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RESEARCH NEEDS IN THE INLAND WATER TRANSPORTATION INDUSTRY

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INTRODUCTION

The future demand for the movement of goods by inland waterways is uncertain. The last few years have seen a decline in barge traffic and an increase in barge industry costs. Deregulation of railroads and the proposals for commodity pipelines may challenge the future of the waterway industry. The competitive position of waterborne transportation may be affected by PL 99-662, the Water Resources Development Act of 1986, which increases the fuel tax paid by inland waterway users and requires that 50 percent of new lock and dam construction be paid from the Inland Waterways Trust Fund.

To remain viable, the barge industry's efficiency and productivity must be increased. To improve its competitive position, it is necessary to first assess the future demand for freight transportation and to assess the factors that are influencing the barge industry. Next, the barge and towing

industry will need to consider its strengths and problems. Finally, the industry and the individual ports and barge companies will have to develop plans of action to assure survival. Strategic planning is a process that attempts to focus on markets, resources, and the organization of the firm and the industry and to develop alternative scenarios to maintain or improve competitive advantage.

The purpose of this conference was to consider how strategic planning may be applied to the barge industry and to the ports. The conference also considered what information and research is needed in order to give managers the necessary data upon which to base alternative strategies. The conference was structured to look at strategic waterway issues and then to break into workshops that considered research needs from the viewpoints of the carrier, the port operator, and the systems planner.

The conference keynote address was by Neil N. Diehl, Chairman and Chief Executive Officer, Ingram Barge Company. Mr. Diehl reviewed the causes of the current financial plight of the barge industry and outlined the measures which must be taken to restore the industry's health. His remarks have been published in the article, "Critical Issues Facing the U.S. Barge Industry in the 1980s," by Niel N. Diehl and Craig E. Philip, Transportation Journal, Vol. 25, No. 1, Fall 1985, pp. 5-10.

A second formal contribution was a paper by Norman Wolf on the use of strategic planning in the Illinois Department of Transportation. His paper is included in Appendix A. There were also presentations by Jim Hall, Iowa Department of Transportation; Michael Bronzini, The University of Tennessee; I. Bernard Jacobson, Temple, Barker and Sloane; and Rex Edwards, Phillips Cartner and Company, Inc., concerning research being conducted to improve water carrier productivity. The outcome of these projects will be featured in future sessions sponsored by the Transportation Research Board.

The remainder of the conference was devoted to the development of specific research needs statements. These follow.

RESEARCH NEEDS WORKSHOPS

The objectives of each workshop were to develop a short list of recent and current research in its subject area, and to draft a set of proposed research problem statements. The problem statements include estimates of urgency, time requirements, and funding needs. The workshop listings of recent research are given in Appendix B, Bibliography of Representative Research. Workshop research recommendations are given in the following sections.

A panel session to consider the research needs statements

drafted at the Memphis conference and to suggest additional research needs was held at the Transportation Research Board Annual Meeting in January 1986. A brief summary of the points raised in that session is presented in Appendix C. Specific project statements prepared by the panelists are included below along with the final versions of the statements from the Memphis conference.

WATERWAY CARRIERS

Participants

Scott Christensen	Union Pacific System
Thomas Groves	Cargo Carriers
Bill Huneke	Association of American Railroads
I. Bernard Jacobson	Temple, Barker & Sloane, Inc.
Dave Marshall	Alter Barge Company (Co-Chairman)
Paul Mentz	Maritime Administration
Michael Newton	Tennessee Valley Authority
J. E. Nivin	American Commercial Barge Line
Craig Philip	Ingram Barge Company (Co-Chairman)
Miles Sonstegaard	University of Arkansas
Edward Tralka	Maritime Administration
Mark Ventling	The Valley Line Company
Tom Vorholt	Ohio River Company

Workshop Summary

From the perspective of waterway carriers, research priorities have changed significantly since 1979 when the last assessment of research priorities was completed by the Transportation Research Board. In most of the areas identified in 1979, substantial progress has occurred.

1. User Charge Impact Analysis. Numerous studies have been completed by various groups examining the impact of user charges. Studies have been completed by the U.S. Department of Transportation, the Maritime Administration, the Corps of Engineers, and a number of state agencies. In addition it now appears likely that congressional direction with respect to user charges is reasonably well established. Dramatic changes in policy direction do not appear likely.
2. Development of a Waterway System Management Plan. Completion of the massive effort involved in the National Waterways Study in large part fills the needs identified in this area.
3. Development of a Commodity Flow Database. Information on barge movements by all carriers is collected by the Waterborne Commerce Statistics Center, a part of the Corps of Engineers. There are continuing problems with

respect to the timely dissemination of this information, but there does not appear to be a research need in this area.

4. Waterborne Commerce Forecasts and Mode Share Analysis. Studies completed for the Maritime Administration under the cooperative research program have adequately addressed this issue, both conceptually with respect to forecast methodology and practically with respect to the dissemination of commodity specific forecasts of waterborne commerce.
5. Waterway Traffic Information Storage and Retrieval System. On-going efforts by the Corps of Engineers with respect to the development of the Performance Monitoring System (PMS) for movements through all locks and dams will be capable of providing timely information to the industry on traffic flows.

Two additional areas not identified in the 1979 assessment have received substantial attention from the industry and the transportation research community.

1. Fuel Management: As with all transportation modes, the dramatic increase in oil prices over the last decade stimulated a great deal of effort by power plant suppliers, fleet managers, and the research community to improve towboat fuel efficiency. Numerous studies have been completed concerning on-board monitoring, optimal tow configurations, etc. There appear to be additional practical opportunities for the industry to improve on fuel use practices but additional research in this area does not seem to be necessary.
2. Lock and Waterway Operational Efficiencies: The extraordinary level of congestion encountered on some portions of the inland waterway network during the late 70s and early 80s stimulated a substantial amount of cooperative industry effort to develop management techniques to minimize the impact of congestion, especially at locks. More exotic system management strategies to deal with the lock congestion problem have been proposed, for example, the establishment of an auction procedure whereby scarce locking spaces could be auctioned to the highest bidder. Practical applicability of these approaches seems small at this time.

