

Navigation Systems

Presented to

Infrastructure Workshop

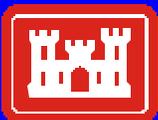
13 March 01



NAVIGATION BUSINESS PRACTICE

Mission Statement:

*“To provide safe, reliable, efficient, and environmentally sustainable waterborne transportation systems (channels, harbors, & waterways) for movement of commerce, national security needs and recreation.”**



*Department of the Army Civil Works Program Strategic Plan, FY2001-2006, March 2000 Draft

Desired End State For Navigation System*

Navigation infrastructure fully capable of supporting national maritime requirements by 2020, or when needed, and consistent with the Navigation Vision 2020.

* Murder Board, 2000



Identifying Present and Future Navigation Needs

- 1992 Innovations for Navigation Workshop
- 1996 USACE Vision Workshops
- 1999 MTS R&D Conference
- 2000 Murder Board Review
- **2000 Innovations for Navigation Workshop**
- 2000 Senior Leaders Conference
- 2001 Infrastructure Workshop
- 2001 MSC Initiative
- 2001 Virtual Forums
- 2001 MTS R&D Conference
- March 2001 Business Area R&D Review



[INP Homepage](#) | [ERDC Homepage](#)

USACE Innovations for Navigation Workshop *Present and Future Capability Needs*

December 5-7, 2000
U.S. Army Engineer Research
and Development Center (ERDC)
Vicksburg, MS



Purposes of the workshop were to:

- Share Districts' experiences in innovations in planning, design, construction, operations, and maintenance of navigation projects.
- Identify present and future technology capability needs for high-performance navigation projects.



Identifying Navigation Needs and Products

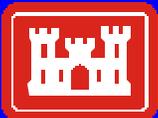
NAVIGATION

STRATEGIC RESEARCH AND DEVELOPMENT PLAN FOR THE U.S. ARMY CORPS OF ENGINEERS

Draft 8 February 2001

GOAL: The purpose of this plan is to ensure that the U. S. Army Corps of Engineers (USACE) Research and Development (R&D) Program provides the knowledge and tools to design, construct, operate, and maintain Federal navigation projects consistent with the USACE Navigation 2020 Vision¹.

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Trends & Issues: External

Global trade will increase faster than overall economic growth and result in greater demands on our navigation and transportation systems.

- **Deep draft commerce will double by 2020, to more than 2 billion tons. Containerization will continue to increase its share of deep draft traffic, approaching 10 percent of total traffic.**

- **Inland commerce increases plus saturation of land-based transportation modes will increase pressure on inland navigation system. Inland system transport will increase to more than 800 million tons, with increased**

- **Vessels will get bigger and faster. The number of 45-75 ft draft vessels will increase, and the largest deep draft container vessels may exceed 12,000 TEU. Barge length and widths will increase and there will be demand for 12-ft-plus draft inland channels.**



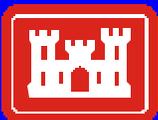
Trends & Issues: Corps Operations

- **Emphasis on Regional Sediment Management and cumulative impacts across multiple projects will increase.**
- **Cost sharing and sponsorship with local agencies will continue.**
- **Changes in intermodal demand and usage will alter benefits/cost regionally and affect demand for project maintenance.**
- **More automated systems will require Corps employees to be better educated and undergo frequent retraining.**
- **...**



Trends & issues: Environmental Quality

- Air quality considerations will influence more navigation projects' viability and constrain dredging.
- Contaminated sediment issues will continue to be an important consideration in new and existing projects. New contaminants and changing threshold criteria are expected to be of concern.
- The danger of increased introduction of non-indigenous species in our navigation systems will increase with increased global trade.
- Environmental responsibilities and climate variability will shift priorities among water resource uses and project benefits.
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Trends & issues: Physical Factors

- Accelerated sea level rise will either be confirmed or refuted by experience. If accelerated sea level rise does occur, dramatic consequences can be expected for several Corps' mission areas, including possible rapid funding increases.
- Greater variability be seen in climate – greater extremes of rainfall and storm events and longer/shorter navigation seasons in ice-affected areas.
- Use and demand for dredged material as a valuable resource will increase.
- Increased competition for water supply among multiple uses will occur as a result of climate variability and increased demand.
- Subsidence issues will arise in more locations.



SUMMARY

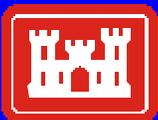
NAVIGATION R&D PRIORITY NEEDS

- Proactively manage sediments on regional basis.
- Adopt state-of-the-art materials, designs and methods for navigation system components.
- Manage watersheds as multi-objective systems.
- Be able to rapidly evaluate system capacity improvements, including deeper and wider channels and locks plus new MTS approaches.
- Seek environmental enhancement opportunities and proactively minimize possible adverse consequences.
- Adopt updated planning and project evaluation procedures for future commerce and national priorities.
- Employ state-of-the-art dredging and disposal technology.
- Employ equipment and technology for real-time monitoring/analysis.
- Be able to deal with complex pollutant/contaminant issues.
- Critical tactical needs



Adopt state-of-the-art materials, designs and methods for navigation system components

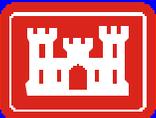
- Assess and improve industry standards
- Design codes for underwater
- Geotube improvements
- Improved corrosion protection and mitigation systems (gates, pipes, valves, mechanical equipment)
- Vertical loads on guide walls
- Alternative power supplies for the operation of locks and dams
- ...



