

NAVSEA PMS325 Support Ships, Boats and Craft Program Office

Mr. Frank Leban
Strategic Sealift R&D Program

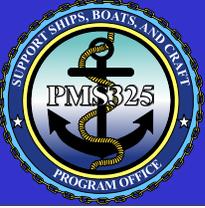
28 Jan 2004





Sealift Tasks Completed/Terminated in FY03

- AS/RS Sea Basing Concept Development
- Automated Container Handling Demonstration
- INLS Spanning Ramp
- Improved Rider Block Tagline System (IRBTS)
- Laser Rangefinder and Electronic Display System (LAREDS)
- Reconfigurable Spaces
- RO/RO Ramp To Platform Interface
- Sea-based Wave Attenuation Technology/
Ship-Attached RIB
- Stereovision for Crane Operators
- UNREP Rigging Winch
- Vehicle Stowage and Handling



Skin-to-Skin Demonstration



Objectives:

- To demonstrate the feasibility of conducting underway mooring and fendering of MSC/MARAD vessels
- Demonstration will also include Sealift R&D projects on shipboard crane controls, lighter fendering and mooring, and ship roll mitigation.

Progress and Status:

- Demonstration conducted Oct 1
 - Demo included Flickertail State and Cornhusker State
 - Skaugen PetroTrans provided planning support & supplied Mooring Master & support crew to conduct the operation
 - PCS crane & LAREDS systems used during demo

Schedule:

- | | |
|-------------------------|--------|
| • Draft Report | Nov 03 |
| • 15 Min Video Produced | Nov 03 |
| • Final Report | Jan 04 |



Automated Container Handling Demonstration



Objective:

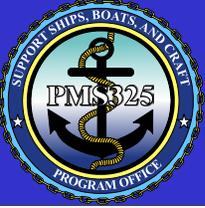
- Design, fabricate and demonstrate an automated system for movement and selection of 20ft ISO containers.

Progress and Status:

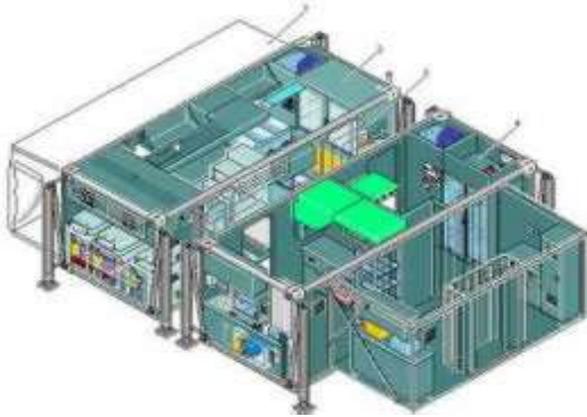
- SOW developed
- Ship visits to view existing shipboard pallet handling systems
- MSC attempting to obtain funding for follow-on phases
- MSC lead, NSWCCD supporting
- Solicitation for design phase scheduled to be issued through MSC by end of July
- RFP released on 21 Aug 03
- Contract awarded to Benedict Engineering on 30 Sept 03

Schedule:

- | | |
|--|--------|
| • Power Systems Requirements | Nov 03 |
| • Structure Load Requirements | Nov 03 |
| • Structure Design and Validation | Dec 03 |
| • Transfer Unit & Spreader Design | Jan 04 |
| • Power Distribution Design | Jan 04 |
| • Final Report, Phase II & III Test Plan | Jan 04 |
| • Animation of Concept | Jan 04 |



Reconfigurable Spaces



Expandable
Containerized
System

Objective:

- To investigate and develop systems allowing for alternate uses of ship space

Progress and Status:

- Researching existing habitability standards
- Identifying Seabasing functions best suited for reconfiguration
- Identifying range of container options
- Investigating options other than containerized concepts
- Developing a matrix of ship space vs. ship space to identify possible conversions and required changes

Schedule:

- | | |
|----------------------|---------|
| • Develop BAA | Q1 04 |
| • Issue BAA | Q2 04 |
| • Concept evaluation | Q2-3 04 |
| • Fabricate and Test | FY05-06 |