To summarize, the workshop members concluded that substantial progress has been made with respect to needed research in a number of major areas and especially those that were identified as being most critical to the waterways industry in the late 70s.

With respect to present and prospective research needs, the

research project statements drafted in the workshop focus on three major areas:

1. The analysis of institutional and managerial responses to the current imbalance between the demand for barge transportation and the supply of barges and towboats;
2. The development of an effective means to prioritize and allocate scarce resources for continued development of water resource projects, especially in the context of shared public-private funding; and
3. Analysis of changing inter-modal relationships, especially in the context of barge company ownership by railroads.

The following research project statements fall primarily into these three broad areas.

RESEARCH PROJECT STATEMENT

TITLE: Surplus Marine Equipment Strategies

PROBLEM STATEMENT: A variety of external factors have created an overwhelming imbalance between demand and supply in the inland marine industry that could lead to the collapse of many competitors.

RESEARCH TASKS: Determine options for fleet rationalization. Assess the legal and/or financial barriers associated with implementation of these options.

URGENCY: HIGH (X) MEDIUM () LOW ()

REASON: Excess capacity has driven barge rates below variable costs, which is a prescription for disaster.

RECOMMENDED RESEARCH PERIOD:

RECOMMENDED FUNDING:

12 MONTHS

\$ 80,000

RESEARCH PROJECT STATEMENT

TITLE: Identification of New Markets for Marine Transportation.

PROBLEM STATEMENT: Over-capacity is the key problem facing the industry today. Finding new markets to utilize these assets in a productive manner will increase chances for the industry's survival.

RESEARCH TASKS: Develop new uses for barge transportation through identification of new or additional commodities or products to move by boat or barge. Investigate alternative uses for existing marine transportation assets.

URGENCY: HIGH (X) MEDIUM () LOW ()

REASON: New revenue sources are needed to enable barge operators to survive.

RECOMMENDED RESEARCH PERIOD:

RECOMMENDED FUNDING:

12 MONTHS

\$ 80,000

RESEARCH PROJECT STATEMENT

TITLE: Ex-Post Analysis of CSX/ACBL Merger

PROBLEM STATEMENT: Major changes in the structure of the transportation industry are underway. Historically, railroads were not able to own barge lines. The CSX/ACBL merger is the first of what may be a continuing consolidation, and it is based on a set of well-defined hypotheses about competitive behavior, documented in the merger proceedings to guide future regulatory proceedings.

RESEARCH TASKS: Document the extent of discriminatory pricing by CSX/ACBL merger, especially on the non-railroad owned barge lines. This should provide proper information to judge the results of the ICC semi-annual studies.

URGENCY: HIGH (X) MEDIUM () LOW ()

REASON: Effects are immediate and could have strong adverse effects on barge lines.

RECOMMENDED RESEARCH PERIOD:

RECOMMENDED FUNDING:

36 MONTHS

\$ 300,000

RESEARCH PROJECT STATEMENT

TITLE: Analysis of Equipment Utilization

PROBLEM STATEMENT: At present, useful data collection on equipment inventories and utilization from various government agencies is untimely or has been halted. More precise and accurate information will improve equipment investment decisions by the individual members of the industry.

RESEARCH TASKS: Develop methods of providing useful information on major classifications of marine assets to the industry in a timely manner. Analyze ownership, leasing, and capacity utilization status and trends.

URGENCY: HIGH () MEDIUM (X) LOW ()

REASON: Overinvestment in equipment has long-term impacts on industry survival.

RECOMMENDED RESEARCH PERIOD:

RECOMMENDED FUNDING:

18 MONTHS

\$ 100,000

RESEARCH PROJECT STATEMENT

TITLE: Traffic Flow Data Dissemination

PROBLEM STATEMENT: In the past, studies and forecasts of various waterway commodity flows have been "one shot deals" without update or renewal of forecasts or information. An on-going and timely data base is needed, and raw data is being collected today through the PMS system maintained by the Army Corps of Engineers.

RESEARCH TASKS: Develop a way that Corps PMS data can be made available to the industry and researchers in a timely manner. Set up a way to collect survey data quickly from the industry. Set into motion continuous forecasts of commodity flows and statistics based on the PMS data.

URGENCY: HIGH () MEDIUM (X) LOW ()

REASON: Strategic response to changing conditions requires timely and accurate data.

RECOMMENDED RESEARCH PERIOD:

RECOMMENDED FUNDING:

15 MONTHS

\$ 100,000

RESEARCH PROJECT STATEMENT

TITLE: The Feasibility of a Futures Market for Barge Grain Freight Rates.

PROBLEM STATEMENT: Past research has often suggested that the introduction of a futures market for a goods or service reduces price variability, increases supply and demand information, and improves risk-management programs. The Chicago Board of Trade has conducted a preliminary study on the feasibility of a futures market for barge traffic but concluded that they lacked

the data needed to make specific recommendations. However, appropriate data and procedures are available to conduct an in-depth analysis of the benefits and drawbacks of a futures market to individual shippers, carriers, and the industry.

RESEARCH TASKS: Gather appropriate time-series and cross-sectional rate data. Identify the proper origin and destination points or the appropriate index of rates that could be traded. Develop other contract specifications relating to cargo, futures months, settlement, etc. Identify and estimate the effects of a futures market on current markets such as the St. Louis Merchants Exchange. Describe the potential users (hedgers and speculators), conditions needed for a successful market, and expected price effects.

URGENCY: HIGH () MEDIUM (X) LOW ()

REASON: Has large potential to improve marketing opportunities and pricing for shippers and carriers.

