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Acquisition

Navy Transition of Advanced Technology Programs to Military Applications
(D-2003-053)

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Acronyms

ATD	Advanced Technology Demonstration
FNC	Future Naval Capability
IPT	Integrated Product Team
ONR	Office of Naval Research
S&T	Science and Technology
TRL	Technology Readiness Level
TTA	Technology Transition Agreement

INSPECTOR GENERAL
DEPARTMENT OF DEFENSE
400 ARMY NAVY DRIVE
ARLINGTON, VIRGINIA 22202–4704

February 4, 2003

MEMORANDUM FOR NAVAL INSPECTOR GENERAL

SUBJECT: Report on Navy Transition of Advanced Technology Programs to Military Applications (Report No. D-2003-053)

We are providing this report for review and comment. We considered management comments on a draft of this report when preparing the final report.

DoD Directive 7650.3 requires that all recommendation be resolved promptly. We request that management provide additional comments to Recommendations A.3., B., C.1., and C.3. Additional management comments should be received by March 6, 2003.

If possible, please provide management comments in electronic format (Adobe Acrobat file only). Copies of the management comments must contain the actual signature of the authorizing official. We cannot accept the / Signed / symbol in place of the actual signature. If you arrange to send classified comments electronically, they must be sent over the SECRET Internet Protocol Router Network (SIPRNET).

We appreciate the courtesies extended to the audit staff. Questions should be directed to Mr. Bruce A. Burton at (703) 604-9071 (DSN 664-9071) or Mr. Roger H. Florence at (703) 604-9067 (DSN 664-9067). See Appendix D for the report distribution. Audit team members are listed inside the back cover.

David K. Steensma

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Deputy Assistant Inspector General
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Office of the Inspector General of the Department of Defense

Report No. D-2003-053 **February 4, 2003**
(Project No. D2001AB-0105.001)

Navy Transition of Advanced Technology Programs to Military Applications

Executive Summary

Who Should Read This Report and Why? Science and technology officials in the Office of the Secretary of Defense and the Department of the Navy should read this report because it evaluates the Navy's current process for enhancing the likelihood that emerging technology would reach the warfighter.

Background. Congress and DoD officials have voiced concern that technology has not quickly transitioned to the warfighter. In 1998, the Vice Chief of Naval Operations instituted the Future Naval Capabilities process to focus the science and technology investment on achieving future capabilities for Naval forces. The Future Naval Capabilities process was designed to align and partner the requirements, acquisition, and science and technology communities to focus on delivering and transitioning priority Naval capabilities. To help achieve the objective, the Navy funded about 225 separate advanced technology projects for FY 2002 for a total of $870 million. The audit examined 39 science and technology projects (33 science and technology products and 6 advanced technology demonstrations) funded with research, development, test, and evaluation funds; advanced technology development appropriations.

Results. Although the Office of Naval Research created a structure to manage its science and technology efforts to facilitate the transition of technology, improvements are still needed. Specifically, while 30 of 33 technologies reviewed did have working-level integrated product teams, all of the 33 technologies lacked one or more of the elements for transitioning.

- None of the technologies had integrated product teams charters to establish roles and responsibilities,

- Not all recipients were included in the working-level integrated product teams, documentation of integrated product teams' issues and actions were limited, and agreements on technology readiness levels and exit criteria were lacking, and

- None of the five acquisition recipients had identifiable funding for technologies scheduled to transition in FYs 2002 and 2003.

Similar coordination problems were identified for the advanced technology demonstration projects included in this review.

Unless the Office of Naval Research improves its coordination with plan recipients by establishing working-level integrated product teams, and evaluates whether near-term

planned transitioning for products should continue if transition funds are lacking, the Navy cannot make fully informed and prudent decisions on whether continued investment is warranted (finding A).

The Office of Naval Research did not use the performance appraisal process effectively to assist in achieving DoD performance goals and its corporate goals of transitioning technology. The incorporation of technology transition in performance appraisal plans of product managers would provide accountability and contribute to the likelihood of technology transitioning (finding B).

The Office of Naval Research did not have an effective management control program to evaluate the technology transition operations within the Science and Technology Directorate. Management needs to establish measurable management controls, direct the performance of internal reviews, and provide management control training so that annual statements of assurance are based on reliable assessments of the science and technology process, and risks and controls can be identified (finding C).

Management Comments and Audit Response. The Deputy Assistant Secretary of the Navy for Planning, Programming and Resources provided comments to the draft report and concurred with most of the recommendations. The Deputy Assistant Secretary nonconcurred with the recommendation to review the advanced technology development efforts for five unfunded science and technology projects scheduled for near-term transition and discontinue product development for technologies that do not have formal acquisition program support including identifiable transition funding. See the Finding section of the report for a discussion of management comments and the Management Comments section for the complete text of the comments.

Management comments were generally responsive to the report and its recommendations. However, comments in response to the recommendation to review advanced technology development projects that lack formal acquisition program support were not fully responsive. Continued expenditure of advanced technology development funds on technologies that do not have coordinated paths or plans for transitioning to acquisition programs ignores lessons learned and training on successful science and technology transitioning provided to Department officials. Near-term transitions that do not have the necessary commitment by the scheduled receiving program should be reviewed to determine whether continued development is warranted. Although the Deputy Assistant Secretary concurred with the recommendations addressing technology transitioning as a performance elements in the appraisal process and improving the management control program, the proposed actions do not adequately address the intent of the recommendations. Accordingly, we request additional comments from the Chief of Naval Research on the final report by March 6, 2003.

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Background

Defense Acquisition. The Deputy Secretary of Defense issued interim acquisition guidance on October 30, 2002. The interim acquisition guidance states that science and technology (S&T) programs shall address user needs; maintain a broad-based program spanning all Defense-relevant sciences and technologies to anticipate future needs and those not being pursued by civil or commercial communities; preserve long-range research; and enable rapid successful transition from the S&T base to useful military products. Advanced technology shall be integrated into producible systems and deployed in the shortest time practicable. Teaming among warfighters, users, developers, acquirers, technology experts, industry, testers, budgeting officials, and system maintainers shall begin during requirements definition.

Science and Technology Guidance. An affordability task force chartered by the Director for Defense Research and Engineering issued a handbook and the Deputy Under Secretary of Defense for Science and Technology issued a guide to the Military Departments and Defense agencies concerning practices that they believed, if instituted, would assist in transitioning technology. In addition, in response to congressional concerns that the DoD had not been successful in transitioning technology, the Under Secretary of Defense for Acquisition, Technology, and Logistics issued a report to Congress identifying why technology was not transitioning.

Addressing Affordability in Defense Science and Technology (S&T): A Handbook for S&T Managers. In October 1999, the DoD S&T Affordability Task Force endorsed a Handbook that stresses the importance of early involvement of all candidate acquisition programs in advanced technology efforts. The Handbook states that early involvement of advanced technology candidate acquisition programs in research development, design, test planning, manufacturing, training, logistics, financing, and contracting are essential to address key issues that lock in a majority of the life-cycle costs of programs. The Handbook states that management tools for ensuring effective technology transitioning include establishing integrated product teams (known as IPTs), creating IPT charters, identifying quantitative metrics and key exit criteria, and developing a formal transition plan that is officially signed by the "customer" (usually an acquisition community member) and the technology manager. Additional management tools include preparing an approved memorandum of agreement or understanding that includes roles and responsibilities of the various participants and a funding strategy, which commits the acquisition community to transition the technology.

Technology Transition for Affordability: A Guide for S&T Program Managers. In April 2001, the Deputy Under Secretary of Defense for Science and Technology issued a Guide to provide S&T managers with strategies to transition technology to the acquisition community. The Guide states that the transition of technology should be timely (get the technology in the hands of the warfighter as soon as possible) and cost-effective (provide the best technology at the lowest possible cost). The Guide states that a key strategy for transitioning

technology is early coordination between the S&T project manager and the receiving acquisition manager to promote a mutual understanding between the two parties.

The Guide provides that IPTs should include the S&T product manager, the S&T contractor, the acquisition manager and the respective contractor(s), and test and evaluation representatives. An IPT should be formed early in the life cycle of a technology's development to address key issues that can greatly affect life-cycle cost and the eventual acceptance and implementation of the technology. Issues that the IPT should address include defining and agreeing upon quantifiable metrics, such as cost, performance, and schedule; exit criteria; and the maturity of the technology at transition identified as technology readiness levels (TRLs) (the TRLs are described in Appendix B). The Guide states that those issues and others should be agreed upon in formal documentation such as memorandums of agreement or understanding and technology transition plans.

Under Secretary of Defense for Acquisition, Technology, and Logistics Report to Congress. In June 2001, the Under Secretary of Defense for Acquisition, Technology, and Logistics provided a Defense Advanced Research Projects Agency report on technology transitioning to congressional defense committees. The report provided Congress with the results of a review of the transition of research to the Military Departments from the Defense Advanced Research Projects Agency and addressed issues that were also applicable for the Army transition of research technology to acquisition program managers and, ultimately, to the warfighter. The report cited a key reason for difficult technology transition was the need for collaboration among three diverse groups: the S&T researcher, the acquisition program manager, and the military user. Effective transition requires the groups to work together as a team, which is frequently a difficult issue. In addition, for a technology transition to be successful, the acquisition program manager's prime contractor must support the technology insertion, and the technology must demonstrate a greater return than the existing capability.

Future Naval Capabilities Process. In 1998, the Vice Chief of Naval Operations instituted the Future Naval Capabilities (FNCs) process to focus the S&T investment on the achievement of future capabilities for Naval forces. The Navy adopted the process in November 1999. The FNC process was designed to align and partner the requirements, acquisition, and S&T communities to deliver and transition priority Naval capabilities within 1 to 6 years. At the center of the FNC process, an IPT for each FNC brings together key members at the Flag Officer or Senior Executive Service level from the requirements, acquisition, and S&T communities. The FNC process was designed to bridge the gap between the acquisition community and the Office of Naval Research (ONR).

The Vice Chief of Naval Operations, the Assistant Commandant of the Marine Corps, and the Assistant Secretary of the Navy for Research, Development, and Acquisition approved 12 FNCs that concentrate the Navy's S&T resources on achieving the highest priority capabilities. The FNC process formally began in FY 2002.

