MARITIME TECHNOLOGY

The Newsletter of the Maritime Technology Alliance — *April 2005 * Vol. 3 Number 1*

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The Maritime Technology Alliance Activities

This newsletter opens the third year of MTA newsletter publication and is the second edition presented in an expanded eight-page format. Featured in this edition are articles that outline the **Technology Transfer** process at the Naval Surface Warfare Center (NSWC) Carderock Division, introduce the **Maritime Institute of Technology and Graduate Studies** (MITAGS) at Linthicum, Maryland, describe the DD(X) Land Based Test Site (LBTS) in Philadelphia, Pennsylvania, and highlight the Office of Naval Research (ONR) and Naval Sea Systems Command (NAVSEA) **Center for Innovation in Ship Design** (CISD). An article outlining MTA membership benefits completes this edition.

These articles cover a wide range of maritime interests. Industrial and academic activities seeking to tap into the wealth of maritime technology available at the NSWC Carderock Division should find the Technology Transfer article of value. MITAGS offers a breadth of support services for maritime activities, including education and training and vast well-equipped modern meeting and conference facilities. The DD(X) LBTS at the NSWC Carderock Division Philadelphia base is an extensive facility involving numerous organizations and equipment manufacturers. Full-up system testing is planned for the latter half of 2005. The CISD, in support of the US Navy's National Naval Responsibility Initiative for Naval Engineering, offers collaborative activities involving naval/marine oriented faculty, students, government and industry personnel.

In the past six months, MTA has continued to promote the maritime interests of Maryland and surrounding area. A sampling of such activities follows:

The **SMART** (Strengthening the Mid-Atlantic Region for Tomorrow) Initiative coordinates regional economic and national objectives of Maryland, Delaware, New Jersey and Pennsylvania. Ivan Caplan, Vice President of MTA, chairs the SMART Maritime Subgroup (SMSG). In meetings held in the latter part of 2004, the SMSG finalized its charter, developed a set of objectives and established its concept of operations. The next meeting of the working group is envisioned for March 2005. If your organization is interested in participating in or learning more about the working group, please contact Ivan Caplan at ILCaplan@comcast.net.

MTA continued to participate as a member of the Governor of Maryland, Robert L. Ehrlich's **Maryland Military Installation Strategic Planning Council** organized to ensure that the capabilities and value of Maryland's military bases are fully understood and appreciated and that they are adequately supported to deliver their essential services and products. Three meetings of the Council were held during this period at which MTA delivered presentations outlining the capabilities and status of NSWC Carderock Division.

On November 30th, MTA's President, Richard E. Metrey, briefed Maryland Congressional delegation staff members on Capitol Hill who were convened to examine the issues and concerns facing the Maryland military bases in the forthcoming 2005 round of Base Realignment and Closure (BRAC).

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Navy Lab Aggressively Pursues Technology Transfer

For 105 years, the Carderock Division Naval Surface Warfare Center (NSWCCD) has addressed the full spectrum of applied maritime science and technology, from the theoretical and conceptual beginnings, through design and acquisition, to implementation and follow-on engineering. NSWCCD addresses literally all of the technical aspects of improving the performance of ships, submarines, and all manner of marine craft, manned and unmanned, and research for the logistics systems that support them. In addition, the Division is uniquely chartered by Congress to support the nation's maritime industry.

Expertise at Carderock is focused in the areas of hydrodynamics, propulsors, structures and materials, main and auxiliary machinery systems, signatures (acoustic, radar, infared and electromagnetic), environmental protection, logistics, systems integration and shipboard in-service engineering. This expertise has resulted in the establishment of **major facilities that are powerful national assets** and offer tremendous opportunities for technology transfer. These major facilities are described on NSWCCD's web site: http://www.dt.navy.mil/our_capabilities/facilities/facilities.html and are available for use by outside sources under cooperative research and development agreements (CRADAs) as well as through work for private party (WFPP) agreements.

Another mechanism for technology transfer is the **opportunity to license patents** from a portfolio of 372 active US patents. The Carderock Technology Transfer (T2) Office maintains a web site that details the office functions, successes and opportunities currently available. This includes a detailed patent database for review as well as a listing of all available facilities for use by interested parties. The comprehensive site allows any potential partner to grasp the scope of the technology available at Carderock and the mechanisms available to access this technology or facilities and to understand the role of the T2 Office in supporting any potential partnership. http://www.dt.navy.mil/wor-wit-us/tec-tra-off/index.html. Another source for information covering all of the Navy's current intellectual property is to be found at http://www.techmatch.com/.