RECOMMENDED RESEARCH PERIOD:

RECOMMENDED FUNDING:

12 MONTHS

\$ 50,000

PORT OPERATIONS AND MANAGEMENT

Participants

Carla Cefaratti	Ohio Department of Transportation
Tom Determann	Determann River Terminal
Don Gibson	University of South Alabama
Harlan Hale	University of Tennessee
Marvin L. Jacobs	Memphis State University
Don H. Jones	University of Tennessee
Don McCrory	Memphis and Shelby County Port Commission (Co-Chairman)
Cliff Mitchener	Greenville Port Commission
Jim Phillips	Arkansas Waterways Commission
Bob Portiss	Tulsa Port of Catoosa
Thomas E. Whitten	Mississippi Department of Energy and Transportation
Norman B. Wolf	Illinois Department of Transportation (Co-Chairman)
David Work	Rosedale-Bolivar County Port Commission

Workshop Summary

Inland ports are both transportation projects and industrial development projects. Financing a new inland waterway port depends vitally on perceptions of what markets the new port will serve, and on its prospects for generating industrial

development. Long-term viability depends on the port's ability to penetrate existing markets and to develop new markets. The three highest priority research needs identified in the workshop focus on these areas. Additional topics discussed included traffic balancing (inbound and outbound), port project development methods, port access by land modes, port cargo forecasts, water transport delivery schedules, and computer applications.

RESEARCH PROJECT STATEMENT

TITLE: How to Market an Inland River Port

PROBLEM STATEMENT: Marketing of an inland port is critical to its success in attracting cargoes as is the availability of cargo handling and storage facilities and inland access modes; however, marketing is an inexact science on which many ports have expended substantial amounts without achieving an increase in traffic. Research is needed on ways to market an inland port facility; on types of marketing techniques to use during the planning and pre-construction phase, development/construction phase and operational phase of a facility; and on innovative marketing techniques to meet future needs of an increasingly competitive transportation environment.

RESEARCH TASKS: Select a number of river ports for case studies of both successful and unsuccessful marketing techniques. Analyze the reasons for the success or failure of the various marketing programs. Identify different types of marketing conducted during the development phases of the ports. Determine ways in which river ports can conduct marketing activities in an increasingly competitive transportation environment.

URGENCY: HIGH (X) MEDIUM () LOW ()

REASON: Has large potential to improve marketing opportunities and pricing for shippers and carriers.

RECOMMENDED RESEARCH PERIOD:

RECOMMENDED FUNDING:

12 MONTHS

\$ 100,000

RESEARCH PROJECT STATEMENT

TITLE: Reduction of Port Operating Costs

PROBLEM STATEMENT: The costs, including stevedoring cost, involved in operating a port have a direct impact on the business a port conducts. Many ports are presently in financial difficulty due to a decrease in business, severe competition and

high operating costs. The Federal government is also placing an increased strain on ports by requiring more participation in activities such as dredging. Reducing operating costs is one method of conserving funds for other uses and needs.

RESEARCH TASKS: Examine conditions and operations which can be improved to reduce costs. Better utilization of land is one example; others include improvements in equipment and their use and better labor utilization. Examine areas where technology can be transferred. Examine areas of extraordinarily high costs where inventions of new equipment to replace personnel or to reduce the difficulty of an operation might be cost-effective.

URGENCY: HIGH (X) MEDIUM () LOW ()

REASON: Ports are generally suffering financially and must have some relief in order to continue a necessary service.

RECOMMENDED RESEARCH PERIOD:

RECOMMENDED FUNDING:

18 MONTHS

\$ 100,000

RESEARCH PROJECT STATEMENT

TITLE: Analysis of Data Required to Evaluate Development of a New Inland Waterway Port

PROBLEM STATEMENT: Traditionally, river port investment decisions were made on the basis of historic trends and forecasted growth of local production or use of bulk commodities. However, with the downturn in the economy and the related impacts on the waterway industry, the availability of funds for river port development has been constrained. Only those projects for which the need can be fully documented are now being considered for funding. Research is needed to determine the types of data needed to evaluate the development of river port projects.

RESEARCH TASKS: Conduct a survey of state agencies and commercial lending institutions to determine the types of information required to justify the funding of a port project. Survey public ports that have recently completed port projects to identify types of data used to justify project funding. Identify existing data sources that ports should use for project justification. Indicate types of data that need to be collected by a port such as market surveys, shipper surveys, etc. Discuss the relative levels of detail needed for international, national, regional, and local factors that may affect port development.

URGENCY: HIGH () MEDIUM (X) LOW ()

REASON: Ports require appropriate data to justify funding from either public agencies or commercial lending institutions.

RECOMMENDED RESEARCH PERIOD:

RECOMMENDED FUNDING:

12 MONTHS\$ 80,000

RESEARCH PROJECT STATEMENT

TITLE: Relationship of Industrial Development to Inland Ports

PROBLEM STATEMENT: Port development is becoming constrained by the reduced availability of riverfront sites that are suitable for port development and port operations and by the increase in the cost of construction of port facilities. These factors have created a shift from the development of small single-use, single-commodity river ports to the development of large-scale, multi-use, multi-commodity ports. Typically, these ports have extensive backup areas for port-related industrial development.

RESEARCH TASKS: Select for analysis several recent large-scale, multi-use public river port projects. Identify the planning criteria used to determine the demand for the project, potential users and types of port facilities, size of the industrial area and infrastructure needed to serve the port facilities and the industrial area, and methods used to finance public-use and private-use facilities. Identify the operation of the port/industrial projects in terms of such factors as the annual rate of absorption of industrial land, tonnage handled at dock facilities, and relative use of dock facilities by tenants and nontenants. Prepare a report that documents planning, funding, and operational aspects of large-scale port/industrial projects.

URGENCY: HIGH () MEDIUM (X) LOW ()

REASON: The shift to port/industrial river projects has created a new demand for information on planning, financing and operating these multi-use facilities.

