 170800, 170801, 172378, 172382, 172391, 172392, 172577
**PAYLOAD CAPACITY**
170277
**PERSONNEL DEVELOPMENT**
035111
**PERSONNEL MANAGEMENT**
084430
**PERSONNEL TRAINING**
128822
**PIPELINE TRANSPORTATION**
157882
**PLANING CRAFT**
095347, 170271
**POLLUTION REGULATION**
170788
**PORT BALTIMORE**
170802
**PORT CAPACITY**
170262
**PORT CHARGES**
170265
**PORT DEVELOPMENT**
051235, 165464, 170262, 170265, 170799, 170802, 170803, 170806, 170807
**PORT FACILITIES**
170262, 170265, 170799, 170806, 170807
**PORT FINANCING**
165464, 170807
**PORT INVESTMENT**
170802
**PORT MANAGEMENT**
165464, 170265
**PORT NEW YORK**
170787, 170799
**PORT NEW YORK (MARKET STUDIES)**
165464
**PORT PLANNING**
019609, 165464, 170262, 170265, 170799, 170802, 170803, 170806, 170807
**PORT PLANNING ECONOMICS**
170799, 170802, 170803, 170807
**PORT SAFETY**
170787
**PORT SURVEYS**
041545, 170802, 170806

**PORT WASHINGTON STATE PORTS**
170807
**POSITION FINDING**
053914, 053915, 071715
**POWER PLANT EFFICIENCY**
149750
**POWER REQUIREMENT**
007493
**POWER TRANSMISSION**
019239
**PRODUCT TANKERS**
170788
**PROPELLER LINE SHAFTING**
019239
**PROPULSION EFFICIENCY**
015387, 057788
**PROPULSION MACHINERY**
150418
**PROPULSION MACHINERY CONTROLS**
170801
**PROPULSION PERFORMANCE**
154904
**PROPULSION PLANT PERFORMANCE**
152481
**PROPULSION PLANT SELECTION**
035176
**PROPULSION SYSTEMS**
097520
**PROPULSIVE EFFICIENCY**
048065

## Q

**QUEUEING THEORY**
172382

## R

**RADAR SYSTEMS**
170787
**RAPID TRANSIT SYSTEMS**
170798
**RECREATION TRANSPORT**
170794
**REFRIGERATED AMMONIA TRANSPORTATION**
012006
**REFRIGERATED BARGES**
012006
**REGULATORY CONSTRAINTS**
128785
**REGULATORY POLICY**
015269, 170270, 170790
**RELIABILITY ANALYSIS**
172392
**RESOURCE MANAGEMENT**
170275
**RESTRICTED WATER OPERATION**
043971
**RISK ANALYSIS**
034661, 130992, 170786
**RIVER COMMERCE**
039894, 129696
**RIVER COMMUNICATIONS**
127028, 127029
**RIVER ICE**
051721
**RIVER ICEBREAKING**
019167, 019391, 051697
**RIVER MODELS**
156537
**RIVER NAVIGATION**
014891, 028633, 035975, 053914, 053915, 071715, 071718, 084565, 126370, 127035, 128791, 130524, 130525
**RIVER PORTS AND TERMINALS**
015004, 170789, 170806
**RIVER TRAFFIC**
015184, 127057, 128791, 129696, 142633, 156917
**RUDDER RESPONSE**
014617

## S

**SAFETY ENGINEERING**
170270
**SAFETY EQUIPMENT**
012006
**SAFETY REGULATIONS**
043973, 170788, 170790
**SAFETY STANDARDS**
172392
**SALVAGE OPERATIONS**
035975
**SALVAGE SURVEYS**
035975
**SEAKEEPING**
046575, 128968, 170271
**SEAKINDLINESS**
046575
**SEDIMENT TRANSPORT**
156537
**SEMISUBMERSIBLES**
170798
**SEWAGE HOLDING TANKS**
167335
**SHAFT ALIGNMENT**
019239
**SHIP DESCRIPTIONS (CATAMARANS)**
142633
**SHIP DESCRIPTIONS (FERRIES)**
152882, 170274, 170276
**SHIP DESIGN**
035176, 057108, 084482
**SHIP DESIGN ANALYSIS**
148859
**SHIP DESIGN DEVELOPMENT**
149738
**SHIP HULLS**
001945
**SHIP MODELS**
097523
**SHIP MOTIONS**
019530, 084482, 128968
**SHIP OPERATION**
170274
**SHIP ROUTING**
170793
**SHIP STABILITY**
097523
**SHIP TRIALS**
128968
**SHIPBOARD LIGHTING**
057467
**SHIPBOARD NOISE**
034915
**SHIPBOARD SEWAGE TREATMENT**
167335
**SHIPPING FORECASTS**
170803
**SHIPYARD AUTOMATION**
048108
**SHIPYARD COMMUNICATION SYSTEMS**
127028, 127029
**SHORT RANGE NAVIGATION**
053914, 053915
**SIMULATED BARGE OPERATIONS**
095333
**SKIRT FAILURE**
015455
**STABILITY ANALYSIS**
097523
**STABILIZATION SYSTEMS**
054231
**STATE OF THE ART (AIR CUSHION VEHICLES)**
149738
**STATE OF THE ART (HOVERCRAFT)**
032649
**STATE OF THE ART (HYDROFOIL CRAFT)**
032649, 035176
**STATE OF THE ART (INLAND WATERWAYS)**
034732
**STATE OF THE ART (MARINE TRANSPORTATION)**
170271
**STATE OF THE ART (RIVER ICE)**
051721