Not Funded



RO/RO Ramp To Platform Interface



Objective:

- Develop an interface system between the ship ramp and RRDF (Roll On/Roll Off Discharge Facility) to enable sea state 3 JLOTS RO/RO operations

Progress and Status:

- Two **passive** motion compensator concepts selected from BAA solicitation
- NPS evaluation program completed
- Neither concept deemed suitable for further development
- Developing Gov't in-house design to determine feasibility of an **active or hybrid** compensator system

Schedule:

- Participate in MARAD ramp structural testing Sep 03
- Complete analysis of active compensator performance criteria Dec 03
- Complete preliminary concept design Jan 04
- Complete concept design feasibility/practicality analysis Feb 04
- Final concept design Mar 04
- Issue RFP May 04
- Award Contract **Not Funded** Jul 04
- Detailed design / prototype fab. Aug-Dec 04



Sea-based Wave Attenuation Technology/ Ship-Attached RIB



Two XM02 RIBs in a V-tow behind barge

System Description:

Army Corps of Engineers' two XM2002 Rapidly Installed Breakwater (RIB) sections. Each is 200-ft long and 28-ft in diameter, weighs 15,000 lbs empty, and is pressurized to 2.5 psi.

Objectives:

- For MPF(F), reduce waves acting on ILP
- For LMSRs, reduce waves acting on RRDF to reduce lighter motion and ramp hinge loads

Progress and Status:

- V-configuration and nose-to-tail tow tests at Pt Canaveral and off Cocoa Beach (Dec 02-Jan 03)
- Performed detailed cleaning and inspection (May 03)
- Removed 3 truckloads of support equipment from Pt Canaveral and transported to NSWC-PC. Attempted truck loading of a RIB was unstable. (Sep 03)
- Lifting bars and supporting frames built to safely load and transport RIBs (Nov 03)
- Both RIBs transported to NSWC-PC for storage awaiting final program decision (Dec 03)

Potential Schedule: (Based on a 1 Jan 05 start)

- | | |
|--|---------|
| • Complete test plan (specific ship) | Feb 05 |
| • Complete refurbishment | Mar 05 |
| • Design & fabricate ship attachment and deployment hardware | June 05 |
| • At-sea demo exercise | Sep 05 |



Stereovision for Crane Operators



System Description:

- Stereo camera system with head mounted display allows crane operator to view working area from multiple angles with enhanced depth perception
- Camera locations allow otherwise obstructed work areas to be seen

Objectives:

- Improve operator's view of working area, enhancing safety & productivity

Progress and Status:

- Prototype system installed and tested on Flickertail State FY 00
- Second system installed at NAVCHAPGRU facility for further training and evaluation Q2 03
- Installation and testing of alternative displays postponed/cancelled TBD

Schedule:

- Continued operator training and testing TBD

Not Funded



UNREP Rigging Winch



LINE HANDLERS ON CRU/DES WITHOUT RIGGING WINCH



LINE HANDLERS ON CRU/DES WITH RIGGING WINCH

Objective:

- To reduce the manpower required to connect UNREP rigs and to increase personnel safety

Progress and Status:

- FY02 at-sea testing indicated rigging modifications successful, but existing winch power insufficient
- Prepared preliminary design for advanced technology Rigging Winch (Variable Frequency Drives, Permanent Magnet Motors, Position Sensing, etc.)
- Rigging Winch capabilities/performance increased to meet Heavy Unrep requirements

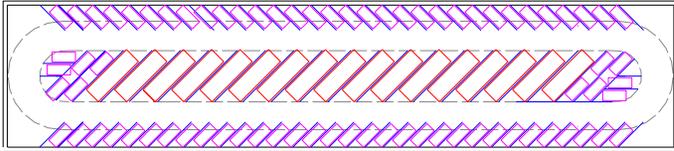
Schedule:

- | | |
|--------------------------------------|---------|
| • Develop preliminary design package | Sep '03 |
| • Fabricate prototype | TBD |
| • At-sea testing | TBD |
| • Final design package | TBD |