Objectives

The audit objective was to determine whether the Navy was successful in transitioning advanced technology projects to military applications. Specifically, we determined whether the Navy had established a process to successfully transition technology. We also evaluated management controls at ONR as they relate to the audit objective. See Appendix A for a discussion of the audit scope and methodology, the review of the management control program, and prior coverage related to the audit objectives.

The audit examined 39 S&Ts (33 S&T products and 6 ATDs) funded from the advanced technology development budget activity within the Navy research, development, test, and evaluation funds; advanced technology development appropriation. The 39 S&T efforts had expenditures of $152 million in FY 2002 and planned funding of $430 million through FY 2007. The audit examined whether working-level integrated product teams were established, whether the teams included the planned primary and secondary recipients, whether charters were established for the teams, whether official memorandums of understanding on technology development were established, and whether agreements included TRLs and exit criteria.

A. Navy Science and Technology Process

While executive-level IPTs were established for the 12 FNCs, improvements in the ONR coordination process are needed at the technology working level and at the acquisition program manager level. Specifically, although 30 of 33 technologies did have working-level IPTs, other critical elements for transitioning were missing:

- Working-level IPTs did not establish charters to identify roles and responsibilities,
- Working-level IPTs did not include all planned acquisition recipients,
- Documentation of IPT issues and action items are needed to prevent development problems resulting from key personnel changes,
- Formal agreement on TRLs and exit criteria were not established for almost half of the technology recipients, and
- None of the five acquisition recipients identified funding for technologies scheduled to transition in FYs 2002 and 2003.

Similar coordination problems were identified for the six ATDs also included in this review. These conditions exist because Navy S&T management did not require formal working-level coordination between acquisition recipient officials and Navy S&T officials as was advocated in the Deputy Under Secretary of Defense for Science and Technology guidance. In addition, the ONR had not established minimum standards for technology development documentation. As a result, unless measures are undertaken to effectively coordinate the 39 technologies that have planned additional funding of $430 million, the Navy cannot make fully informed and prudent decisions on which projects warrant continued investment.

Navy Advance Technology Program

FNC Planning and Execution. To maximize the benefit to the warfighter, ONR initiated the FNC process during FY 1998. The ONR action required shifting the emphasis from conducting S&T research on very long-term development of high-risk technologies to developing focused S&T products that are selected, managed, and demonstrated to meet pre-established exit criteria within 7 years. Long-term, high-risk research continues in the basic and applied research categories.

The Navy Science and Technology Corporate Board established 12 FNCs that represent the highest priority performance and systems to be delivered to the

warfighter by 2010. FNCs were to be managed by using IPTs. The IPTs for the FNCs function like a corporate board and are composed of executive-level officials from the Navy or Marine Corps.

The goal of each FNC was to provide significant S&T advances in products and establish deliverables with defined demonstrations, culminating in technology transitions. S&T products are the fundamental elements of the FNCs. S&T product managers were to establish exit criteria to support transition. Achieving the exit criteria represents development success. Exit criteria act as a contract between the S&T developer and the customer.

To assist in achieving the goals of the FNC process, ONR established the requirement to develop business plans at the FNC level. The business plans supported product development and were designed as a management tool for the FNC to maintain program control at the product level and document the expected performance ranges and conditions of the exit criteria for the emerging S&T effort.

Technology Development Guidance

The Deputy Secretary of Defense interim guidance states that S&T programs shall address user needs; maintain a broad-based program spanning all Defense-relevant sciences and technologies to anticipate future needs and those not being pursued by civil or commercial communities; preserve long-range research; and enable rapid, successful transition from the S&T base to useful military products. The Handbook provides elements of best practices and procedures captured in the form of criteria for S&T managers. These criteria are endorsed by the Deputy Under Secretary of Defense for Acquisition and Technology Affordability Task Force that was charted by the Director for Defense Research and Engineering to develop solutions on how to strengthen DoD S&T programs.

Navy Science and Technology Products Reviewed

The ONR needs to strengthen its S&T coordination with planned acquisition program recipients. The Handbook and Guide recommend the establishment of memorandums of agreement or understanding with the acquisition program manager(s), including agreements on TRLs and exit criteria, to ensure that acquisition programs have the necessary funding for S&T integration. In addition, ONR should require S&T product managers to document IPT issues and action items to prevent development problems resulting from key personnel changes.

The audit examined 39 S&Ts (33 S&T products and 6 ATDs) funded with research, development, test, and evaluation funds; advanced technology development appropriations with expenditures of $152 million in FY 2002; and planned funding of $430 million through for FY 2007. The 33 products had 35 primary recipient acquisition programs (1 product had two additional primary recipients) and the 6 ATDs had 6 candidate programs. The table summarizes the

audit results by S&T product and ATD, using the recommended business practices in the Handbook and Guide.

Summary of Science and Technology Products and Advanced Technology Demonstrations (ATDs) Examined
(ratio shows positive responses to total examined)[1]

	Number of Occurrences		Percent of Occurrences	
	33 Products[2]	6 ATDs[3]	33 Products	6 ATDs
Integrated Product Team at the product level				
Team established	30 of 33	3 of 4[3]	91	75
Charter established	0 of 30	0 of 3	0	0
Acquisition program manager included	30 of 35[4]	3 of 3	86	100
Acquisition program prime contractor included	21 of 25[5]	3 of 3	84	100
Acquisition Program Manager				
MOA/MOU/TTA	23 of 35[4]	3 of 4	66	75
Exit TRLs formally agreed	12 of 35	0 of 4	34	0
Exit criteria formally agreed	20 of 35	2 of 4	57	50
Funding for FYs 2002 and 2003 transitions by the acquisition recipient	0 of 5	0 of 0	0	0

Appendix C provides the supporting detail to the table by FNC.

[1] Draft documents were not considered as a positive response.

[2] Reviewed 33 products: 14 of Knowledge, Superiority and Assurance; 6 of Littoral Antisubmarine Warfare; 5 of Organic Mine Countermeasures; and 8 of Fleet Force Protection.

[3] We reviewed six ATDs. Of the six ATDs, four were scheduled for transitions to acquisition programs. Two were scheduled for transition to an FNC, but with the same manager. As such, no coordination between parties is necessary for these two efforts.

[4] Thirty-three products identified 35 primary acquisition program recipients for the developing technologies (1 product in Fleet Force Protection had 2 additional prime recipients identified). Thirty of the 33 recipients were included in the working-level IPTs.

[5] Of the 30 acquisition program recipients included in working-level IPTs, 25 had contractors identified. Twenty-one of the 25 contractors were participating in the working-level IPTs.

Integrated Product Teams

The Deputy Secretary of Defense issued interim acquisition guidance on October 30, 2002. The interim acquisition guidance states that IPTs will be used. IPTs will include teaming among warfighters, users, developers, acquirers, technology experts, industry, testers, budgeting officials, and system maintainers. Also, the Handbook and Guide cite best business practices including establishment of working-level IPTs and IPT charters. To be effective, IPTs must include the acquisition program manager(s) and have an established charter. The acquisition program manager(s) prime contractor should also be considered for IPT participation, if appropriate, to facilitate the technology integration.

Integrated Product Teams Established. The Handbook and Guide recommended the establishment of IPTs at the working level for all the S&T products and ATDs. ONR officials established working-level IPTs for 30 of the 33 products and for all the ATDs. Thirty of the 33 primary technology recipients were participating in a working-level IPT to some degree. In addition to the primary recipients, 11 technologies had secondary recipients that represent other acquisition programs identified by ONR officials that also are candidate systems for the emerging technologies. However, ONR documentation showed that although 11 additional secondary acquisition programs were planned to receive the technology, only 1 participated in the IPT. Although three of the four ATDs had established a working-level IPT, one of the three did not have participation by the primary recipient. For secondary recipients of the ATD technologies, one of the three were participating in the working-level IPTs.

The Handbook and Guide do not distinguish between IPT participation at the primary and secondary level. Although the focus of the developing technology should be at the primary recipient level, secondary recipient participation in the working-level IPT is important to preclude avoidable transition cost drivers to the secondary recipient. It would be desirable to include secondary participants in technology meetings because both primary and secondary recipients are stakeholders in the technology development, and primary recipient decisions may affect the secondary recipient's integration of the technology.

Integrated Product Team Charters. In addition to the establishment of IPTs, the Handbook and Guide recommend the establishment of IPT charters. The Handbook states that IPT charters provide the best way to minimize team misunderstanding. The Handbook provides that each charter should include:

- The mission and objectives of the team,
- The metrics to evaluate the team's progress,
- The scope of the team's responsibility,
- The relationship of the team with other teams,
- The authority and accountability of the team,

- The resources available for the team, and
- A team membership list.

Although the IPT charters to identify the roles and responsibilities of the participants have been established at the executive FNC level, none of the S&T products or ATDs had established IPT charters.

For the 30 IPTs established for the 33 products, 29 were informal IPTs. The IPTs usually had no records of frequency, attendance, decisions, or outcomes of meetings; as a result, the audit could not determine the viability of the IPTs. Specifically, 21 IPTs did not document discussions or decisions resulting from the meetings.

The lack of documentation for IPT meetings may provide a significant risk in the orderly continuation of S&T efforts because 25 percent of ONR S&T personnel will be eligible to retire during FYs 2002 through 2004. In addition, ONR officials stated that S&T product development positions were also filled with detailees from field offices for up to 2 years. The combination of key personnel changes through retirements, detailees returning to the field offices, and the lack of documentation for IPT action items and decisions pose a development risk because of the potential loss of corporate knowledge. The lack of IPT documentation occurred because ONR did not provide guidance to S&T managers on the need for creating records of IPT meetings and results, and ONR management's belief that documentation should be kept to a minimum to reduce administrative burdens. This risk is avoidable by requiring the documentation of significant program decisions and development issues. ONR does not require the establishment of IPT charters to document the roles and responsibilities of the ONR or acquisition officials or require the establishment of a record of issues, decisions, or action items resulting from the IPTs.