RECOMMENDED RESEARCH PERIOD:

RECOMMENDED FUNDING:

12 MONTHS\$ 80,000

RESEARCH PROJECT STATEMENT

TITLE: Demand for New Port Services

PROBLEM STATEMENT: With the development of the load center concept, ports are finding that their competition has increased. Now, ports on the East coast compete with ports on the West coast for the same cargoes, with the result that traditional geographic port "hinterlands" no longer exist. To respond to increased competition, ports are adding extra services to the package they are able to offer a steamship line, such as freight forwarding

functions, computerized cargo tracking, and cargo consolidation. While ports must provide additional services they also must keep costs and charges in line. If they cannot, ports will lose business and risk having to close down.

RESEARCH TASKS: Examine the services being offered by ports and their relevance to attracting and retaining steamship customers. Survey steamship lines to determine which services they consider the most important in their location decisions (i.e., ports of call decisions). Examine other services which ports may consider offering to steamships lines, especially those which will not place additional, sizeable cost burdens on the ports.

URGENCY: HIGH () MEDIUM (X) LOW ()

REASON: In this competitive environment, ports need improved information on types of services required to attract steamship companies.

RECOMMENDED RESEARCH PERIOD:

18 MONTHS

RECOMMENDED FUNDING:

\$ 100,000

RESEARCH PROJECT STATEMENT

TITLE: Safety Risk Analysis and Insurability.

PROBLEM STATEMENT: Risk is a major area of concern for ports and steamship lines. Personnel safety is one area of major concern and is an area where insurance rates can fluctuate thousands of dollars based on simple things such as personnel safety training programs. The cost involved may be as high or higher than \$67 for every \$100 in payroll.

RESEARCH TASKS: Determine what the risks are in water transportation and classify the degrees of risk. Examine ways of reducing risks. Examine insurance rates as they relate to risks and how they are likely to change with improved safety in high risk operations, functions and conditions.

URGENCY: HIGH () MEDIUM (X) LOW ()

REASON: Insurance is a costly item and improvements in risk analysis could represent substantial savings.

RECOMMENDED RESEARCH PERIOD:

12 MONTHS

RECOMMENDED FUNDING:

\$ 80,000

RESEARCH PROJECT STATEMENT

TITLE: Accuracy of Port Commodity Forecasts

PROBLEM STATEMENT: Among practitioners in the inland waterway port planning profession, the reflex response to "inland waterway port planning" is "commodity/tonnage projections." The use of such projections as the primary component in the benefit/cost method of justifying a large segment of inland waterway or canal development dates from the early years of this century; its utilization to justify the navigation segment of a single inland waterway port waterfront industrial park dates from the end of World War II. The subject of the realized usage of a waterway or canal after some shakedown years of operation versus those initial projections has been examined in the case of at least one inland waterway/canal; no such examination of individual ports has been made.

RESEARCH TASKS: Identify port projects for which detailed commodity forecasts were made. Classify the forecasts according to data sources and methodology. Compare the forecasts with the subsequent actual port traffic.

URGENCY: HIGH () MEDIUM () LOW (X)

REASON: Pressure to develop improved techniques to forecast future use of planned port facilities and waterway improvement projects.

RECOMMENDED RESEARCH PERIOD:

12 MONTHS

RECOMMENDED FUNDING:

\$ 80,000

SYSTEM PLANNING, ECONOMICS, AND OPERATIONS

Participants

Michael Bronzini	University of Tennessee (Co-Chairman)
Thomas Fisher	Tennessee Valley Authority
Jim Hall	Iowa Department of Transportation
Thomas Holder	West Virginia Governor's Office
Elliot Lipson	Alaska Department of Transportation
Howard Olson	Corps of Engineers (Co-Chairman)
Peter Spock	American Commercial Barge Line
Jim Swift	Waterways Journal

Workshop Summary

The existing state of knowledge was judged to be relatively advanced in the areas of project analysis, including lock capacity, benefit/cost analysis, and environmental impact assessment; impacts of user charges; and system planning, including methodology, data, intermodal and multimodal analysis,

system capacity, and system benefits and costs.

Research needs were found to exist in the following areas:

1. Benefits of Multipurpose Projects

Authorized purposes vs. actual uses
Beneficiaries
Amount and distribution of benefits
Allocation of benefits to purposes

2. Prioritization of Projects

Project selection in the new cooperative environment
(federal/state/local/private partnership)
System efficiency vs. regional and project level
efficiency

3. System Operations

Operation of major tributaries to meet mainstream flow
needs as well as local system needs

4. Methodology Issues

Forecasts: techniques and comparative results
Analysis of major rehabilitation projects
Comparison of lock capacity models/results

5. Safety

Conflicts between recreational and commercial traffic
Reliable marking of navigation hazards
Hazardous materials movements

RESEARCH PROJECT STATEMENT

TITLE: Revision of Water Project Evaluation Criteria

PROJECT STATEMENT: The benefit/cost ratio has been used historically to define priorities for water resource development projects. The use of this methodology has been widely criticized. It is asserted that many beneficiaries are not included or are not assigned proper shares of benefits. On the other hand, many environmental costs appear to be overlooked.

RESEARCH TASKS: Evaluate the current benefit/cost methodology and its current use. Analyze the process of developing benefit estimates and the allocation of those benefits among users. Also study the development of costs, particularly overlooked environmental costs. Recommend revisions in current benefit/cost methodology or develop a new method for evaluating projects.

URGENCY: HIGH (X) MEDIUM () LOW ()

REASON: Extremely important to project funding and allocation of user charges.

RECOMMENDED RESEARCH PERIOD:

RECOMMENDED FUNDING:

12 MONTHS

\$ 150,000

RESEARCH PROJECT STATEMENT

TITLE: Prioritization and Staging of Inland Navigation Improvements

PROBLEM STATEMENT: Corps of Engineers navigation project planning is presently done on a project-by-project basis. While it adequately deals with the needs of individual facilities, it does not relate these to the system needs as a whole.