Examples of the breadth of technology developed by NSWCCD and available to industry for licensing and for cooperative development are described below.

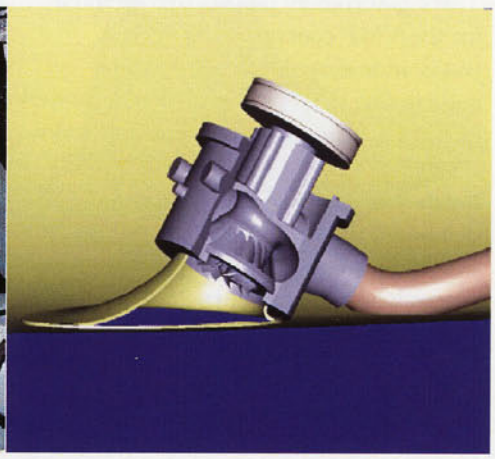
Plastic Waste Processor

In November 2004, it was announced that the US Navy's 2003 Prestigious Admiral Bowen Award winning invention was the Plastic Waste Processor. This system (and the related deployment program) developed by engineers at NSWCCD will allow the Navy to meet the stringent requirements associated with operating on international seaways, reduce shipboard operations costs, and protect the environment.

The inventors have made this technology available beyond their traditional U.S. Navy customers. The U.S. Navy is the world's leader in keeping the oceans clean, and the plastic waste processor is the world's leading solution for treating plastics waste at sea. Carderock has licensed three U.S. patents covering the plastic waste processor technology and design to Universal Technologies, Inc. (UTI), of Estill Springs, Tennessee. This license will make the plastic waste processor available for commercial ocean-going vessels and will allow the fullest use of the plastic waste processor technology for both military and commercial purposes.

Waterjet Propulsion

The commercial use of waterjet propulsion is extensive and highly successful. Military use is less extensive, but as the military pursues waterjets it will benefit from the commercial experience. However, military requirements will generally require refinements to the commercial designs. It can be assumed that the military will require a greater attention to cavitation reduction, unsteady force and vibration reduction, and a wider speed operating range. Cavitation is a noise source; it causes structural erosion, and induces structureborne vibration, which also is a noise source both in the ship itself and in the far field. Similarly, unsteady forces generated by the blade rows and the resulting vibration causes noise in the vessel and in the water and can initiate metal fatigue.



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One design solution is the **VMP** (Vertical Motor Propulsor), which was developed at Carderock in the mid 90s for a monohull displacement ship. The VMP uses a mixed flow pump and a nearly vertical inlet. It has a very short flow passage for minimum flow losses and is an enabler for electric drive propulsion. VMP takes the form of a mixed flow pump with a very steep intake and a volute. The volute discharge is in a generally horizontal direction and is connected by a horizontal duct to the transom of the ship where the flow is discharged through the nozzle. A schematic of a model scale DDG 51 with modified stern and the VMP inlet and nozzle installation are shown in the figures.

A major challenge for the development of VMP includes development of an analytical design methodology for efficient intake design and the development of a novel underwater steering and backing mechanism. Three government patents were granted for the VMP concept. The VMP was demonstrated through model scale testing that it is comparable in powering performance as compared with the conventional screw propeller and is superior in maneuvering and backing performances. Furthermore, VMP was also predicted to be more survivable compared to conventional propulsion. Presently, there are three additional invention disclosures associated with this research area that are expected to be patented.

High Performance Coatings for Corrosion and Wear

Abrasive debris trapped in the shaft housing staves of mine countermeasure ships eventually score the shafts, limiting shaft life to about one year. No existing coating was available which could survive in the environment, protect the shaft, and not create galvanic corrosion problems. The cost of recurring repair was averaging $1.5M every 18 months for this US Navy ship class to dry-dock, remove and refit, and weld repair damaged shafting. The solution was to develop a revolutionary **ceramic nanocomposite coating**. Coated shafts were tested in service on four ships. Inspection revealed an intact, biological growth-free coating with no evident scoring after 3 years service. This highly tenacious, functional coating has other application potential to resolve wear and/or combined wear-corrosion issues.

This project is highly demonstrative of what value is added by employing efficient teaming from development through application when end-use application is the primary focus.