Acquisition Program Prime Contractor. One goal of the Navy S&T program is to transition technology to an acquisition program and, subsequently, to the warfighter. The Guide and Handbook recommend that the acquisition program prime contractor participate in the IPT to facilitate the integration of the evolving technology into the receiving platform. The 30 products that established IPTs had 33 primary and 11 secondary planned technology recipients. The 33 primary recipients had 25 prime contractors participating in their acquisition program. Prime contractor participation in the working-level IPTs varied significantly between primary and secondary recipients in that 21 of the 25 primary recipients' contractors participated in IPTs, while none of the secondary recipients' prime contractors participated.

Of the three ATDs that established an IPT, all primary recipient acquisition programs had prime contractor participation in the IPT, but only one of the three secondary recipients had their prime contractor participating. The Navy had no official S&T guidance that discusses representation in IPTs for products or ATD efforts.

Role of Acquisition Program Managers

To improve the technology transition rate, acquisition program managers must make a firm commitment to transition the technology to their programs. The commitment should include a formal and up-to-date memorandum of agreement or understanding between the S&T product manager and the acquisition program manager(s). Each memorandum should specify the relationships and the respective responsibilities of the S&T product manager and the receiving acquisition program manager(s). The agreement should address system requirements, funding, personnel support, exit criteria, and TRLs. Within the ONR, technology transition agreements (TTAs) represent and function as the memorandum of agreement or understanding. The TTAs represent agreement between the product manager and the planned recipient on TRLs and exit criteria. Although ONR guidance requires the establishment of TTAs, to include agreement on TRLs and exit criteria, the guidance was not always followed.

Technology Transition Agreements. The ONR issued memorandum guidance in November 2001 that required the development of TTAs as part of the FNC business and execution plans. Each advanced technology development product was to have a TTA that represented agreement between the ONR and the receiving acquisition program manager(s) on the development of the technology for transitioning and the exit criteria. For the 33 products, ONR identified 35 primary and 11 secondary recipients for the emerging product technologies. Formal TTAs were established for 23 of the 35 primary acquisition programs and 2 of the 11 secondary acquisition programs. The four ATDs had four primary and three secondary recipients for the technologies and formal agreements were established with three of the primary and two of the secondary recipients.

Technology Readiness Levels. DoD adopted TRLs in response to a General Accounting Office Report, "Best Practices: Better Management of Technology Development Can Improve Weapon System Outcomes," issued in July 1999. TRLs are an assessment of the technical maturity of an S&T product or ATD. In July 2001, the Deputy Under Secretary of Defense for Science and Technology issued a memorandum to the Military Departments and Defense agencies that emphasized the development of TRLs for S&T efforts. The TRLs range from one through nine, with more mature S&T efforts having a higher TRL and a lower risk for the acquisition program. The ONR had not established TRLs with many of the planned primary or secondary technology recipients. Of the 35 primary recipients, only 12 agreed to the TRLs, and no agreements were established with the 11 secondary recipients.

The four ATDs had four primary and three secondary recipients for the technologies. None of the ATDs had agreements on the TRLs for the emerging technologies.

Exit Criteria. The exit criteria for each product describe the current capabilities, expected performance parameters and conditions of measurement, the range of acceptable performance improvements, and test conditions and verification methods for measuring performance. The S&T product manager and the

acquisition program managers, in collaboration with the IPT, develop exit criteria that are appropriate for transitioning the technology. The 33 products had 35 primary and 11 secondary technology recipients. Agreement on the exit criteria was established for 20 of the 35 primary and for 1 of the 11 secondary recipients.

The four ATDs had four primary and three secondary recipients for the technologies. Exit criteria agreements was made with two of the primary and one of the secondary recipients.

Acquisition Program Funding

The DoD research, development, test, and evaluation budget is divided into seven budget activities. The S&T community receives funding from the first three budget activities only: basic research, applied research, and advanced technology development. The acquisition community is funded with three budget activities: demonstration and validation, engineering and manufacturing development, and operational systems development. A seventh budget activity, management support, is directed toward installations or operations required for general research and development use. S&T products are not funded from the budget activity fund appropriated for the acquisition community, and acquisition programs are not funded from the budget activity fund appropriated for the S&T community. The separation of research, development, test, and evaluation funding between the S&T and acquisition communities and the shrinking of the research, development, testing, and evaluation budget make coordination between the S&T product managers and acquisition program managers very critical. If S&T products and ATDs are critical to future and existing weapon systems, and the technology is successfully demonstrated using coordinated TRLs and exit criteria, the acquisition community must set funds aside for transitioning.

Acquisition program managers were not providing the funding for technology transitioning. For the 33 products reviewed, 5 products were scheduled to transition to the acquisition program manager during FY 2002 or FY 2003. Of the 5 products, none of the acquisition program managers had identifiable funds for the transitioning technologies. Acquisition program managers should be required to specifically identify funds for the emerging technologies particularly for near-term transitions to ensure that funds are available and to determine the adequacy of the funding as a requirement for continued expenditure of advance technology development funds by ONR. Without adequate funding for technology transitioning, ONR will not be able to determine whether continued investment in S&T products is beneficial or whether the limited research funds should be directed to other more promising technology transitioning candidates.

Recommendations, Management Comments, and Audit Response

A. We recommend that the Chief of Naval Research, for advanced technology development efforts:

1. Require the establishment of integrated product teams that may include representatives from the primary and secondary candidate acquisition program office(s) and the acquisition program office prime contractor(s), where applicable.

Management Comments. The Deputy Assistant Secretary of the Navy for Planning, Programming and Resources partially concurred with the recommendation. The Deputy Assistant Secretary stated that the Navy is implementing the first part of the recommendation to include target acquisition program offices as IPT members. The Deputy Assistant Secretary stated that all FNCs have IPTs at the program level and are forming IPTs at each project level. Further, it is imprudent to require IPTs in every case, but exceptions should and will be rare, justified, and documented.

The Deputy Assistant Secretary stated that the inclusion of prime contractors in all IPTs is not executable and potentially harmful to the acquisition of new technologies because the IPT is a forum for discussion of Government-only issues. The Deputy Assistant Secretary stated that prime contractors are included in IPTs when the program manager determines it is appropriate. The Deputy Assistant Secretary suggested that the recommendation be modified to include the phrase "with the acquisition office's prime contractor(s) when desired by the acquisition program manager."

Audit Response. The comments are responsive to the recommendation. We agree that the inclusion of the acquisition program office prime contractor in all cases may not be appropriate and, as such, the recommendation included the phrase "where applicable." As a technology develops, the S&T manager and officials receiving the technology need to evaluate whether the inclusion of the prime contractor is warranted when technology integration considerations need to be addressed. Involvement of the acquisition prime contractor is particularly important when the acquisition prime contractor is different than the ONR contractor developing the emerging technology because integration technology issues may exist. The actions discussed in the Deputy Assistant Secretary's comments indicated that the inclusion of the acquisition prime contractor will be actively considered and the inclusion, where appropriate, will occur.

2. Require the establishment of formal memorandums of agreement or understanding and technology transition agreements between the science and technology manager and candidate acquisition program manager(s). The establishment of formal agreements should be a requirement for continued research, development, test, and evaluation funding.

Management Comments. The Deputy Assistant Secretary concurred and stated that all FNCs will have formal memorandums of agreement and that ONR is implementing a requirement for memorandums of agreements at the project level. The Deputy Assistant Secretary stated that it is imprudent to require a memorandum of agreement in every ATD project, but the inability to reach an agreement with an acquisition program managers becomes an indicator of transition problems as a project matures.

3. Review the technology paths or plans for the five unfunded science and technology products that are scheduled to transition in FYs 2002 and 2003 and consider discontinuing product development that does not have formal acquisition program support with identified funding.

Management Comments. The Deputy Assistant Secretary nonconcurred and stated that the intent of the recommendation goes beyond the scheduled transition in FYs 2002 and 2003 in that the principle should be applied in future cases. The Deputy Assistant Secretary stated that the Navy agrees with concerns that the Director, Defense Research and Engineering expressed to the Deputy Under Secretary of Defense for Acquisition, Technology, and Logistics in response to a similar recommendation on Army research programs (Inspector General, DoD, Report No. D-2002-107, "Army Transition of Advanced Technology Programs to Military Applications," June 14, 2002). The Deputy Assistant Secretary's comments referred to statements by the Under Secretary of Defense for Acquisition, Technology, and Logistics that to bring transformational technologies to operating forces depends on an acquisition environment that fosters efficiency, creativity, and innovation to demonstrate unproven technologies and explore risk mitigation before an acquisition program commits to a technology. The Deputy Assistant Secretary added that the Chief of Naval Research has no authority to compel program managers to identify transition funding and that all ATD programs that had not already satisfied the criteria for acquisition would have to be discontinued to satisfy the recommendation. Such an action would severely hamper ONR efforts to provide innovative solutions and transformational naval capabilities.

Audit Response. Management comments were not fully responsive. We revised the recommendation based on the comments. The report of the Under Secretary of Defense for Acquisition, Technology, and Logistics to Congress, in June 2001, cited that a key reason for difficulty in technology transitions was the need for collaboration among three diverse groups: the S&T researcher, the acquisition program manager, and the military user. The Under Secretary's report stated that effective transitions require the groups to work together as a team, which is frequently difficult because of their diversity. The intent of the recommendation was to address the five near-term technologies in question. The audit results for the five near-term technologies identify that coordination needed to be improved

and that funds necessary for technology transition were not available. We agree with the Under Secretary's comments that an acquisition environment that fosters efficiency, creativity, and innovation is necessary before an acquisition program commits to a technology. However, the five technologies in question were in development for several years with development participation by the planned user. The Navy needs to consider whether continued expenditure of ATD funds on technologies scheduled for near-term transition to acquisition programs is prudent if the necessary funds to continue the required development are not available.

Although the Chief of Naval Research has no authority to compel program managers to identify transition funding, he does have the responsibility to review technology paths and plans for technology products to ensure viability, to identify whether the necessary transition funds are available, and to determine whether continued expenditure of ATD funds is appropriate when technology transitioning is questionable. With limited S&T financial resources, it is prudent to align S&T efforts to technologies that are more likely to result in successful transitions. The Handbook and Guide, as discussed in this report, emphasize that successful transitions require commitment from all parties. Coordination and commitment are also stressed in the Defense Systems Management College training course, "Program Management for S&T Manager" STM 301, formally known as "Technology Insertion in Defense Systems Acquisitions." We believe that continued expenditure of ATD funds on technologies that do not have coordinated paths or plans for transitioning to acquisition programs ignores lessons learned and training on successful S&T transitioning provided to Department officials. Successful transitioning requires coordination and funding considerations through formal agreements with candidate acquisition program managers. The recommendation was not intended to subject ATDs to the milestone review process used for acquisition programs. We request that the Navy review the technology path or plans for the five unfunded S&T products, determine what action should be taken and provide additional comments to the final report.