RESEARCH TASKS: Analyze and project system, segment, and individual lock and dam traffic, based on national forecasts. Analyze present system, segment, and individual lock and dam capacity/deficiencies. Determine economic importance and benefit/cost of individual facilities/improvements. Prioritize individual improvements and stage according to the projected availability of funds.

URGENCY: HIGH (X) MEDIUM () LOW ()

REASON: Present congressional work on waterways funding will necessitate a rational and stable long-range prioritization method.

RECOMMENDED RESEARCH PERIOD:

RECOMMENDED FUNDING:

18 MONTHS

\$ 150,000

RESEARCH PROJECT STATEMENT

TITLE: Analysis of Major Facility Rehabilitation Projects

PROBLEM STATEMENT: There are clear guidelines and procedures available for the economic analysis of new lock and channel projects. However, future infrastructure needs will be predominantly for maintenance and rehabilitation of existing facilities. Techniques for analyzing such projects are less established. There is a need to determine the physical and functional consequences of various levels and timing of maintenance and rehabilitation efforts and to develop procedures for estimating the related costs and benefits.

RESEARCH TASKS: Identify and characterize maintenance and rehabilitation actions. Define the user consequences of various facility maintenance schedules. Determine the public and private cost allocation for each alternative. Establish data collection needs and methods. Develop techniques for estimating costs and benefits. Apply the analytical methods to prototype projects and interrelated systems of projects.

URGENCY: HIGH () MEDIUM (X) LOW ()

REASON: With the growing emphasis on rehabilitation of waterway projects, instead of on new construction, improved techniques are needed for the selection and justification of waterway rehabilitation projects.

RECOMMENDED RESEARCH PERIOD:

RECOMMENDED FUNDING:

12 MONTHS

\$ 100,000

RESEARCH PROJECT STATEMENT

TITLE: Comparison and Evaluation of Methods for Estimating Lock Capacity

PROBLEM STATEMENT: There are several models which are routinely used to estimate the traffic capacity of navigation locks. These models were developed to meet specific project goals, and they have not been subjected to a rigorous comparison on theoretical and empirical grounds. Thus there is little guidance as to which methods are preferred for various situations, and how to compare the answers obtained by various models.

RESEARCH TASKS: Select models for analysis (LOKCAP, LOCALC, and LOKSIM2 are suggested). Install models on a single computer facility. Obtain data for a few typical locks and analytical scenarios. Run each model for each scenario and compare the results. Determine the reasons for any significant differences noted. Make recommendations for model usage and any improvements needed.

URGENCY: HIGH () MEDIUM (X) LOW ()

REASON: The methods used are known to yield useful estimates. The comparison is needed to establish the current state of the art and identify any further research needs.

RECOMMENDED RESEARCH PERIOD:

RECOMMENDED FUNDING:

12 MONTHS

\$ 80,000

RESEARCH PROJECT STATEMENT

TITLE: Barge Traffic Safety in High Recreational Use Areas

PROBLEM STATEMENT: In recent years the issue of safety concerns from recreational and residential interests have surfaced in connection with potential terminal locations and potential fleeting sites. The general consensus of navigation "experts" seems to be that there has been a problem and that the problem is more perceived than real. However, there has not been a documented study that confirms this or quantifies the impact.

RESEARCH TASKS: Define the issue. Obtain historical safety data. Analyze data. Prepare Report.

URGENCY: HIGH () MEDIUM (X) LOW ()

REASON: The potential conflict between recreation and navigation appears to be growing; the development of navigation projects could be in danger without a study that presents the facts.

RECOMMENDED RESEARCH PERIOD: RECOMMENDED FUNDING:
12 MONTHS \$ 60,000

RESEARCH PROJECT STATEMENT

TITLE: Operational and Safety Constraints of Bridge Pier Clearances and Unmarked Dikes at High Water Conditions

PROBLEM STATEMENT: Two similar safety problems are proposed for research: (1) bridge piers present navigation hazards to inland waterway tows due to lack of design standards on horizontal clearance and the lack of a radar image from non-metallic piers; and (2) at times of high water dikes may be obscured, and the lack of navigation lights on the dikes produce a hazardous condition for tows.

RESEARCH TASKS: Assess the problem, frequency, and severity of accidents for problems (1) and (2) above. Develop proposals to solve the problem. Propose demonstration sites to implement solution. Estimate costs and benefits of proposed solutions.

URGENCY: HIGH () MEDIUM (X) LOW ()

REASON: Safety on waterways and cost reduction to aid financial health of barge industry.

RECOMMENDED RESEARCH PERIOD: RECOMMENDED FUNDING:
12 MONTHS \$ 100,000

RESEARCH PROJECT STATEMENT

TITLE: Yearbook of Projections of Inland Waterway Traffic and Related Transportation and Shipper Industries

PROBLEM STATEMENT: Many projections are developed each year based on different scenarios, assumptions, methods, and levels of effort. The assembly of this information is done independently by many researchers and operating personnel in business, academia, and government. Valuable resources could be saved and put to more advanced applications if a collection of current work is available on a periodic basis, such as annually. This will require the presentation and analysis of the most current and projected waterway traffic data which are essential to navigation planning and investment.

RESEARCH TASKS: Define the problem. Develop approaches to assemble the information. Develop proposed levels of analysis of information. Develop proposals for dissemination of information on various forms such as publications, machine readable systems, etc. Estimate costs and markets for each product. Prepare example in camera-ready and machine readable form.

URGENCY: HIGH () MEDIUM (X) LOW ()

REASON: The data would provide a common base of knowledge for business, academia, and government.

