May 2004

Expeditionary Logistics

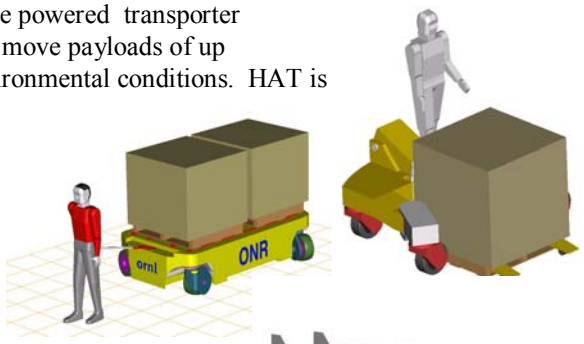
A FUTURE NAVAL CAPABILITY

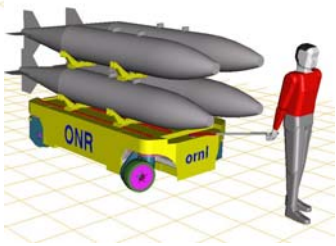
Human Amplification Technology (HAT) Moving Forward

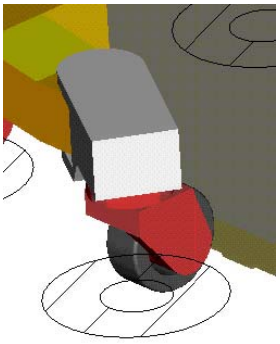
As a member of the Compact/Agile Material Mover family of technologies, the recently awarded Human Amplification Technology (HAT) project is the first shipboard internal cargo movement initiative to emerge from those recommended in the Technology Roadmap, published earlier this year. The HAT project team is led by the Oak Ridge National Laboratory and includes Northrop Grumman Newport News, and industrial partner Systems and Electronics, Inc. (SEI). A National Steel and Shipbuilding Company (NASSCO) representative will participate in the project, providing input into the technology development and another National Shipbuilding Research Program (NSRP) shipyard representative will provide technical oversight services for the project. The early inclusion of SEI as a potential commercializer and the two additional shipyards will dramatically increase the probability of this new technology transferring into new and existing ship programs.

Described in its simplest form, Human Amplification Technology is a set of advanced technologies that combine to form a man-machine interface in which a machine automatically amplifies human strength by adjustable preset ratio (e.g., with a 500:1 ratio, a 5,000 lb. payload will only appear to weigh 10 lb). The obvious benefits include the ability of a single Sailor or Marine to lift, move and control very heavy payloads more safely in various sea states. By fully developing the specific technology components addressed in this project and integrating them in various combinations with previously developed HAT components or other related technologies, HAT will offer efficient alternatives to a wide variety of labor intensive, time consuming, and cumbersome material handling tasks.

One of the three primary project objectives is to develop a proof of principle powered transporter (HAT-T) which will enable a single individual to precisely and effortlessly move payloads of up to 12,000 pounds throughout a ship in the full range of operational and environmental conditions. HAT is being developed as a readily scalable technology to make it easily backfitable into legacy platforms. A family of transporters with various capacities from a few hundred to several thousand pounds will provide the means to effectively move internal cargo on various ship classes. The initial version of HAT-T will be manually controlled. One of the specific applications for the HAT-T systems is for mass movement of cargo during resupply operations. In these cases, when moving material across or through large expanses of relatively open deck areas, the direct human interface with individual transporters would not be an effective utilization of available manpower. Future versions of HAT will be capable of autonomous navigation and include the ability to individually or collaboratively develop an optimized path for movement from one location on a deck to another while safely avoiding both stationary and moving obstacles - a major manpower reduction benefit. Planned follow-on efforts include the development of a heavy lifter (HAT-L) for large payloads and a sailor strength assist (HAT-S) device for handling small payloads or operation in more confined spaces. Specific application for these lifting/manipulating machines and their related end effectors/payload interface devices may be platform dependent but the resulting effects will be the same: reduced workload, reduced fatigue of personnel, enhanced safety, and improved output/throughput.







The second major deliverable of the HAT project being developed concurrently with the transporter is the fully functional Off-Center-In-Line-Omnidirectional-Wheel (OCILOW). This wheel design including powering and control is integral to the transporter and achieves holonomic mobility using conventional wheels for more positive control while offering a wider range of capability than other omni wheel designs.

Another major deliverable of this project phase is the testing and validation of the Ship Motion Compensation Force Control System. This is the key control component of the HAT project which will provide sophisticated control algorithms to reduce or eliminate the effects of low frequency dynamic loading caused by wave induced ship movement while lifting, moving, or otherwise manipulating heavy payloads. These advanced algorithms were developed in the earlier concept phase of this project but must be validated and tested before integration into other HAT-based equipment. These control algorithms will have direct applicability to other systems.

Further information can be found on the ExLog website at:
http://www.onr.navy/fncs/explog/overview.asp

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Highlights / Accomplishments

High Capacity Alongside Sea Base Sustainment (HiCASS)

* ONR Contracts is continuing to process the HiCASS Large to Large Quick Look Contracts for Rolls Royce, Oceaneering and Lockheed Martin. It is anticipated that the contracts will be issued in June.

* An effort is underway to initiate a study to understand the HiCASS Large to Small Material Transfer issues.

* The SBIR Phase I Final Reports for Composite Ro/Ro Structures have been reviewed and comments provided to offerors. The recommendations for proceeding to Phase II have been developed and sent to the Selection Authority.

Strike-Up/Strike-Down (SUSD)

* ASRS Phase II Base Period project complete and final report submitted. This report details the development of a mature concept for a shipboard Automated Storage and Retrieval System (ASRS) capable of automating storerooms, magazines and holds to provide efficient and secure storage of material. The NSRP team is negotiating requirements for the next phase to include a complete system design for an actual shipboard cargo hold.

Sea Base to Shore Surface Craft (SSSC)

* Developed a study framework for the Sea Base Connector Enabling Capability. Together with N75, the ExLog FNC will identify the key performance parameters and metrics and key technology gaps that require investment in order to enable the vision of Sea Basing.

* Developing models of various types of rotory wing aircraft to explore the feasibility and size of aircraft within the ranges of key performance parameters specified in the Sea Base S&T Gaps. OPNAV will factor this data into its process to refine the Gaps and identify the specific goals for Sea Base Heavy Air Lift. The ExLog FNC will use this data to invest in developing the most critical technologies to the required levels.

Naval Force Sustainment (NFS)

* FedBizOpps Sources Sought posted for advanced high strength materials in support of the Blast Resistant Container effort, 19 April 2004.

* Blast Resistant Container Program presented to the Dept of Defense Explosive Safety Review Board on 21 April, 2004, at their request. The presentation was well received.

Naval Logistics Command and Control (NLC2)

* 95% complete-resubmit of Naval Logistics Command Control approach to Lynn Torres. Resubmit needed to maximize BAA submits that meet project needs, and ensure that GFE is readily available and useful for offerors.