B. Performance Assessments

The performance appraisal process was not effectively used as a management tool to assist in achieving DoD performance goals and the ONR corporate goals of transitioning technology. This condition exists because the ONR did not incorporate performance goals necessary for successful technology transitioning into the S&T product managers' performance plans. As a result, the ONR did not fully apply the Deputy Under Secretary of Defense for Science and Technology's best practices and Navy S&T managers were not held accountable for transition of technology.

Background

Deputy Under Secretary of Defense for Science and Technology. The Deputy Under Secretary of Defense for Science and Technology issued a Handbook to the Military Departments and Defense agencies on practices that, if instituted, would assist in achieving the DoD goal for transitioning technology. ONR established corporate goals to be used as a performance benchmark that included inserting technology in naval operations.

Addressing Affordability in Defense Science and Technology (S&T): A Handbook for S&T Managers. In October 1999, the DoD S&T Affordability Task Force issued a Handbook that stresses the importance of involving all candidate acquisition programs, that is, the acquisition program managers, in developing research. As described in the Background of this report, the Handbook emphasizes close coordination with technology recipients. The Handbook also states that one of the keys to successful transitioning is implementing an S&T personnel assessment process that is based on transitioning and affordability, in addition to individual technical achievements and publishing technical papers.

ONR Corporate Goals. The ONR FY 2002 corporate goals, issued on October 23, 2001, continued the theme of goals established for FY 2001. The corporate goals established the basis for the ONR senior executive service objectives and performance evaluation and provided a benchmark for establishing performance objectives and assessments for all personnel. The corporate goals identified four broad areas: programmatic, personnel, financial, and business practices. The programmatic area includes the attribute to advance development leading to products that transition to the acquisition community for insertion into naval operations.

Performance Plans

The personal performance plans for the ONR science and engineering senior executive service and product managers did not include adequate S&T performance requirements necessary to enhance technology transitioning.

Examination of performance plans for FNC senior executive service (known as Level 4) and product managers (known as Level 3) identified critical elements in four major areas; program planning and leadership, program liaison and teamwork, program execution, and supervision.

Program Planning and Leadership. The program planning and leadership critical performance element for senior executive service and product managers included three broad subcategories: planning scope and impact, program innovation, and technical credibility. The planning scope and impact subcategory focuses on providing leadership in conceptualization and definition of technical areas with anticipated Naval needs. Program innovation requires the identification of promising S&T, programmatic, or organizational concepts of new approaches. Technical credibility means being recognized as an expert in a technical application important to ONR.

Program Liaison and Teamwork. The senior executive service and product managers' critical performance element for program liaison and teamwork included the categories of communication and interaction, advocacy and integration, and corporate participation. Communication and interaction involve maintaining communications external and internal to DoD on product areas of ONR. Advocacy and integration focuses on collaborating with a wide variety of S&T experts to influence investments that meet ONR product areas or strategic goals. Cooperative participation involves fostering successful working relationships and consulting with higher-level officials on complex issues.

Program Execution. The senior executive service and product managers' critical performance element for program execution had two subcategories: asset management and program assessment and documentation. Asset management includes defining near-term and long-term asset requirements and managing overall program assets (people, contracts, funding, and equipment). The program assessment and documentation subcategory includes defining and monitoring broad corporate metrics for measuring program success in meeting ONR needs, integrating new information technologies or business practices to achieve enhancement, and establishing and implementing effective processes for monitoring and assessing whether the quality of program research efforts are consistent with the ONR corporate metrics framework.

Supervision. The senior executive service and product managers' critical performance element for supervision had three subcategories: organizational development, performance management, and workforce development. Organizational development includes establishing an infrastructure for multiple work units or teams to achieve mission and program goals, promoting best practices in organization development, and attracting high performing scientists and engineers. Performance management involves establishing organizational goals and objectives, internal controls, and performance management and incentive techniques that monitor achievements and provide recognition. The workforce development subcategory includes mentoring for career growth, developing successful technical and leadership team members, encouraging continuous learning, and coaching subordinates.

The inclusion of program planning and leadership, program liaison and teamwork, program execution, and supervision are all important performance elements for the product managers; however, the performance elements did not emphasize the importance of advanced technology development transitioning. The inclusion of a performance element for technology transitioning and the attributes for coordination and technology transitioning identified in the Deputy Under Secretary of Defense for Science and Technology Handbook and Guide would help highlight that proven technology must transition to the warfighter.

Although the ONR performance plans provide for tailoring performance expectations to address specific technologies that product managers are responsible for, according to ONR officials, none of the performance plans were tailored to include expected technical accomplishments during the performance period. The performance standards did address achieving ONR goals, but such a generic standard lacks the specificity and the ability to measure achievement of goals and measures at the individual level. The incorporation of specific, expected product achievements such as reaching a technical milestone, meeting a product timeframe schedule, establishing and using working-level IPTs with all planned users (as opposed to only at the FNC level), or achieving a technology transition to the acquisition community would be a better measure of product managers' performance. The inclusion or referencing of expected performance elements would assist in achieving the ONR corporate goals by providing a link between performance assessments and technology transitioning and would hold Navy S&T managers accountable for transition performance.

Recommendation, Management Comment, and Audit Response

B. We recommend that the Chief of Naval Research require that the personnel performance plans for product managers responsible for advanced technology development-funded programs explicitly require a supervisor's assessment of the manager's performance with planned technology users. The performance plans should include performance assessments for establishment of working-level integrated product teams with all planned (primary and secondary) technology users, creation of integrated product team charters, coordination and acceptance of quantitative metrics and key exit criteria with all planned users, development of transition plans that are formally agreed to by all planned users, and development and maintenance of up-to-date memorandums of agreement or understanding.

Management Comments. The Deputy Assistant Secretary concurred and stated that ONR is revising its personnel performance system with planned implementation in FY 2004 to contain a critical element for Program Planning and Leadership. The Program Planning and Leadership performance element would require "working results in significant new scientific and/or technical results as well as applications or other outcomes that significantly expand the

future capabilities of the Navy and Marine Corps." The Deputy Assistant Secretary stated, in addition, that ONR has begun a database of organizational metrics, which includes transitions as a major indicator of success.

Audit Response. The Deputy Assistant Secretary's comments are not fully responsive to the recommendation. The recommendation requires that technology transition be identified as a performance element, with specific actions to be used as measures of product managers' performance to enhance technology transitions. The Army has agreed to add technology transition as an element to the program managers' performance plans and the Air Force performance plans specifically addresses technology transition as an element. However the Navy comments describe a performance system that is generic and does not address the specific levels of performance from product managers, such as establishing IPTs, coordinating quantitative metrics and key exit criteria, developing transition plans, and maintaining current memorandums of agreement or understanding. We believe the inclusion of these specific elements in performance plans are necessary to enhance the likelihood of technology transitions. We request additional management comments to the final report that provide more definitive actions related to the recommendation.

C. Effectiveness of the Management Control Program

The ONR did not effectively use the management control program as a management tool for evaluating the technology transition operations within the S&T Directorate. This condition occurred because ONR did not conduct periodic command reviews to assess compliance with management control policy, ONR managers did not receive management control training consistent with their responsibilities and obligations, and ONR did not identify sufficient management controls to assess the transition of technologies. As a result, the ONR annual statements of assurance are not based on reliable assessments of the S&T process and did not adequately assess risks and controls.

Management Control Criteria

The Office of Management and Budget Circular A-123, Revised, "Management Accountability and Control," June 21, 1995, requires agencies to adequately document management control procedures and states:

> Agencies and individual Federal managers must take systematic and proactive measures to (i) develop and implement appropriate, cost-effective management controls for results-oriented management; (ii) assess the adequacy of management controls in Federal programs and operations; (iii) identify needed improvements; (iv) take corresponding corrective action; and (v) report annually on management controls.

DoD Directive 5010.38, "Internal Management Control Program," August 26, 1996, requires DoD organizations to implement a comprehensive strategy for management controls that provides reasonable assurance that programs and administrative and operating functions are efficiently and effectively carried out in accordance with applicable law and management policy. The directive requires continuous monitoring and periodic evaluations that provide the basis for the annual statement about reasonable assurance. Management control objectives include executing functions properly; avoiding fraud, waste, and mismanagement; safeguarding assets; accounting for revenues and expenditures properly; and complying with laws and regulations.

DoD Instruction 5010.40, "Management Control Program Procedures," August 28, 1996, implements policy, assigns responsibilities, and prescribes procedures for management control programs. The Instruction provides guidance for determining materiality for management control weaknesses.

SECNAV Instruction 5200.35D, "Department of the Navy Management Control Program," December 10, 1997, requires that all Department of the Navy Components maintain effective management control systems and continually monitor and improve the effectiveness of controls chosen to be employed for their programs. Monitoring efforts should be documented and performance appraisal

systems should reflect any management control responsibilities, accomplishments, deficiencies, and corrective actions taken. Each Department of the Navy Component should establish criteria for scheduling evaluations of assessable units.

ONR Instruction 5200.1B, "Office of Naval Research Management Control Program," June 8, 2001, requires that all ONR Components maintain effective management control systems, and that all levels of ONR management establish controls, and the effectiveness of controls established for programs be continually monitored and improved. The Instruction assigns responsibility for an annual review of one-third of the corporate staff and departments to the Corporate Business Council.

ONR Management Controls

Management controls need to be adequately designed, documented, and tested to provide assurance that command resources are used efficiently and effectively. The S&T departments did not identify sufficient management controls to meet the objectives of the management control process. In some instances, controls were not documented and, in others, controls were documented but could not be quantified.

Management Controls Within the S&T Directorate. The ONR S&T Directorate comprises six departments; five departments are responsible for technology development, which is the focus of this review. Three of the five S&T departments used the same management control plan. All five S&T departments provided statements in FY 2001 that they had reasonable assurance that management controls were in place and operating effectively. Further examination disclosed that two of the S&T departments could not provide documentation to identify the management controls that they had monitored or tested. The three remaining S&T departments had documented management control plans used to derive their management control annual assessments.