RECOMMENDED RESEARCH PERIOD:

RECOMMENDED FUNDING:

12 MONTHS

\$ 100,000

APPENDIX A

STRATEGIC PLANNING FOR WATER TRANSPORTATION
IN ILLINOIS

by

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I. Introduction

This paper represents an initial step in the development of a strategic plan for water transportation in Illinois. While states and port authorities have been conducting planning activities that could be considered a part of a strategic planning process, no overall strategic plan has yet been developed. In order to undertake a strategic planning process, a public agency must first have a basic understanding of what the process entails, how to go about developing a plan and how it is used once it is developed.

This paper draws primarily upon the study completed last December titled: A Guide to Strategic Planning for the Inland Barge and Towing Industry, conducted by the firm of Temple, Barker and Sloane and sponsored by the Maritime Administration and Dravo Mechling Corporation. The paper attempts to provide a brief overview of the strategic planning process for the private sector barge and towing industry and to apply the process to a public governmental agency involved in port and waterway development.

Strategic planning relies upon accurate information and realistic forecasts. Therefore, the last part of this paper discusses how Illinois has been involved in the development of a comprehensive data base on past, present and forecasted barge shipments as one element of the strategic planning process.

II. What is Strategic Planning?

The derivation of the word "strategy" provides insight to the process known as strategic planning. "Strategy" is derived from the Roman word "strategem" which had its origin on the field of battle. A strategem was a military plan devised by a legion or army for the purpose of outwitting or deceiving the enemy and gaining an advantage that would lead to victory. In modern business terms, a strategy is a plan carefully devised by a company to gain a competitive advantage over other companies, to secure a larger portion of a market and to achieve a greater financial return on resources invested in the business.

The key to strategic planning is that it represents a break from traditional systems planning in how it approaches the future. Strategic planning is a process which asks management what should the program aims of the company or the public agency be at some point in the future, such as in 5, 10, or 20 years. Given the current knowledge and experience of the agency, what strategies can be pursued today to maximize future opportunities and to overcome future constraints. It is a process that anticipates changes in the agency's environment and offers alternatives to current agency objectives and practices. Strategic planning is intended to improve the operating decisions of today by making them in light of future probabilities.

The application of strategic planning within state agencies would represent a break from traditional project oriented planning. While long-term planning has historically resulted in either vague conceptual plans or lengthy project lists, strategic planning from a government agency perspective is a means to determine and select today's programs that will achieve a desired purpose in the future. In this way, strategic planning is not limited to setting program direction or selecting capital projects for multi-year programs, but extends itself to the entire scope of legislative, budgetary

and operational efforts of the agency.

From the viewpoint of the governor, the chief executive officer of a state, the development of longer range perspectives by state agencies is desirable because the agencies may become more pro-active rather than reactive in meeting the challenges of the future. The development of longer range agendas, through the mechanism of strategic planning, can provide a framework for establishing the administration's leadership and vision of a better future for the people of the state.

It should be recognized that the essence of strategic planning is the process of developing the plan, not the plan itself. The strategic planning process and its outputs can assist planners and decision-makers by improving the awareness of the business environment and by better integrating the resources and providing direction for programs that will increase a state's efficiency and effectiveness. In the end, the strategic plan represents the product of a series of assumptions about the future, some of which are bound to be inaccurate. However, the dynamic, re-iterative process of strategic planning is critical to providing future direction for a state agency and for making necessary revisions to a strategic plan in response to changing conditions and a changing environment.

III. The Strategic Planning Process

In the study A Guide to Strategic Planning for the Inland Barge and Towing Industry, the strategic planning process is divided into three phases, as follows:

Phase I - Analysis of External and Internal Environments

Phase II - Strategy Development

Phase III - The Strategic Plan.

Following is a discussion of these three phases used in the strategic planning process from the perspective of a state agency involved in port and waterway planning and development.

A. Analysis of Environments

1. External Environment

Planning by government agencies generally is conducted to satisfy internal or statutory objectives. The central purpose of strategic planning, however, is anticipating external developments and events so that policies and programs can be shaped to take advantage of opportunities or to protect against foreseeable problems. The objective is the creative use of change. The types of factors to be considered by the

state agency in developing a strategic plan for water transportation include an assessment of water transportation facilities and services available to shippers; the market for water transportation including past use of the waterway system and forecasts of future waterborne shipments; competitive factors that may affect the availability of water transportation including competition among barge lines and from other modes of transportation including rail, truck and pipeline; the physical condition of the waterway system; and new technologies in materials handling and towboat and barge design.

2. Internal Environment

The state agency involved in port and waterway development should undertake an assessment of the long-range planning being conducted by state agencies involved in areas such as transportation, economic development, agriculture and mineral production. The following types of questions should be asked of these long-range plans: Are the plans targeted to provide sets of policies or specific project recommendations or a combination of policies and projects? What kinds of data are collected and what are the sources? How do the plans relate to current operational programs? Are the plans reflective of the state's financial condition and regulatory environment?

For a barge line, a forecast of demand for barge services for each of the company's market division is vital to long-range planning. Such a forecast should identify types and volumes of cargoes and river originations and destinations. From the state perspective, a forecast of commodity shipments is a critical factor in the determination of public investments in river terminals and in landside modes - railroads and highways - serving port areas. Several important steps in developing waterborne forecasts include a profile of historic traffic by commodity groups and by origin/destination patterns and a tonnage forecast that does not simply extrapolate from historic trends but, instead, analyzes the economic, political, competitive and regulatory factors that may be expected to affect future shipments.

B. Strategy Development

From the perspective of a barge line, strategies should be developed that, if achieved, will provide a competitive advantage over other barge lines and over other modes of transportation. These strategies should provide direction in determining the markets that the company will serve at some point in the future, what types of customer needs will be met and how the company will provide these services. The development of strategies is important in that they provide a basis for allocating the company's resources and in evaluating the company's performance in achieving its strategies. From the perspective of a state agency involved in water transportation, strategic objectives could identify the types

of planning and research programs to be conducted by the state, types of improvements to the state transportation system to reduce the cost and transit time for water shipments, and types of financial assistance that might be provided by the state for waterway improvement projects and local port capital projects.