Not Funded



Vehicle Stowage and Handling



Potential 100% Selective Offload Arrangement



Automated Parking Garage

Objective:

- Determine impact of selective offload on vehicle stowage space requirements

Progress and Status:

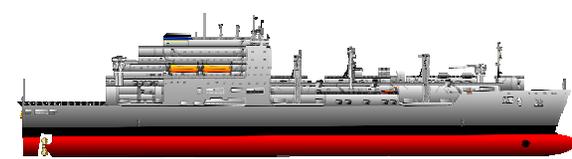
- Identified vehicle list and footprints
- Designed stowage arrangements
- Investigated various ASRS options
- Identifying metrics for evaluation
- Partnered with ONR Center for Innovation in Ship Design (CISD) Sea Basing Team
- Developing evaluation model for arrangements
- Testing stowage arrangement concepts in ICODES

Schedule:

- | | |
|---------------------------------|--------|
| • Develop concept illustrations | Nov 03 |
| • Evaluate stowage factors | Dec 03 |
| • Evaluate ship impacts | Dec 03 |
| • Task completion | Dec 03 |
| • Issue final report | Dec 03 |

Completed

FY04 Sealift Task Continuations & New Starts*



* Subject to N42 approval



High Speed Sealift



Objective:

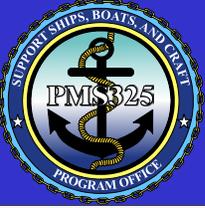
- To investigate critical technologies and develop criteria to enable development of high speed commercial and military sealift ships.

Progress and Status:

- HSS TDP critical technologies
- Hull-propulsor interaction
 - Completed CFD analysis Q3 03
 - Model test initiated Sep 03
 - Structural design
 - Completed trimaran load predictions Q3 03
 - Completed steel baseline design Q4 03
 - Continue criteria development
 - HSS AoG and ESC Support
 - Tech support to AMCS study ongoing
 - HSS technology office initiative
 - Support HSV experimentation
 - HSV-X1 seakeeping & structural trials Q2 03
 - HSV-2 instrumentation & trials planning Q4 03

Schedule:

- AMCS study tech support Q1-2 04
- Complete Phase 1 hull-propulsor integration model test Q1 04
- Initiate composite structural design Q1 04
- HSV 2 technical trials Q2 04



Omni-Directional Vehicle (ODV) Technology



NSWC-PC 8klb ODT aboard CAPE GIRARDEAU

Objective:

To reduce intership cargo movement time and increase stowage density by producing a more maneuverable vehicle capable of autonomous control.

Focused on two efforts:

1. Development of an 8klb omni-directional side loader (ODSL) prototype
2. Increase ODSL prototype capacity to 10klb

Progress and Status:

- Identified COTS chassis and lift system compatible with existing omni wheel for ODSL
- Completed dockside operational evaluation with 8klb ODT at Pt. Hueneme
- Performance Spec and Preliminary Design delayed due to personnel availability for 4th Quarter NAVSEA Demo
- Design study review and spec reading held at NSWC PHST Earle (November)
- ODSL Performance Specifications (in review)
- ODCM Feasibility Study (in review)

Proposed Schedule:

- | | |
|---|--------|
| • ODSL Design Review | Mar 04 |
| • Prototype ODSL fabrication and functional tests | Sep 04 |
| • Display 8klb ODSL at ExWar NDIA | Oct 04 |
| • 10klb capacity omni-wheel | Sep 05 |
| • ODSL Certification Tests | Sep 05 |



Pendulation Control System



System Description:

- Control system and sensor package for standard shipboard cranes that automatically compensates for ship motions

Objectives:

- Incorporate operational enhancements and develop acquisition documentation for the Pendulation Control System in single crane mode with lighter tracking
- Develop Technical Package for adoption on LMSR & MPS cranes, including dynamics characterization
- Develop PCS for Twin/Quad mode operation

Progress and Status:

- Successfully completed ATD pierside technology demonstration at NWS Yorktown, Cheatham Annex (CAX) for single crane operation
- Demonstrated capability to safely operate crane while ship rolling up to ~1.5 degrees.
- Received ABS approvals for PCS operation at up to SWL of crane
- Demonstrated single-mode PCS during at-sea demo