NAVIGATION BUSINESS PRACTICE

Future Operating Capabilities:

1. Capability to make the existing system work better by: **INFRASTRUCTURE ENHANCEMENTS** to support projected 2020 traffic demands and ensure a high level of reliability.
2. Capability to provide new system components that offer: **INTEGRATED NAVIGATION SYSTEM DESIGN AND MANAGEMENT** for the Navigation 2020 Vision -- a safe, efficient, effective, reliable, and environmentally responsible system.
3. Capability to perform: **REGIONAL SEDIMENT MANAGEMENT** to optimize function of the system, reduce costs, and increase benefits.
4. Capability to conduct: **DREDGING AND DREDGED MATERIAL MANAGEMENT** to minimize costs and maximize benefits.



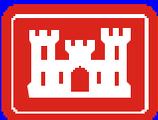
Future Operating Capabilities

1. **Capability to make the existing system work better by: INFRASTRUCTURE ENHANCEMENTS to support projected 2020 traffic demands and ensure a high level of reliability.**

- Proactively adopt state-of-the-art materials, designs and methods for navigation system components.
- Be able to rapidly develop system capacity improvements, including deeper channels and locks plus new MTS approaches.
- Employ equipment and technology for real-time monitoring/analysis.
- Proactively adopt state-of-the-art materials, designs and methods for navigation system components.
- Employ quantitative methods to assess the impact of proposed resources on system performance.
- Contribute to the development of a national navigation system.
- Adopt information technologies to improve system performance.

Benefits

- Improved system performance and safety
- Proactive maintenance to extend effective life of existing facilities.
- Minimized risk and disruption to traffic.
- Reduced costs for projected deep-draft ports.
- Increased capacity of inland system.



Future Operating Capabilities

2. Capability to provide new system components that offer: **INTEGRATED NAVIGATION SYSTEM DESIGN AND MANAGEMENT** for the Navigation 2020 Vision -- a safe, efficient, effective, reliable, and environmentally responsible system.

- Proactively manage sediments on regional basis.
- Proactively adopt state-of-the-art materials, designs and methods for navigation system components.
- Be able to rapidly develop system capacity improvements, including deeper and wider channels and locks plus new M/S approaches
- Seek environmental protection and minimize
- Adopt new technologies for future comm
- Employ equipment monitoring/anal

Benefits

- Improved system performance and safety
- Proactive monitoring and maintenance
- Real-time information
- Maximized operational period for wider range of conditions
- Improved water allocation strategies



Future Operating Capabilities

3. Capability to perform: REGIONAL SEDIMENT MANAGEMENT to optimize function of the system, reduce costs, and increase benefits.

- Proactively manage sediments on regional basis.
- Manage watershed
- Seek environmental
- proactively
- Engage equipment
- monitoring/analy
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Benefits

- Better maintained channels with less dredging
- Increased beneficial use of dredged material.
- Reduced bank and shore erosion.
- Stabilized wetlands
- Enhanced environmental protection & restoration
- High performance projects.



Future Operating Capabilities

4. Capability to conduct: DREDGING AND DREDGED MATERIAL MANAGEMENT to minimize costs and maximize benefits.

- Employ state-of-the-art dredging and disposal technology.
- Seek environmental enhancement opportunities and proactively minimize possible adverse consequences.
- Employ equipment and technology for real-time

- Be capable of monitoring and controlling dredging operations.
- Be capable of producing high quality dredged material.
- Be capable of producing high quality dredged material.
- Possess the capability to handle

Benefits

- Improved and more efficient dredging, transport, and placement.
- Reduced quantity of contaminated sediments & lower cost per unit for special handling.
- Expansion of operational windows.
- Improved environment and public health.
- High performance projects.



Navigation Needs

Infrastructure R&D Example Products

- Proactively manage sediments on regional basis



- Regional geomorphology-dynamics, groundwater modeling, man/ nature structure reliability

- Adopt state-of-the-art materials, designs and methods for navigations system components



- Web-guidance for innovative materials, design, construction and maintenance repair techniques, rapid specification

- Manage watersheds as multi-objective systems



- Subsurface, groundwater, and morph-dynamics models integrated to support ecosystem demands



Navigation Needs

Infrastructure R&D Example Products

- Be able to rapidly evaluate system capacity improvements, including deeper and wider channels and locks plus new MTS approaches



- Scientific simulation of realistic structural response, morphodynamics of channel erosion and stability

- Seek environmental enhancement opportunities and proactively minimize possible adverse consequences



- Green-sustainable construction materials, lubricants, tools and viable, stable wetlands & disposal sites, monitoring, remediation

- Adopt updated planning and project evaluation procedures for future commerce and national priorities



- HAZUS with updated modules for natural and man-made hazards



Navigation Needs

Infrastructure R&D Example Products

- Employ state-of-the-art dredging and disposal technology



- Advanced geophysics, material additives, geosynthetics, ecosystem subsurface support

- Employ equipment and technology for real-time monitoring/analysis



- Automated monitoring with permanent, or expedient sensors, rapid analysis tools

- Be able to deal with complex pollutant/contaminant issues



- Subsurface conceptualization tools, non-intrusive investigations, real-time monitoring, groundwater modeling for predicting remedial effectiveness

