Inland Waterways Users Board Briefing Coastal and Hydraulics Laboratory February 19, 2009

ERDC-CHL Inland Navigation Activities Mississippi Basin



Organization Chart





Recent CHL Inland Navigation Projects within the Mississippi River Basin





Navigation Mission

- Conduct research regarding the planning, design, operation, management, and maintenance of navigation channels, locks, ports, and waterway systems.
- Provide safe and efficient marine transport, cost effective systems, and environmentally acceptable conditions.
- Employ analytical techniques, numerical models, simulator models, physical models, field investigations, and consultation services.



Navigation Physical Models



Site specific physical model to assist in planning and designing project. Areas of expertise include:

- Lock approaches
- Navigation span location for bridges
- Floodgate locations





Olmsted Hydraulic Model Studies





Lock Filling and Emptying Models





- Lock chamber additions and extensions to accommodate increased tonnage capacity
- Studies conducted to determine safe filling and emptying operations
 - Chamber performance
 - Cavitation potential
 - Safe conditions in the lock approaches (Vortex formation)
- Multiple designs can be evaluated



Numerical Modeling

- 1D 2D and 3D modeling capabilities \bigcirc
- 3D flow at hydraulic structures \bigcirc
- **Navier-Stokes solutions** \bigcirc
- Adaptive Hydraulics (ADH) Model \bigcirc













Field Investigations









Navigation Systems / Continuing GI R&D Program

Deep Draft – Inland Navigation







Program Manager: James Clausner Technical Director: Jeff Lillycrop



Navigation Systems "An Integrated Program"

Components

- Navigation Hydrodynamics – CHL, CRREL, ITL
- Infrastructure (GSL, ITL,CRREL, CERL)
- Economics (IWR) and Risk (IWR, CHL, ITL)
- Hydropower (HDC, NWD, CERL)
- Efforts integrated with CIRP, MCNP
- Industry Input













Inland Navigation Focus Area











Focus Area Leader: John Hite



Inland Hydrodynamics Work Area Challenges

- Inland Traffic Increasing/Capacity at limit
- Need to increase capacity and reliability
- Safer and more efficient lock approaches
- Emergency repairs increasingly likely
- Ice/debris reduce capacity, cause accidents
- Improved fill/empty systems
- Reduce construction costs of new/rehabed locks







Inland Navigation Infrastructure Work Area

Challenges

- Most locks are approaching or have exceeded their 50-year economic life
- Unscheduled failures of steel locks gates, concrete lock walls, and pumps and motors reduces lock reliability, system efficiency and capacity
- Understand existing condition, relation to strength capacity and remaining service life to effectively plan and schedule repairs, major rehabilitations and replacements







Inland Nav Safety Initiative

• Purpose:

 An initiative that will require U.S. Coast Guard (USCG), USACE, navigation industry and other Federal agency cooperation and collaboration to ensure increased safety, security and reliability of our navigation projects along our inland and intracoastal waterways.



R&D Efforts Supporting Nav Safety Initiative

Real Time Current velocity (RTCV) Meters

LOMA







R&D Efforts Supporting Nav Safety Initiative, Con't

Bullnose Energy Absorption System





Inland Navigation Technology Workshop, Feb 3-4 2009

Theme: Digital technology's impact on safety and efficiency

- Attended: 60 people from Corps (24), Industry (27), CG, NOAA, Academia
- Sessions on AIS, Corps Navigation Safety Initiatives, Industry Initiatives, Breakout sessions on Vision of Inland Waterways Operations in 2013, 2020
- Presentations and Summary Report on web site in near future