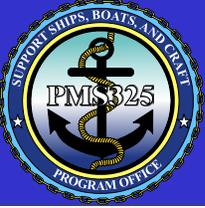
Schedule:

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| • PCS Software Task Awarded | Apr 03 |
| • At-sea evaluation of PCS | Sep 03 |
| • Begin PCS Software Testing | Dec 03 |
| • Servo-valve Data Collection | Feb 04 |
| • JLOTS '04 PCS Demonstration | Feb 04 |
| • DELMAR '04 | May 04 |
| • Implement Twin Mode | Q4 04 |

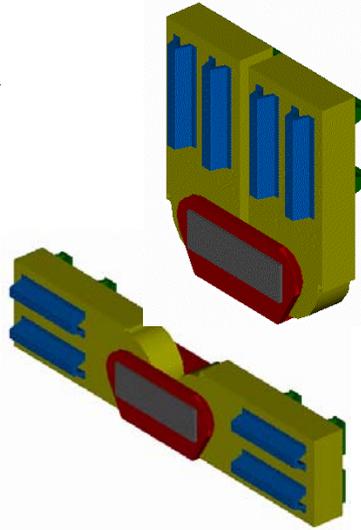
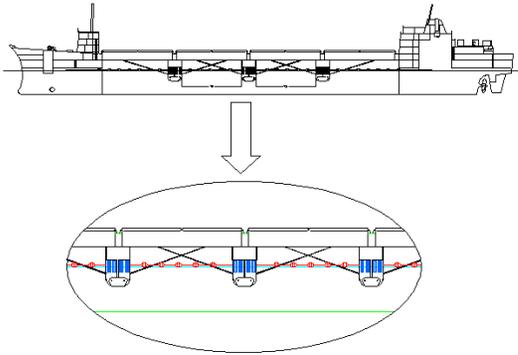


Add'l Crane Improvement Efforts

- **Spreader Bar Messenger Frame**
- **Alternative Swing Sensor/Alongside Vessel Tracker**



Ship/Lighter/Platform Interface Deep Draft Composite Fender



System Description:

- High strength composite construction with COTS cushion elements
- Deep draft & high inertia stability design
- Configured for use with wide variety of lighters
- 6' standoff distance
- Highway transportable

Objective: Develop a Sea State 3 capable docking and mooring systems for JLOTS ships, lighters, and platforms

Progress and Status:

- 3 DDCFs constructed and delivered in Q1 FY03
- Initial tests conducted w/Flickertail State
- Test results led to modifications to deployment and mooring system, design and installation completed in Q2 FY03
- Field testing conducted in Oct 03. New features tested, sea state 3 effectiveness proven, problem areas identified

Proposed Schedule:

- Modifications planned to allow DDCF use with HSV-2 Swift
- Additional field testing in JLOTS 04 Q2 04
- Acq Spec Development Q3 04



Ship Roll Mitigation System (SRMS)/ Ship Roll Stimulation System (SRSS)



SRMS/SRSS installed in the T-ACS 5 Hold

•System Description:

Ship Roll Stimulation System hardware with control system modified to function as an active anti-roll tank

•Objective:

Demonstrate the benefits of ship roll mitigation, particularly in long period waves

Progress and Status

- 1/8-scale model force roll oscillation test completed
- Installed on T-ACS 5
- Tested during 4th Qtr Demo
 - Distinct improvement of Passive SRMS vs no roll mitigation
 - Qualitative benefits noted (crew's comments) of Active SRMS over Passive SRMS (inconclusive due to ship roll angles being too small and no environmental data)

Proposed Schedule

- | | |
|---|--------|
| • JLOTS 04 – TBD | Feb 04 |
| • Test full-scale SRMS aboard T-ACS 5 in Sea State 3 or above | TBD |



Vacuum Mooring Technology

Mooring Systems Ltd' s pier-side system



Objectives

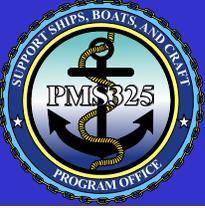
- Determine the performance requirements and operational issues for a skin-to-skin mooring system for MPF(F).
- Identify the advantages and disadvantages of vacuum mooring in comparison with other traditional and potential mooring systems.
- Prepare a plan for developing a system suitable for MPF(F).

