Executive Summary
Life Cycle Technology Insertion

United States defense strategy is critically dependent on its ability to exploit advanced technology. History has shown that technology can act as a major force multiplier and provide operational superiority against adversaries and the threats they present to the American way of life. It is critical for the Department of the Navy (DON) to exploit technology to create war-fighting capabilities as quickly and efficiently as possible. To that end, senior Navy and Marine Corps leadership is concerned that the processes for both identifying and exploiting new technology be operating at maximum efficiency.

What is desired is timely delivery of cost effective war-fighting capabilities to our Fleet and Fleet Marine Forces. This study was undertaken at the request of the Assistant Secretary of the Navy for Research Development and Acquisition ASN(RD&A) to:

The Problem

- Review the current process for technology exploitation,
- Identify problem areas and deficiencies if any, and
- Make recommendations to achieve improvements in these processes.

Scope of Study

The study included identifying problem areas and making recommendations for improvement in all phases of technology development from early discovery through development to operational use. This included examining processes for:

- Early identification of promising new technology,
- Application and feasibility demonstration of technology,
- Systems engineering and integration of technology into war-fighting systems, and
- Operational use and life-cycle support of technology as used in fielded systems.

The study was intended to address transition processes for both naval and commercially developed technologies. The study was not however limited to just examining technical issues. It also addressed management and acquisition practice issues which impact the effective insertion and operational use of technology. Some of the questions to be addressed included:

- How can early awareness of promising new technologies be ensured?
- Are technology transitions tightly coordinated with real operational requirements?
- Are technologies and the associated system concepts proposed cost effective and has a quantifiable business case been conducted?

- Are we ensuring that technology transitions are really providing useful capability improvements for the warfighter?
- Are capability improvements supportable in the field from a cost perspective?
- Does the technology transition process ensure that technology transition is occurring at a pace which provides capability when needed?

Process for Identifying Barriers to Technology Insertion, Best Practices and Making Recommendations

The study was heavily oriented around "fact finding." The process focused on interviewing major "stakeholders" in the technology insertion process at various stages of technology development. The stakeholders included representatives from:

- The Office of Naval Research (ONR),
- Acquisition Program Managers,
- Fleet and Fleet Marine Force (FMF) users,
- Defense industry prime contractors,
- Navy Warfare Laboratories,
- Operational Test and Evaluation Force (OPTEVFOR),
- Navy Comptroller,
- Office of the Chief of Naval Operations (OPNAV), and
- Systems Commands.

The Life Cycle Technology Insertion (LCTI) Panel was also fortunate to benefit from having a set of members with a wide range of hands-on experience pertinent to this topic. Panel members included senior operations managers from industry, technologists from both government and academia, former flag-level operations and staff officers from both the Navy and Marine Corps, and several members with previous experience in OPNAV and Office of the Secretary of Defense (OSD). All panel members have been or are currently stakeholders in the technology insertion process.

Based on the results of extensive fact-finding, and the diverse experience of its panel members, the LCTI Panel made a number of key observations and identified key recommendations for improvement.

Principal Observations

The study panel made a number of key observations. These fall into two categories. "Barriers" which the panel felt currently limit the effectiveness of technology insertion and "enabling practices" which equate to "best practices" which the panel felt should be actively encouraged and emulated.

Some of the principal problem areas or barriers that were observed include:

- In the interest of schedule and cost, technology insertion programs often "short cut" good systems engineering practice particularly with regard to human factors and systems interoperability.
- The DON lacks corporate wide management focus in planning resources, creating and fostering the use of enabling tools, and facilitating management incentives to promote technology insertion.
- Naval technology insertion programs inadequately exploit modern systems modeling and simulation (M&S) tools to better facilitate technology insertion.
- DON's Future Naval Capabilities (FNC) programs are structured with neither the focus or critical mass necessary for success.
- The panel also observed that several programs have developed and are exploiting practices which are enhancing technology insertion. These should be replicated where possible. Some of these "best practices" are:
- The use of "open architectures" and commercial standards particularly as regards information technology (IT) insertion,
- The use of innovative competitive acquisition strategies to encourage collaboration and incentivize industry for technology insertion,
- The initial development of some core capabilities as regards generic modeling and simulation tools which could be expanded and more broadly applied to better enable technology insertion.
- In particular several programs exemplified best practices. They were:
- The submarine Acoustic Rapid Commercial Off-The-Shelf (COTS) Insertion (ARCI) program whose goal is to improve the U.S. Submarine Force's ability to detect hostile submarines at greater ranges, is using open software architectures and innovative competitive procurement strategies.
- The Navy and Marine Corps Intranet (NMCI) program whose goal is to improve computing and communications capabilities via a private intranet has developed innovative acquisition strategies which incentivize contractors to utilize new technology.
- Finally, the Integrated Command Environment (ICE) lab facility at the Naval Surface Warfare Center (NSWC) in Dahlgren and the Distributed Engineering Plant (DEP), represent the beginnings of some potentially powerful and generic tools sets which exploit M&S in a distributed test-bed environment to better address human factors and systems interoperability issues.

Recommendations

Four major recommendations are made to improve DON process for efficiently harvesting and more effectively transitioning new technologies into operational capabilities. The recommendations are:

1. Strengthen the systems engineering process for technology insertion by developing and using generic sets of systems modeling and simulation enabling tools. The tools are particularly needed to address human factors engineering and system interoperability issues.

2. Develop "gain sharing" incentives for both DON program managers and contractors. In the case of program managers, allow programs to retain a portion of the savings generated through new technology insertion. Additionally, when contractors successfully utilize new technology which results in savings to the government, allow them to maintain their previously negotiated profit and a portion of the savings. Such incentives could greatly offset the natural risks which are inherent in incorporating new technologies and would encourage managed risk-taking.
3. Current FNC programs should be critically reviewed in order to: (a) provide better focus in terms of their measurable objectives, and (b) prioritize to ensure that a sufficient "critical mass" of resources is applied to high priority initiatives.
4. The most important "enabling" recommendation which the panel makes is that the ASN(RD&A) establish a Naval Technology Insertion Executive Office (NTIEO) which: promotes "best practices" and "end-to-end" strategies for LCTI, develops and maintains corporate M&S tools, develops and promotes "gain sharing" incentive strategies, possesses technology exploitation planning, programming and budget authority, promotes harvesting and integrating of technology from all sources, and reviews, prioritizes and funds FNC programs. The specific responsibilities and duties of the office are further detailed later in this report.