C. The Strategic Plan

The Guide to Strategic Planning presents several business-type plans for a barge line in the implementation of a strategic plan. The strategic business plans, and their possible application to and use by a state agency, are as follows:

1. The Sales Plan identifies and prioritizes the needs of specific customers of the barge line and indicates the particular customers or market segments where sales efforts should be focused. A sales plan could be developed by a state agency which identifies and prioritizes the needs of major shippers, in particular, the inter-modal transportation facilities required by these shippers to maintain a competitive position.
2. The Competitive Plan states assumptions about the competition's behavior and determines specific actions the barge line should take to neutralize competitive activity. While state government is not in a competitive position for the shipment of goods, the state should analyze the potential competitive impacts of actions by the various transport modes on one another and on shippers. As examples, a state agency should analyze the potential impacts on barge companies of railroad mergers, acquisition of barge lines by railroads and acquisition of truck lines by railroads.
3. The Financial Plan develops short-term financial details that are used to develop the barge company's budgets and financial controls. From the state perspective, the financial plan should involve the determination of budgets required for staff salaries for persons assigned to water transportation programs, for technical studies to be conducted by consultants and for capital improvements to port facilities operated by port authorities. In addition, the financial plan should identify where public dollars may be needed to undertake port infrastructure improvements and improvements to and construction of railroads and roadways to ports.
4. The Organizational/Personnel Plan structures the company to meet the demands of the strategic plan and allocates human resources in order to best carry out the strategy. The state agency should prepare an organization plan that identifies the position of water transportation staff within the agency and determines the number of staff and their technical levels required to conduct the strategic planning programs related to water transportation and port development.

5. For corporations which have divisions other than a barge line, the Corporate Development Plan integrates the needs and contributions of the barge line with those of the entire corporation. For a state agency, the needs of port authorities and the water transportation system, along with the strategic plan for water transportation, should be integrated into overall statewide transportation and economic development plans and programs.

IV. Development of a Comprehensive Data Base on Inland Waterway Transportation in Illinois

The strategic planning process is driven by a comprehensive data base that should be developed and maintained on a current basis to provide input to the ongoing planning process and to assist the private company or state agency in responding to short-term developments or immediate crises that require on-the-spot decisions. At such times, the availability of comprehensive, timely and readily accessible data is critical to effective decisions and actions by a barge line or a state agency. This section of the paper discusses the types of studies conducted by IDOT to develop a data base on water transportation.

A. Directory of Water Terminals

Illinois has 1,100 miles of navigable inland waterways, providing Illinois with one of the largest commercial navigation systems among all the states. Because of the extent of the waterway system and the numerous terminals located on the waterways, the initial step in the development of a data base on water transportation involved an inventory of existing terminals. A Directory of Lake and River Terminals, which lists all 344 terminals in the state, was prepared to assist the state in port and waterway planning and to assist potential shippers in terminal selection.

For each terminal, the Directory provides such information as the terminal name, address, telephone, name of contact person, tonnage and commodities handled, highways or railroads which serve terminals, and terminals that are for public-use or private-use. Some highlights of the information about water terminals in the state are as follows:

- Illinois has 317 terminals which handle barges and 27 terminals which handle deep-draft domestic and international shipping via the Great Lakes and the St. Lawrence Seaway.
- In terms of commodities handled, 87 terminals in Illinois or 25 percent handle grain, 58 terminals or 17 percent handle petroleum products, 41 terminals or 12 percent handle sand and gravel, and 39 terminals or 11 percent handle coal.

- Most of the water terminal facilities are inter-modal transfer operations where bulk cargoes are transferred between landside modes and barges or deep-draft ocean-going and Great Lakes vessels. Analysis of inland access modes to 271 of the water terminals indicates that 47 percent have railroad and highway access, 38 percent have highway access only, 15 percent have rail access only.

B. Inland Waterway Commodity Flow Study

The next step in developing a data base on water transportation involved the conduct of a study entitled Inland Waterway Commodity Flow Study for the State of Illinois. The study presents a historical profile of barge traffic to and from Illinois. The three waterways that serve barge transportation - the Illinois, Mississippi and Ohio rivers - are divided into 10 segments, and for each segment the study indicates, by year, the total tons loaded to and unloaded from barges and the tons of individual commodities loaded to and unloaded from barges. Also, port hinterlands or market areas are identified for outbound grain and inbound fertilizer shipments using maps of the state. This analysis of port market areas involved direct contact with river terminals in each of the 10 segments to determine the extent of the geographic area served by water transportation for shipments of grain and fertilizer commodities.

The Commodity Flow Study was conducted by Data Resources, Inc. (DRI) a consulting firm which has access to the Corps of Engineers dock-to-dock data tapes. The annual waterborne commerce reports, published by the Corps of Engineers, do not indicate the tonnage of commodities loaded and unloaded in each individual state. Based upon recent contacts with the Corps of Engineers Waterborne Commerce Statistics Center, we have learned that the Corps is developing a "public domain data base" that may include state-to-state and county-to-county waterborne data. This type of data would facilitate port and waterway planning and marketing on the part of states, inland port authorities, private terminal operators and the barge and towing industry.

Some of the major findings of the Inland Waterway Commodity Flow Study are as follows:

- Illinois barge loadings increased from 42.9 million tons in 1970 to 56.8 million tons in 1978, an overall 32 percent increase or an average increase of 4 percent per year.
- Illinois barge unloadings declined from 32.6 million tons in 1970 to 28.9 million tons in 1978, an overall 11 percent decrease.
- Total Illinois barge loadings of 85.7 million tons in

1978 represented 16.0 percent of the national total 534 million tons classified by the Corps of Engineers as internal traffic.

- The two major commodities transported by barge are coal and grain. In 1970, coal accounted for 34 percent of the tonnage loaded or unloaded and grain accounted for 14 percent. By 1978, coal fell to 27 percent and grain increased to 22 percent.
- Grain traffic increased by 80 percent during the period, reflecting the policy of the U.S. to increase grain exports.