Proposed FY04 Efforts

- Coordinate with CSC modeling validation
- Develop performance/design criteria
- Develop a 'roadmap to deployment'
 - Detailed program plan
 - POA&M for prototype demonstration
- Static two-ship interface analysis, MPF(F) with super-containership, T-AKR 300, T-AKE, T-AOE to estimate allowable roll
- Demonstrate skin-to-skin mooring using existing shipboard system on the M/V ARATERRE in calm water

Proposed Schedule

- | | |
|--|--------|
| • Initial characteristics for CSC model | Mar 04 |
| • MPF(F) static interface analysis | May 04 |
| • Detailed POA&M for vacuum mooring demonstration and deployment | Jun 04 |
| • Preliminary mooring loads analysis | Jul 04 |
| –Vac. Mooring w/ & w/o Roll Mitigation | |
| –Conv. Mooring w/ & w/o Roll Mitigation | |
| • Comparative analysis of vacuum mooring vs other systems | Aug 04 |
| • ARATERRE Demo – TBD, possibly as early as Feb or Mar 04 | |



Wireless RAnging, Phone and Data (WRAPD) Link



System Description:

- Currently, each unit is a 42-in wide, 30-in tall, 9.5-in deep box housing 2900 LEDs (2500 w/ a 50-deg wide beam and 400@10-deg) and is and weighs 160 lbs.
- One unit to send/receive on each ship (two on supply ship for two ship UNREP)
- Minimum range requirement: 300 ft

Objective: To increase safety and reduce manning by fielding a wireless ranging system that provides phone and data links.

Progress and Status:

- Initial clear weather land-based test (Apr 03)
 - Voice satisfactory to 350 ft
 - Ranging to 225 ft (75 ft short)
- Fog and rain chamber tests (May 03)
 - Voice passed, ranging failed
- Decision made to replace ranging LEDs with lasers to meet distance reqmt (Aug 03)
- Small boat test (Dec 03)
 - Ranging compared well with Bushnell rangefinder
 - Voice unsatisfactory due to system noise

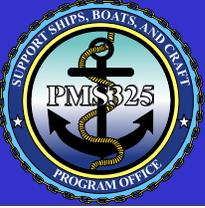
Proposed Schedule:

- Debug system to return voice to Apr 03 performance Jul 04
- Ship test Aug 04



Joint Modular Intermodal Container

- **16 JMIC = 1 TEU**
- **Test articles for shipboard material handling demos**
- **OPLOG Integration Team funding development**



Back-ups



AS/RS Sea Basing Concept Development



Objective:

- To investigate suitability of commercial material handling practices and equipment to enable sea basing

Progress and Status:

- Modeling tool comparison showed Extend™ model is capable of modeling material flow through the MPF(F) vessels / squadrons
- FY03 funding allocation reduced to help fund Q4 At-Sea Demo
- Outlining RFP for COTS based ASRS to culminate in afloat demo

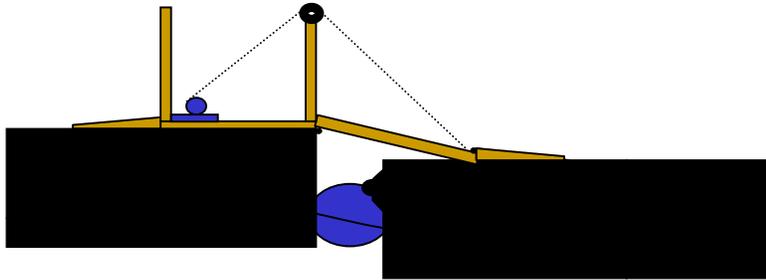
Schedule:

- Develop detailed RFP Q4 03 – Q1 04
- Issue RFP Concept Development Q2 04
- Award Contract(s) Q2 04
- Evaluate & Downselect Concept Design(s) Q4 04
- Award Follow-on Contract for Prototype Design, Fabrication and Shipboard Testing Q1 05

Not Funded



INLS Spanning Ramp



Objective:

Discharge cargo from RO/RO Discharge Facility to causeway ferry & other JLOTS systems (NL, MCS, ELCAS-M)

Support NAVFAC INLS Acquisition

Progress and Status:

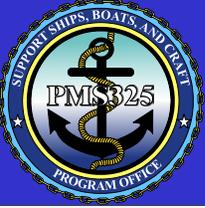
- Concept Development Q4 '02
- Prototype Design Q1 '03
- Prototype Fabrication Q4 '03
- Testing Q4 '03

Schedule:

- Prototype testing completed Q4 03
 - Deployment/assembly issues
 - Trafficability issues
- Design data transitioned to INLS Program

Completed

Q4 03



Improved Rider Block Tagline System (IRBTS)



IRBTS Installation aboard the USNS MENDONCA (T-AKR 303)

System Description:

The IRBTS is a computer-based crane operators aid which integrates the control of the rider block liftline and tagline with the hoist and luff commands at the operator's discretion.

Objective:

To increase safety and operator efficiency by automating the crane's control system and eliminating slack rope conditions.

Progress and Status:

- IRBTS integrated into crane control system and installed on T-ACS 1-3
- ABS reviewed and approved design spec and installation for USNS MENDONCA (T-AKR 303) (Sep 02)
- First set installation completed (Dec 02)
- Testing postponed first due to ship activation and subsequently to enable personnel to participate in 4th Quarter Demo. Ship now homeported in Philadelphia instead of Norfolk.

Schedule:

- Test MENDONCA first crane set TBD*
- ABS approval of first crane set TBD*

If FY04 funds provided:

- Install and test on second crane set TBD*

*Based on ship availability.



Laser Rangefinder and Electronic Display System (LAREDS)



System Description:

- COTS Laser rangefinder and two electronic billboards deployed aboard T-AK and T-AKR ships
- One billboard directed at the ownship pilot house and one at the receiving ship

Objectives:

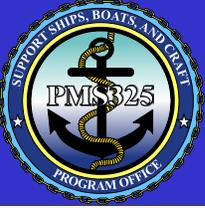
- Provide the separation distance data to supply and receiving ships
- Low cost (\$17K) forerunner to WRAPD Link

Progress and Status:

- Prototype tested at-sea on TIPPECANOE (T-AO 199), RUSHMORE (LSD 47) and TARAHA (LHD 1) Sep 02
- First production system received from Laser Atlanta Jul 03
- Ship Checks of production system aboard KANAWHA (T-AO 196) and SUPPLY (T-AOE 6) Jul 03
- Tested system aboard FLICKERTAIL STATE during the 4th Qtr Demo Oct 03

Proposed FY04 Schedule (unfunded):

- Make available for extended at-sea testing at SEA 05Z's request TBD
- USCG interest in testing system as a result of ExWar NDIA display TBD
- Provide training and installation support for subsequent buys TBD



Summary of Technical Status

Improved Phone & Distance Line

- WRAPD Link
 - Replaced Ranging LEDs with lasers met the 300-ft distance requirement but generated power supply-related noise thereby preventing simultaneous ranging and voice transmission
 - Voice LEDs met requirements during land-based tests in early 2003; however, mods to include ranging have caused sufficient noise to make voice unsatisfactory
 - Tests of data LEDs were marginal and highly dependent on the data package size. No further testing performed due to inability to resolve voice noise problem.

Ship Roll Mitigation System

- Full-scale testing TBD/OBE

Omni Directional Vehicle Technology

- Side loading forklift - Performance specifications and concept design completed
- Container mover - First phase of requirements study completed

Sea-based Wave Attenuation Technology/Ship-attached RIB

- Completed tug-barge tow tests with two configurations of RIB tows
 - Tow force and end/joint stability need further testing
- Ship-attachment hardware to be developed
- Refurbishment (~\$100K per section) needed