The standard management control plan is composed of four assessable units: plan and execute S&T programs, lead and leverage other S&T for the Department of the Navy, customer relations and transitions, and administrative support. The four assessable units have subcategories called controls that are used to measure management's effectiveness in managing the assessable units. The controls identified by the S&T departments are provided, verbatim, in the table that follows.

ONR S&T Management Control Plan

Assessable unit	Management Control	How Measured
1. Plan/Execute Science and Technology Programs	a) Attract best Principal Investigators for task	Judgment
	b) Ensure quality/innovation and state-of-the-art	Judgment
	c) Balance of basic-applied-demo and risk	Judgment
	d) Ensure naval relevance	Judgment
	e) Properly integrated/coordinated	Judgment
2. Lead/Leverage Other Science and Technology for Department of the Navy	a) Attract best Program Officers and sustain/grow skills	Judgment
	b) Technological awareness at forefront(s)	Judgment
	c) Interagency activities as leader	Judgment
	d) International activities as leader	Judgment
3. Customer Relations and Transitions	a) Requirements and needs interactions	Judgment
	b) Extrapolations based on science and technology potentials	Judgment
	c) Work the transitions	Judgment
	d) Marketing of science and technology "value-added"	Judgment
4. Administrative Support Activities	a) Inquiries (Congress, Freedom of Information Act, etc.)	Review submittals
	b) Personnel actions and activities	Judgment
	c) Timekeeping	Review submittals
	d) Science and technology awards process	Review submittals
	e) Travel	Review submittals
	f) Fiscal tracking	Review submittals
	g) Management information systems	Review submittals

Why Management Controls Need Improvement

Need for Periodic Reviews by the Corporate Business Council. ONR Instruction 5200.1B, "Office of Naval Research Management Control Program," June 8, 2001, assigns responsibility for reviewing compliance with management control policy to its Corporate Business Council. The Corporate Business Council is required to review one-third of the corporate staff and departments each year. The Corporate Business Council did not conduct any command reviews. If the Corporate Business Council had conducted reviews as required, it may have identified weaknesses in the ONR management control program. In addition, thorough reviews would have revealed that management controls were neither specific nor measurable.

Appropriate Management Control Training for Key S&T Managers. ONR did not comply with DoD Directive 5010.38 and SECNAV Instruction 5200.35D requirements to provide training to managers, consistent with their management control responsibilities. An ONR management control official stated that each S&T department head was provided a briefing on management controls. However, the department heads were not provided formal training. ONR established an Internet web site for management control training, but the site serves more as a resource center than a training venue because personnel are allowed to self-certify training completion without demonstrating any comprehension of management controls.

Management Controls for Transition of S&T Technologies. ONR identified just one management control that was specific to the transition of technologies. As shown in the preceding table of S&T management controls, ONR identified the technology transition effort within assessable unit number 3., "Customer Relations and Transitions." The control identified with the technology transition effort is "Work the transition." The assessment of this one identifiable control over technology transitions is completed by the judgment of the S&T officials. ONR can improve the management controls over technology transition by identifying additional controls that are quantifiable and measurable, such as:

- Establishing and keeping current memorandums of agreement or understanding, or technology transition agreements that include TRLs, exit criteria, transition timelines, and funding agreements for development and transitioning.
- Establishing and maintaining a working-level IPT charter that identifies the roles and responsibilities of the participating parties.
- Establishing a working-level IPT with the acquisition program manager and, as appropriate, the prime contractor.
- Recording, coordinating, and establishing agreement on the decisions, issues, and action items resulting from the working-level IPT meetings.
- Coordinating secondary transition paths.

Effect of Weaknesses Noted

Until adequate management controls are identified and tested, ONR cannot determine with reasonable assurance that the S&T Directorate is operating efficiently and effectively.

Recommendations, Management Comments, and Audit Response

C. We recommend that the Chief of Naval Research,

1. Require Science & Technology Department officials responsible for technology transition programs to identify and document appropriate management controls that are measurable and that will contribute to preparing the annual statement of assurance.

Management Comments. The Deputy Assistant Secretary concurred and stated that ONR formed an S&T Performance Measurement Analysis Program, established performance measurement prototypes, convened a Working Group, conducted a study of vendors, and developed three web-based performance measurement prototypes for test and evaluation. Preliminary data had been collected and one of the metrics is transitioning.

Audit Response. Although the Deputy Assistant Secretary concurred the comments do not address the intent of the recommendation to establish quantifiable and measurable assessable units. It is unclear how the processes described in the response affect the ONR S&T management controls that we reviewed. The table on page 20 represents the ONR S&T official management control program. The comments do not address the finding, the table, or the recommendation to modify the S&T management control program to include measurable controls. We request that ONR officials review the suggested improvements to the S&T management control program as discussed on page 21 (establishing memorandums of agreement, technology transition agreements, establishing working-level IPT charters) and provide additional comments that address how the management control program, with measurable controls, will be used as a management tool to enhance technology transitioning.

2. Direct the Corporate Business Council to conduct annual command reviews and use the review results as a basis for the Office of Naval Research annual statement of assurance.

Management Comments. The Deputy Assistant Secretary concurred and stated that the ONR Corporate Business Council reviewed 59 of 138 ONR assessable units. The review results contributed to the ONR FY 2002 annual assurance statement. The reviews will continue contributing to future statements.

3. Provide management control training to the Science and Technology officials, consistent with the requirements of DoD Directive 5010.38.

Management Comments. The Deputy Assistant Secretary concurred and stated that ONR will continue to provide training to managers consistent with their responsibilities and obligations. ONR developed web-based management control training in recognition of the need to have a means of delivery available on demand. The Deputy Assistant Secretary stated that the web-based training is augmented by assistance from the Management Control Coordinator when needed, required, or requested.

Audit Response. The Deputy Assistant Secretary comments did not address the intent of the recommendation. We were aware that the S&T officials received personal briefings and, in some cases, completed the web-based management control training. The comments restate the training program that existed during the audit. Our discussions with S&T officials concerning the management control program identified that the officials' comprehension of management controls was not consistent with their responsibilities and obligations, thus resulting in this finding and recommendation. For example, one ONR official requested the auditors to explain an assessable unit prior to discussing the management control plan. This official reported a high confidence in controls in his annual report for this assessable unit. In addition, only two of six S&T Department officials had completed the web-based management control training. Management comments do not identify any additional actions to be taken as a result of this finding that would enhance the S&T officials' understanding of management controls. We request that the Navy provide additional comments to the final report discussing how management control training will be improved to ensure that S&T officials understand the program and their responsibilities and can use this knowledge to develop quantifiable and measurable controls.

Appendix A. Scope and Methodology

Work Performed. We examined 39 S&T technologies at the ONR to evaluate the management process for transitioning successful technologies to the warfighter. The S&T technologies examined were funded with the advanced technology development budget activity within the Navy research, development, test and evaluation appropriations, and had a FY 2002 budget of $870.3 million, which includes $189.8 million in congressional increases. The FY 2003 budget request is $617.1 million.

We conducted interviews with S&T and acquisition program officials, and examined applicable key documentation. Key documentation included guidance advocated by the Deputy Under Secretary of Defense for Science and Technology; FNC business plans; technology transition agreements; IPT meeting minutes where available; memorandums of understanding and agreement; acquisition program funding profiles; S&T management plans; technology transition paths or plans; and the research, development, test, and evaluation budget item justification sheet (R-2 Exhibit).

We performed this audit from January 2002 through August 2002 in accordance with generally accepted government auditing standards with the exception of the scope limitations noted below.

Limitations to Scope. We did not evaluate the technical merits of the S&T products. We limited the ONR management control review to the S&T management procedures and the departments responsible for transitioning technology from S&T community to the acquisition program managers or another technology area.

Use of Computer-Processed Data. We relied on computer-processed data without performing tests of general and application system controls to confirm the reliability of the data. We relied on the Department of the Navy Science and Technology Program website, https://donst.nrl.navy.mil/donst/, and the computerized listing to represent the known universe of S&T products in the review of the management process. We validated the total funding for FY 2002 on the computerized listing to the total funding under the advanced technology development budget activity within the Navy research, development, test, and evaluation appropriation. Validating the computerized listing to the appropriations was appropriate for this audit because the audit's objective was to examine the management process for transitioning technology, not the individual S&T products. Further validation of the computerized listing would not change the conclusions in this report.

General Accounting Office High-Risk Area. The General Accounting Office has identified several high-risk areas in the DoD. This report provides coverage of the Weapon System Acquisition high-risk area.

Management Control Program Review

DoD Directive 5010.38, "Management Control (MC) Program," August 26, 1996, and DoD Instruction 5010.40, "Management Control (MC) Program Procedures," August 28, 1996, require DoD organizations to implement a comprehensive system of management controls that provides reasonable assurance that programs are operating as intended and to evaluate the adequacy of the controls.

SECNAV Instruction 5200.35D, "Department of the Navy Management Control Program," December 10, 1997, requires that all Department of the Navy Components maintain effective management control systems and continually monitor and improve the effectiveness of controls chosen to be employed for their programs. ONR Instruction 5200.1B, "Office of Naval Research Management Control Program," June 8, 2001, requires that all ONR Components maintain effective management control systems.

Scope of the Review of the Management Control Program. We evaluated the management control process at ONR to determine whether effective management procedures were established to transition successful S&T projects to acquisition program managers and, ultimately, to the warfighter.

Adequacy of Management Controls. We identified a material management control weakness for ONR as defined by DoD Instruction 5010.40. ONR management controls for technology transition within the S&T Directorate were not adequate to provide reasonable assurance that the transition effort had been executed efficiently and effectively. Recommendations C.1., C.2., and C.3., if implemented, will improve ONR management controls over the technology transition effort. A copy of the report will be provided to the Navy official responsible for management controls.

Adequacy of Management's Self-Evaluation. ONR officials identified technology transition with the S&T Directorate as part of an assessable unit. However, in its evaluation, ONR officials did not identify the specific material management control weaknesses identified by the audit because the ONR evaluation was too general and not measurable.