**STEERING SYSTEM DESIGN**
014617
**STRUCTURAL DESIGN**
172391
**STRUCTURAL WEIGHT DETERMINATION**
054293
**STRUCTUREBORNE NOISE**
034915
**STRUTS**
154904, 170271, 172391, 172577
**SUBDIVISION**
084482
**SUBMERSIBLES**
170259
**SUPERCAVITATING PROPELLERS**
048065, 154904
**SUPERCHARGING**
163437
**SUPERPORTS**
156917
**SURFACE EFFECT SHIP EVALUATION**
127560, 135844, 135856, 170800
**SURFACE EFFECT SHIPS**
007493, 048109, 052027, 052028, 052058, 054238, 084813, 127560, 135848, 135850, 135851, 149738, 170277
**SWATH SHIPS**
084813, 170271
**SYSTEMS ANALYSIS**
019258

T

**TANKER CONSTRUCTION**
170788
**TANKER DESIGN**
170788
**TANKER OPERATIONS**
170788
**TECHNOLOGY TRANSFER**
170271
**TERMINAL DESIGN**
170795
**TERMINAL FACILITIES**
170262, 170267, 170276, 170795, 170799
**TEXAS PORT ACTIVITY**
041545
**THERMAL STRESS**
163437
**TOLL OPERATIONS**
019676
**TONNAGE MEASUREMENT**
157878
**TOWBOAT OPERATING COSTS**
095333
**TOWBOATS**
028633, 048117, 095333, 127057
**TOWED BARGES**
051697
**TRADE DEVELOPMENT**
170788, 170807
**TRADE FORECASTS**
015184
**TRAFFIC ANALYSIS (FREIGHT)**
015184, 039326, 056741
**TRAFFIC CONTROL**
128822, 170787
**TRAFFIC INFORMATION SYSTEMS**
170787
**TRAINING COURSES (PILOTS)**
128792
**TRAINING DEVICES**
035111
**TRAINING PROGRAMS**
128792
**TRANSPORT ECONOMICS**
051235
**TRANSPORT POLICIES/NATIONAL**
034732, 128822, 156917
**TRANSPORTATION PLANNING**
051235, 156917, 170263, 170803
**TRANSPORTATION RESEARCH**
051235
**TRANSPORTATION SYSTEM ANALYSIS**
039326, 128822, 157880, 157882, 170263
**TUG BARGE ECONOMICS**
170270
**TUG BARGE LINKAGE**
170270
**TUG BARGE OPERATIONS**
054080
**TUG BARGE SYSTEMS**
170270
**TURBINE DESIGN**
150418

U

**UNLICENSED PERSONNEL TRAINING**
128792
**URBAN TRANSPORTATION (WATER)**
170264

V

**VESSEL TRAFFIC ANALYSIS**
170799
**VESSEL TRAFFIC CONTROL**
033705, 127035, 170787
**VHF COMMUNICATIONS**
033705, 170787
**VIBRATION DAMPING**
028926
**VIBRATION SURVEYS**
028926

W

**WATER CANNONS**
019167
**WATER CONSERVATION**
048122
**WATER FLUSH ICE REMOVAL**
019167
**WATER JET PROPULSION**
148836
**WATER POLLUTION CONTROL**
048122
**WATER TRANSPORTATION COSTS**
170786
**WATERBORNE TRADE**
041545, 054083
**WATERFRONT DEVELOPMENT**
170270, 170275, 170799
**WATERJET PROPELLED CRAFT**
097520
**WATERJET PROPULSION**
054231, 057788, 097520, 150418, 152481, 170272, 172378, 172391, 172577
**WATERJET PUMP PERFORMANCE**
057788
**WATERWAY CONGESTION**
019676, 129696
**WATERWAY IMPROVEMENT**
014891, 015184, 128791, 128822, 129696, 170273
**WATERWAY NAVIGATION**
170273
**WATERWAY TRANSPORTATION**
015004, 015500, 039326, 041503, 048122, 051235, 170261, 170264, 170265, 170266, 170268, 170269, 170789
**WATERWAY TRANSPORTATION COSTS**
170264, 170266, 170269
**WATERWAY USER CHARGES**
019676, 048122, 054080, 128785, 129696, 170265, 170804
**WATERWAYS COMMERCE STATISTICS**
097502, 128791
**WAVE RESISTANCE**
019530
**WEATHER ROUTING**
170793
**WEIGHT CALCULATION**
054293
**WORLD TANKER FLEET**
170788