The tables in the Commodity Flow Study are presently being updated to include barge tonnage data by commodity for the years 1979-1982. IDOT will periodically update the study in order to maintain a comprehensive historic data base on barge transportation in Illinois.

C. Inland Waterway Commodity Forecast Study

As the next step in the development of a comprehensive data base, IDOT has contracted with DRI to conduct an Inland Waterway Commodity Forecast Study to develop forecasts of barge traffic on the inland waterway system of Illinois. The study should be completed by August 1985.

The forecast methodology for future inland waterway barge traffic will use three major steps, including: 1) identification of international, national and state production and consumption factors that will affect the need for water transport of coal, grain, fertilizer, petroleum products, sand and gravel and other commodities shipped by the river system; 2) development of commodity forecasts specific to Illinois for those major commodity groups handled on the inland waterway system; and 3) development of barge tonnage forecasts to and from the state for major commodities.

D. Illinois Coal: Markets and Delivery Systems

Late in 1982, IDOT initiated a continuing, in-house, freight planning program for the purpose of determining the location, use, condition and needs of the freight transportation facilities that handle the shipment of bulk commodities to and from the state. This type of information is to be used by IDOT in the determination of potential investments of public funds for improvements to key components of the freight transportation system. In addition, where freight service deficiencies are identified, the state will be in a better position to respond to requests from the private sector for assistance in funding facility improvements.

The first study, entitled Illinois Coal: Markets and Delivery Systems, was completed in April, 1983. The study identifies

Resources

Robert Heuser, University of Illinois
Barry Palmer, DINAMO/OVIA
Craig Philip, Ingram Barge Company

The moderator opened the session by describing the process used to generate the draft project statements and the Transportation Research Board's role in activities of this kind.

The panelists and those in attendance generally agreed with the research agenda developed at the Memphis conference. Some of the key issues raised by the panelists are summarized below.

Mr. Creelman pointed out the need for reliable data on the size and character of the inland fleet. The national data files on this are not compatible and provide conflicting results. There is no way to separate of the private fleet from the common carrier fleet. There is also no way to determine what equipment is in productive use and what equipment is laid up. He also noted the need for research to aid in avoiding future surprises such as those leading to the current depressed state of the industry.

Mr. Hanchey stated that the Corps of Engineers presently spends less than 1 percent of its funds on research. Since operation and maintenance now accounts for the largest share of both total and research expenditures, the Corps is looking harder at research payoff, and is emphasizing short-term benefits. Projects of interest include: lock congestion; port deepening, multiport analysis; regional economic development impacts; risk analysis; data collection coordination, efficiency, accessibility, and usability; and better forecasts of waterborne commerce.

Dr. Hauser noted the apparent lack of research on waterways as traditional economic markets. The question here is: What are the equilibrium price and output for the barge industry? Important issues relate to project priorities and data accessibility. He suggested the need for further research on barge rate setting mechanisms, such as a futures market.

Mr. Palmer stated the perspective of his organization is a commitment to obtaining modernization and rehabilitation of the Ohio River system. Efforts at project analysis and prioritization would benefit greatly from research to develop a standard method for determining lock capacity. This would focus attention on system needs rather than methodology, and would help assure that all potential projects are evaluated fairly.

Dr. Philip focused on the current dire straits of the barge industry. Priority research would address the imbalance of vessel supply and demand, prioritizing infrastructure renewal and carrier participation in this process, and inter-modal realignments. He also suggested that adequate and more timely data on waterborne commerce could be obtained by sampling rather than the current complete reporting of all traffic, and that the performance monitoring system data collected by the Corps at all locks could

the transportation facilities used to move coal to, from and within Illinois in 1980 and the facilities which are expected to carry coal in 1990. The analysis of the 1980 system was based on actual traffic patterns, while long-term contracts between coal companies and utilities were used to forecast the 1990 coal markets and transportation facilities that will be needed to serve these markets.

In 1980, utility contracts provided for the consumption of 42.8 million tons of Illinois coal, and long-term utility company contracts through the year 1990 are projected to require 55.3 million tons of Illinois coal, an increase of 29 percent. Total coal traffic in Illinois in 1980, including contract, short-term and spot market shipments, was 51.0 million tons and total coal traffic in 1990 is projected to be 75.5 million tons, an increase of 48 percent.

The water transport system in Illinois is vital to the efficient movement of coal to and from the state. In 1980, 21.3 million tons of coal were shipped by water, of which 19.3 million tons were shipped by barge on the inland waterways and 2.0 million tons were shipped from the Port of Chicago to other Great Lakes ports. Waterborne shipments of coal are expected to increase only slightly by 1990, to about 23.0 million tons. While the demand for Illinois coal is projected to increase significantly from 1980 to 1990, most of the increase in demand will be from utilities in Indiana and Missouri, which will require increased rail shipments of coal but have minimal impact on barge shipments.

E. Grain Transportation Study

IDOT is completing an analysis of the grain transportation system in Illinois. The initial step in this study involved the mailing of 1,350 questionnaires to river terminals, rail elevators and grain processors. The importance of the inland waterway system to Illinois agriculture is shown by the fact that each year, 90% of the Illinois soybeans produced for export and 77% of the corn produced for export are transported to the Gulf ports by barge.

APPENDIX B

WATERWAY TRANSPORTATION RESEARCH NEEDS PANEL DISCUSSION

At the 1986 TRB Annual Meeting a panel discussed the draft research needs statements. The panel members were:

Michael S. Bronzini, The University of Tennessee
(Moderator)

William H. Creelman, Deputy Maritime Administrator for
Inland Waterways and Great Lakes

James R. Hanchey, U.S. Army Engineer Institute for Water

be a source for quick tracking of commodity traffic changes.

All in attendance agreed that finding the funds to conduct the needed research poses a major challenge.

APPENDIX C

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