Prior Coverage

During the last 5 years, the General Accounting Office has issued one report and the Inspector General of the Department of Defense has issued two reports discussing the benefits of adequately managing the challenges of transitioning technologies to warfighters.

General Accounting Office

Report No. NSIAD-99-162, "Best Practices: Better Management of Technology Development Can Improve System Outcomes," July 30, 1999

Inspector General of the Department of Defense (IG DoD)

IG DoD Report No. D-2002-107, "Army Transition of Advanced Technology Programs to Military Applications," June 14, 2002

IG DoD Report No. D-2002-146, "The Defense Advanced Research Projects Agency's Transition of Advanced Information Technology Programs," September 11, 2002

Appendix B. Technology Readiness Levels and Their Definitions

The Deputy Secretary of Defense issued interim acquisition guidance on October 30, 2002. The interim guidance provided a matrix that lists technology readiness levels and descriptions from a systems approach for both hardware and software as shown below.

Technology Readiness Level	Description
1. Basic principles observed and reported.	Lowest level of technology readiness. Scientific research begins to be translated into applied research and development. Examples might include paper studies of a technology's basic properties.
2. Technology concept and/or application formulated.	Invention begins. Once basic principles are observed, practical applications can be invented. The applications are speculative and there may be no proof or detailed analysis to support the assumptions. Examples are limited to analytic paper studies.
3. Analytical and experimental critical function and/or characteristic proof of concept.	Active research and development is initiated. This includes analytical studies and laboratory studies to physically validate analytical predictions of separate elements of the technology. Examples include components that are not yet integrated or representative.
4. Component and/or breadboard validation in laboratory environment.	Basic technological components are integrated to establish that they will work together. This is relatively "low fidelity" compared to the eventual system. Examples include integration of "ad hoc" hardware in a laboratory.
5. Component and/or breadboard validation in relevant environment.	Fidelity of breadboard technology increases significantly. The basic technological components are integrated with reasonably realistic supporting elements so it can be tested in simulated environment. Examples include "high fidelity" laboratory integration of components.
6. System/subsystem model or prototype demonstration in a relevant environment.	Representative model or prototype system, which is well beyond that of TRL 5, is tested in a relevant environment. Represents a major step up in a technology's demonstrated readiness. Examples include testing a prototype in a high fidelity laboratory environment or in a simulated operational environment.
7. System prototype demonstration in an operational environment.	Prototype near, or at, planned operational system. Represents a major step up from TRL 6, requiring the demonstration of an actual system prototype in an operational environment such as an aircraft, vehicle, or space. Examples include testing the prototype in a test bed aircraft.
8. Actual system completed and qualified through test and demonstration.	Technology has been proven to work in its final form and under expected conditions. In almost all cases, this TRL represents the end of true system development. Examples include developmental test and evaluation of the system in its intended weapon system to determine if it meets design specifications.
9. Actual system proven through successful mission operations.	Actual application of the technology in its final form and under mission conditions, such as those encountered in operational test and evaluation. Examples include using the system under operational mission conditions.

Appendix C. Summary of Advanced Technology Development Projects Reviewed

Knowledge Superiority and Assurance

System	Receiving Acquisition Program	MOA/ MOU/ TTA[1] With User	Established an IPT[2]	IPT[2] Charter	IPT[2] Includes User	IPT[2] Includes Prime Contractor	Funding By Acquisition User to Transition[3]	Receiving User Agreed to TRL[4]	Receiving User Agreed to Exit Criteria
Air Operations Decision Support	Program Manager (Air), E2/C2 Leadership Council (P)[5]	Yes	Yes	No	Yes	Yes	n/a[12]	No	Yes
Dynamic Reconfiguration of Link-16	Program Manager (Warfare), Advanced Tactical Data Link Systems (PMW 159) (P)[5]	Yes	Yes	No	Yes	Yes	n/a[12]	No	Yes
Image Processing and Exploitation Architecture	Program Manager (Air), Cruise Missile Command and Control Program (PMA 281) (P)[5]	Yes	Yes	No	Yes	Yes	n/a[8]	Yes	Yes
Integrated Decision Support Suite	Program Manager (Air), Tactical Automated Mission Planning System (PMA 233) (P)[5]	Yes	Yes	No	Yes	Yes	n/a[12]	No	Yes
	Special Warfare Command (S)[5]	Yes	No	n/a[6]	No	No	n/a[12]	No	Yes

Note: See footnotes at the end of the appendix.

Knowledge Superiority and Assurance (cont'd)

System	Receiving Acquisition Program	MOA/MOU/ TTA[1] With User	Established an IPT[2]	IPT[2] Charter	IPT[2] Includes User	IPT[2] Includes Prime Contractor	Funding By Acquisition User to Transition	Receiving User Agreed to TRL[4]	Receiving User Agreed to Exit Criteria
Integrated Marine Multi-Agent Command and Control Technology	Program Manager Ground Command and Control (Marine Air-Ground Task Force Command, Control, Communications, Computers, & Intelligence Product Group) (P)[5]	Yes	Yes	No	Yes	Yes	n/a[12]	Yes	Yes
Joint Mission Planning System/Gator Surface Assault Planning	Program Manager (Sea), Landing Craft Air Cushion (PMS 377J) (P)[5]	Yes	Yes	No	Yes	Yes	n/a[12]	No	No
	Program Manager (Air), Tactical Automated Mission Planning System (PMA 233) (S)[5]	No	No	n/a[6]	No	No	n/a[12]	No	No
Multi-National Virtual Operations Capability	Program Manager (Warfare), Advanced Automated Tactical Communications (PMW 179) (P)[5]	Yes	Yes	No	Yes	Yes	n/a[12]	No	No
	Program Manager (Warfare), Information Systems Security (PMW 161) (S)[5]	No	No	n/a[6]	No	No	n/a[12]	No	No

Note: See footnotes at the end of the appendix.

Knowledge Superiority and Assurance (cont'd)

System	Receiving Acquisition Program	MOA/MOU/ TTA[1] With User	Established an IPT[2]	IPT[2] Charter	IPT[2] Includes User	IPT[2] Includes Prime Contractor	Funding By Acquisition User to Transition	Receiving User Agreed to TRL[4]	Receiving User Agreed to Exit Criteria
Naval Battleforce Networking: Intra-Battlegroup Wireless Networking	Program Manager (Warfare), Advanced Automated Tactical Communications (PMW 179) (P)[5]	Yes	Yes	No	Yes	n/a[7]	n/a[12]	Yes	Yes
Naval Battleforce Networking: Traffic Flow Engineering	Program Manager (Warfare), Advanced Automated Tactical Communications (PMW 179) (P)[5]	Yes	Yes	No	Yes	Yes	n/a[12]	Yes	Yes
On-Hull Extremely Low Frequency Antenna	Program Manager (Warfare), Submarine Communications (PMW 173) (P)[5]	Yes	No	n/a[6]	n/a[6]	n/a[6]	n/a[12]	Yes	Yes
Real-time Execution Decision Support	Program Manager (Air), Tactical Automated Mission Planning System (PMA 233) (P)[5]	Yes	Yes	No	Yes	Yes	n/a[12]	No	Yes
STORYMAKER Precision Geo-Location	Program Manager (Air), Maritime Surveillance Aircraft Leadership (P)[5]	Yes	Yes	No	Yes	Yes	n/a[12]	Yes	Yes

Note: See footnotes at the end of the appendix.

Knowledge Superiority and Assurance (cont'd)

System	Receiving Acquisition Program	MOA/MOU/ TTA[1] With User	Established an IPT[2]	IPT[2] Charter	IPT[2] Includes User	IPT[2] Includes Prime Contractor	Funding By Acquisition User to Transition	Receiving User Agreed to TRL[4]	Receiving User Agreed to Exit Criteria
Virtual Information Center Technologies for Open-Source Requirements II	Program Manager (Warfare), Navy Command and Control Systems (PMW 157) (P)[5]	Yes	Yes	No	Yes	Yes	n/a[8] (FY03)	Yes	Yes
X/Ku Band Phased Array	Program Manager (Sea), DD(X) Program Office (PMS 500) (P)[5]	No	Yes	No	Yes	No	n/a[12]	No	No
	Program Manager (Sea), Naval Fires Network (PMS 454) (S)[5]	No	Yes	No	Yes	No	n/a[12]	No	No
	Program Manager (Sea), AEGIS Combat System Program (PMS 400B) (S)[5]	Yes	No	n/a[6]	No	No	n/a[12]	No	No

Note: See footnotes at the end of the appendix.

Littoral Anti-Submarine Warfare

System	Receiving Acquisition Program	MOA/MOU/ TTA[1] With User	Established an IPT[2]	IPT[2] Charter	IPT[2] Includes User	IPT[2] Includes Prime Contractor	Funding By Acquisition User to Transition	Receiving User Agreed to TRL[4]	Receiving User Agreed to Exit Criteria
Common Tactical Picture	Undersea Technology Directorate, Advanced Systems and Technology Office (SEA 93) (P)[5]	Yes	Yes	No	Yes	Yes	n/a[12]	No	Yes
Environmentally Adaptive Sonar Technology	Program Manager (Sea), Surface Ship Under-Sea Warfare (PMS 411) (P)[5]	Yes	Yes	No	Yes	Yes	n/a[12]	No	Yes
Lightweight Broadband Variable Depth Sonar	Program Manager (Sea), DD(X) Program Office (PMS 500) (P)[5]	Draft[9]	Yes	No	Yes	Yes	No (FY03)	No	No
Multistatic Antisubmarine Warfare	Undersea Technology Directorate, Advanced Systems and Technology Office (SEA 93) (P)[5]	Yes	Yes	No	Yes	Yes	No (FY02)	No	Yes
Sonar Automation	Undersea Technology Directorate, Advanced Systems and Technology Office (SEA 93) (P)[5]	Yes	Yes	No	Yes	Yes	No (FY02)	No	Yes
Weapon/ Platform Connectivity	Program Manager (Sea), Undersea Weapons (PMS 404) (P)[5]	Yes	Yes	No	Yes	Yes	No (FY03)	No	Yes

Note: See footnotes at the end of the appendix.

Organic Mine Countermeasures

System	Receiving Acquisition Program	MOA/MOU/ TTA[1] With User	Established an IPT[2]	IPT[2] Charter	IPT[2] Includes User	IPT[2] Includes Prime Contractor	Funding By Acquisition User to Transition	Receiving User Agreed to TRL[4]	Receiving User Agreed to Exit Criteria
Autonomous Unmanned Vehicle Technology for Clandestine Reconnaissance and Minehunting	Program Manager (Sea), Explosive Ordnance Disposal (PMS EOD) (P)[5]	Yes	Yes	No	Yes	n/a[7]	No (FY03)	Yes	Yes
Data Fusion for Mine Detection	Program Manager (Sea), Surface Mine Warfare (PMS 411) (P)[5]	Yes	No	n/a[6]	n/a[6]	n/a[6]	n/a[12]	Yes	Yes
Imagery Exploitation Tecniques	Naval Oceonographic Office (P)[5]	Yes	No	n/a[6]	n/a[6]	n/a[6]	n/a[8]	Yes	No
Standoff Mine and Obstacle Breaching Warhead	Program Manager (Sea), Surface Mine Warfare (PMS 490) (P)[5]	Yes	Yes	No	Yes	Yes	n/a[12]	Yes	Yes
Unmanned Aerial Vehicle Payload Systems for Mine and Obstacle Detection	Marine Corps System Command (P)[5]	Draft[9]	Yes	No	Yes	Yes	n/a[12]	No	No

Note: See footnotes at the end of the appendix.

Fleet Force Protection

System	Receiving Acquisition Program	MOA/MOU/ TTA[1] With User	Established an IPT[2]	IPT[2] Charter	IPT[2] Includes User	IPT[2] Includes Prime Contractor	Funding By Acquisition User to Transition	Receiving User Agreed to TRL[4]	Receiving User Agreed to Exit Criteria
Advanced Damage Countermeasures	Program Executive Office Surface Strike (PEO S) (P)[5]	Draft[9]	Yes	No	Yes	n/a	n/a[12]	No	No
Advanced Multifunction Radio Frequency Concept Version 1	Naval Sea Systems Command, Surfare Radar (PMS 426) (P)[5]	Yes	No	n/a	No	No	n/a[12]	Yes	Yes
	Program Executive Office Surface Strike (PEO S) (P)[5]	No	Yes	No	Yes	n/a[6]	n/a[12]	No	No
	Program Manager (Sea) Systems Division (PMS 473) (P)[5]	No	No	n/a[6]	No	No	n/a[12]	No	No
	Program Executive Office Carriers (PEO C) (S)[5]	No	No	n/a[6]	No	No	n/a[12]	No	No
	Program Executive Office Expeditionary Warfare (PEO EXW) (S)[5]	No	No	n/a[6]	No	No	n/a[12]	No	No
	Program Executive Office Subs (PEO Sub) (S)[5]	No	No	n/a[6]	No	No	n/a[12]	No	No

Note: See footnotes at the end of the appendix.

Fleet Force Protection (cont'd)

System	Receiving Acquisition Program	MOA/MOU/ TTA[1] With User	Established an IPT[2]	IPT[2] Charter	IPT[2] Includes User	IPT[2] Includes Prime Contractor	Funding By Acquisition User to Transition	Receiving User Agreed to TRL[4]	Receiving User Agreed to Exit Criteria
Anti-Torpedo Torpedo Tripwire	Program Manager (Sea), Undersea Defensive Warfare Systems (PMS 415) (P)[5]	Draft[9]	Yes	No	Yes	Yes	n/a[12]	No	No
	Program Executive Office Subs (PEO Sub) (S)[5]	No	No	n/a[6]	No	No	n/a[12]	No	No
	Program Executive Office Expeditionary Warfare (PEO EXW) (S)[5]	No	No	n/a[6]	No	No	n/a[12]	No	No
Dynamic Magazine Protection	Program Manager (Sea), Aircraft Carrier, Experimental (PMS 378) (P)[5]	Draft[9]	Yes	No	Yes	n/a	n/a[12]	No	No
Electronic Warfare Integrated System for Small Platforms	Direct Reporting Program Manager Advanced Amphibious Assault (DRPM AAA) (P)[5]	No	Yes	No	Yes	No	n/a[12]	No	No
	Program Manager (Sea), Amphibious Warfare (PMS 378) (S)[5]	No	No	n/a[6]	No	No	n/a[12]	No	No

Note: See footnotes at the end of the appendix.

Fleet Force Protection (cont'd)

System	Receiving Acquisition Program	MOA/MOU/ TTA[1] With User	Established an IPT[2]	IPT[2] Charter	IPT[2] Includes User	IPT[2] Includes Prime Contractor	Funding By Acquisition User to Transition	Receiving User Agreed to TRL[4]	Receiving User Agreed to Exit Criteria
Missile Warning System	Program Manager (Air), Advanced Tactical Aircraft Protection Program (PMA 272) (P)[5]	No	Yes	No	Yes	Yes	n/a[12]	No	No
Near Field Deamping	Program Executive Office, Surface Strike (PEO S) (P)[5]	Draft[9]	Yes	No	Yes	n/a	n/a[12]	No	No
Passive Magazine Protection	Program Executive Officer, Surface Strike (PEO S) (P)[5]	Draft[9]	Yes	No	Yes	n/a	n/a[12]	No	No

Note: See footnotes at the end of the appendix.

Advanced Technology Demonstrations

System	Receiving Acquisition Program	MOA/MOU/ TTA[1] With User	Established an IPT[2]	IPT[2] Charter	IPT[2] Includes User	IPT[2] Includes Prime Contractor	Funding By Acquisition User to Transition	Receiving User Agreed to TRL[4]	Receiving User Agreed to Exit Criteria
Broadband Processing	Littoral Anti-Submarine Warfare FNC (P)[5]	n/a[10]	n/a[10]	n/a[10]	n/a[10]	n/a[10]	n/a[10]	n/a[10]	n/a[10]
	Program Manager (Sea), Undersea Weapons (PMS 404) (S)[5]	n/a[11]	n/a[11]	n/a[11]	n/a[11]	n/a[11]	n/a[11]	n/a[11]	n/a[11]
Buoyant Cable Antenna	Knowledge Superiority and Assurance FNC (P)[5]	n/a[10]	n/a[10]	n/a[10]	n/a[10]	n/a[10]	n/a[10]	n/a[10]	n/a[10]
	Program Manager (Warfare), Submarine Communications (PMW 173) (S)[5]	Yes	Yes	No	Yes	No	No	No	No
Claymore Marine	Program Manager (Air), Air Anti-Submarine Warfare Systems Program (PMA 264) (P)[5]	No	No	n/a[6]	n/a[6]	n/a[6]	No	No	No
Forward Air Support Marine	Program Manager (Sea), Naval Surface Fire Support (PMS 529) (P)[5]	Yes	Yes	No	Yes	Yes	No	No	Yes
	Loitering Electronic Warfare Killer ACTD (S)[5]	Yes	No	n/a[6]	No	No	Yes	No	No

Note: See footnotes at the end of the appendix.

Advanced Technology Demonstrations (cont'd)

System	Receiving Acquisition Program	MOA/MOU/ TTA[1] With User	Established an IPT[2]	IPT[2] Charter	IPT[2] Includes User	IPT[2] Includes Prime Contractor	Funding By Acquisition User to Transition	Receiving User Agreed to TRL[4]	Receiving User Agreed to Exit Criteria
Reactive Material Warhead	Program Manager (Sea), Standard Missile Program (PMS 422) (P)[5]	Yes	Yes	No	Yes	Yes	Yes	No	Yes
	Program Manager (Air), Defense Suppression Systems Program (PMA 242) (S)[5]	Yes	Yes	No	Yes	Yes	No	No	Yes
	Missile Defense FNC (S)[5]	No	No	n/a[6]	No	No	Yes	No	No
Vectored Thrust Ducted Propeller Compound Helicopter	Program Manager (Air), Multi-Mission Helicopters Program (PMA 299) (P)[5]	Yes	Yes	No	Yes	Yes	No	No	No

[1] Memorandum of Agreement; Memorandum of Understanding; Technology Transition Agreement
[2] Integrated Product Team
[3] The notation of "no" indicates that transition funding for the emerging technology was not specifically identifiable in budget documentation at the respective program office.
[4] Technology Readiness Level
[5] (P) – Primary Acquisition Receiver; (S) – Secondary Acquisition Receiver
[6] Not applicable because no IPT was created for this product.
[7] Not applicable because there is no Prime Contractor for this product.
[8] Not applicable because no additional funding is required for transition.
[9] Draft documentation was not counted as a positive response.
[10] Of the 6 ATDs, 4 are scheduled for transitions to acquisition programs. The remaining two are scheduled for transition to an FNC, but will have the same manager after transition. No coordination between parties is necessary for these two efforts.
[11] Covered under the Littoral Anti-Submarine Warfare FNC product entitled, "Weapon/Platform Connectivity."
[12] Not applicable because FY04 and beyond budgets were not formalized at the time of the audit.

Appendix D. Report Distribution

Office of the Secretary of Defense

Under Secretary of Defense for Acquisition, Technology, and Logistics
    Deputy Under Secretary of Defense for Science and Technology
Under Secretary of Defense (Comptroller)/Chief Financial Officer
    Deputy Chief Financial Officer
    Deputy Comptroller (Program/Budget)

Department of the Navy

Assistant Secretary of the Navy (Research, Development, Acquisition)
    Chief of Naval Research
    Direct Reporting Program Manager, Advanced Amphibious Assault
Commander, Naval Air Systems Command
Commander, Naval Sea Systems Command
Commander, Space and Naval Warfare Systems Command
Commander, Marine Corps Systems Command
Naval Inspector General
Auditor General, Department of the Navy

Non-Defense Federal Organization

Office of Management and Budget

Congressional Committees and Subcommittees, Chairman and Ranking Minority Member

Senate Committee on Appropriations
Senate Subcommittee on Defense, Committee on Appropriations
Senate Committee on Armed Services
Senate Committee on Governmental Affairs
House Committee on Appropriations
House Subcommittee on Defense, Committee on Appropriations
House Committee on Armed Services
House Committee on Government Reform
House Subcommittee on Government Efficiency, Financial Management, and Intergovernmental Relations, Committee on Government Reform
House Subcommittee on National Security, Veterans Affairs, and International Relations, Committee on Government Reform
House Subcommittee on Technology and Procurement Policy, Committee on Government Reform

Department of the Navy Comments

DEPARTMENT OF THE NAVY
OFFICE OF THE ASSISTANT SECRETARY
RESEARCH, DEVELOPMENT AND ACQUISITION
1000 NAVY PENTAGON
WASHINGTON, DC 20350-1000

20 November 2002

MEMORANDUM FOR THE DEPARTMENT OF DEFENSE ASSISTANT INSPECTOR GENERAL
FOR AUDITING

Subj: DRAFT AUDIT REPORT ON NAVY TRANSITION OF ADVANCED TECHNOLOGY PROGRAMS TO MILITARY APPLICATIONS (PROJECT NO. D2001AB-0105.001)

Ref: (a) DoDIG memo of 30 Sept 02

Encl: (1) Department of the Navy Response

In response to your memorandum of 30 September 2002, the Department of the Navy appreciates the opportunity to provide comments on the subject report. The enclosure provides concurrence or non-concurrence with each recommendation, and comments as you requested.

I wish to emphasize the Navy's disagreement with two of the report's recommendations, which could have an adverse impact on the Navy's ability to transition new technology to our operating forces. Contrary to Under Secretary of Defense (Acquisition, Technology and Logistics) policy, these recommendations are overly prescriptive, and are harmful to an acquisition policy environment that fosters efficiency, creativity, and innovation.

Recommendation A.1. suggests that the Chief of Naval Research require inclusion of the acquisition program office's prime contractors, where applicable, in integrated product teams (IPT) established for advanced technology development (6.3) efforts. All Navy 6.3 efforts have, or soon will have, IPTs including representatives of targeted acquisition programs. The acquisition program manager should have sole authority to decide whether, when, and how his prime contractors participate in these IPTs. In practice, most 6.3 IPTs will include the prime contractors when appropriate. Requiring the inclusion of prime contractors in all cases would leave the government open for potential problems, including the appearance of pre-selection for future solicitations and possible abuses of proprietary information.

Recommendation A.3. requires that the Chief of Naval Research discontinue any product development for 6.3 efforts scheduled to transition in FY 2002-2003 that does not have identified funding from an acquisition program. This recommendation, if implemented, would limit 6.3 funding to projects that had already passed acquisition milestone A, and thereby forestall nearly all transformational technology development. It is essential that 6.3 programs be able to demonstrate unproven options, mitigate risks, and offer alternative solutions before an acquisition program commits to transition the product.

WILLIAM J. SCHAEFER
Deputy Assistant Secretary of the Navy
Planning, Programming and Resources

Department of the Navy Response
to
AIG(A) Draft Report of 30 September 2002
on
Navy Transition of Advanced Technology Programs to Military Applications (Project No. D2001AB-0105.001)

Recommendation A.1:

We recommend that the Chief of Naval Research, for advanced technology development efforts: 1. Require the establishment of integrated product teams that include representatives from the primary and secondary candidate acquisition program office(s) and the acquisition program office prime contractor(s) where applicable.

Department of the Navy Response:

Partially concur. Recommend removal of the phrase "and the acquisition program office prime contractor(s) where applicable" or substitution of the alternative phrase "with the acquisition office's prime contractor(s) when desired by the acquisition program manager."

The Navy is implementing the first part of the recommendation to require establishment of integrated product teams (IPTs) that include target acquisition program offices as members. The Navy has divided advanced technology programs into two groups, Future Naval Capabilities (FNCs) and Exploitation and Development (E&D). FNCs provide S&T support to near and mid term warfighter requirements and acquisition programs, with focus on transition within five years. E&D programs support higher risk transformational efforts.

Subject audit was conducted in FY 2002, the first year of implementation of the FNCs. All FNC programs are required to have IPTs as recommended. At present, all FNCs have IPTs at the program level, and are forming IPTs for transition of each project. For transformational E&D efforts, an IPT will be the norm. It is imprudent to require IPTs, or any bureaucratic instrument, in every case; but exceptions should and will be rare, justified, and documented. FNCs will document compliance with this portion of the recommendation in the ONR Investment Balance Review in January 2003, and management control statements of assurance for FY 2003.

The recommendation that the CNR require inclusion of prime contractor(s) in the IPTs is not executable and potentially harmful to the acquisition of new technologies. IPTs for 6.3 programs openly discuss government-only issues, including pending contract negotiations and proprietary information. The prime contractors are brought in when the program manager determines it is appropriate. Prime contractors normally are, and will continue to be, active participants in the IPTs. However, the recommendation suggests that

CNR require that the prime contractors be present. This decision should be made by the contracting officer representative/acquisition program manager at his discretion.

Recommendation A.2:

We recommend that the Chief of Naval Research, for advanced technology development efforts require the establishment of formal memorandums of agreement or understanding and technology transition agreements between the science and technology manager and candidate acquisition program manager(s). The establishment of formal agreements should be a requirement for continued research, development, test, and evaluation funding.

Department of the Navy Response:

Concur. Ninety-two percent (92%) of the FNCs currently have formal MOAs for transitions in FY 2003 to targeted acquisition programs. All of the FNCs will have formal memorandums of agreement (MOA) soon. ONR is implementing a requirement for MOAs at the project level as transition arrangements are made. ONR is devoting much attention to determining at what level of maturity, size and/or technical detail MOAs should be required, and with whom. It is imprudent to impose a blanket requirement for an MOA in every 6.3 project, or to require management to stop a project prematurely for lack of one; but inability to reach an MOA with an acquisition program becomes an indicator of a transition problem as a project matures. FNCs will document compliance with this recommendation in the ONR Investment Balance Review and management controls statements of assurance for FY 2003.

Recommendation A.3:

We recommend that the Chief of Naval Research, for advanced technology development efforts review the technology paths or plans for the 5 unfunded science and technology products that are scheduled to transition in FY 2002 and 2003 and discontinue any product development that does not have formal acquisition program support with identified funding.

Department of the Navy Response:

Non-concur. Recommend removal of the word "formal" and the phrase "with identified funding."

The Navy understands that the recommendation literally applies only to unfunded projects scheduled for transition in FY 02-03, but the clear intent of the report's findings (see p.10) is that the principle should be applied in future cases. The Navy concurs with the concerns that the DDR&E expressed to the DUSD (AT&L) in response to a similar recommendation regarding Army 6.3 programs (attachment (1)). The entire effort to bring transformational technologies to the

operating forces depends on an acquisition environment that, as stated by USD (AT&L), "fosters efficiency, creativity, and innovation." Such an environment, in turn, depends on the ability to use 6.3 funds to demonstrate unproven technologies, and explore risk mitigation, before an acquisition program commits to a technology. The Chief of Naval Research has no authority to compel an acquisition program manager to identify transition funding. Therefore, all 6.3 programs that had not already satisfied the criteria for acquisition would have to be discontinued in order to comply with this recommendation. Such action would effectively move 6.3 efforts past milestone A and severely hamper ONR's efforts to provide innovative solutions and transformational naval capabilities.

Recommendation B:

We recommend that the Chief of Naval Research require that the personnel performance plans for product managers responsible for advanced technology development-funded programs explicitly require a supervisor's assessment of the manager's performance with planned technology users. The performance plans should include performance assessments for establishment of working-level integrated product teams with all planned (primary and secondary) technology users, creation of integrated product team charters, coordination and acceptance of quantitative metrics and key exit criteria with all planned users, development of transition plans that are formally agreed to by all planned users, and development and maintenance of up-to-date memorandums of agreement or understanding.

Department of the Navy Response:

Concur. ONR is revising its personnel performance system to a demonstration model that is being tested in FY03 and scheduled for implementation in FY04. Performance standards for all positions in the two senior bands of the Science and Engineering Career track (that is, above the GS-11 level) contain a Critical Element for Program Planning and Leadership, which includes the following standard:

"Work results in significant new scientific and/or technical results as well as applications or other outcomes that significantly expand the future capabilities of the Navy and Marine Corps."

This standard will be implemented whether or not the demonstration model is approved. Performance against this standard will be documented in FY 2003 Yearly Accomplishment Reports and evaluations. Additionally, ONR has begun a database of organizational metrics (discussed below) which includes transitions as a major indicator of success. Data has been collected for FY 2001, and FY 2002 data is due for collection in January 2003.

Recommendation C.1:

We recommend that the Chief of Naval Research require Science and Technology Department officials responsible for technology transition programs to identify and document appropriate management controls that are measurable and that will contribute to preparing the annual statement of assurance.

Department of the Navy Response:

Concur. ONR formed an S&T Performance Measurement Analysis Program in January 1999, established performance measurement prototypes in August 1999, convened a Working Group in July 2001, conducted a Balanced Scorecard study of vendors in November 2001, and developed three web-based performance measurement prototypes for test and evaluation in April 2002. Preliminary data have been collected for FY 2001, and are due for FY 2002 in January 2003. One of the most significant metric is "Transitions," defined as "S&T that is sufficiently matured to the point where a product has moved on and somebody is doing something with it (i.e., they bought it)." Compliance with this recommendation will be documented in the next statement of assurance in September 2003.

Recommendation C.2:

We recommend that the Chief of Naval Research direct the Corporate Business Council to conduct annual command reviews and use the review results as a basis for the Office of Naval Research annual statement of assurance.

Department of the Navy Response:

Concur. ONRINST 5200.1B assigns responsibility to the ONR Headquarters (HQ) Corporate Business Council (CBC) for reviewing compliance with ONRINST 5200.1B and with SECNAVINST 5200.35D for ONR Corporate Staff elements and Departments. These reviews should be conducted such that about one-third of the Corporate Staff elements and Departments are reviewed each year and no department is reviewed at greater than three year intervals. During FY 2002, the CBC reviewed 59 of ONR's 138 assessable units. The results of these reviews contributed to ONR's FY 2002 annual assurance statement. These CBC reviews will continue in the manner prescribed by ONRINST 5200.1B with the results contributing to ONR's annual statement of assurance.

Recommendation C.3:

We recommend that the Chief of Naval Research provide management control training to the Science and Technology officials, consistent with the requirements of DOD Directive 5010.38.

Final Report Reference

Department of the Navy Response:

Concur. ONR will continue to provide training to ONR managers consistent with their responsibilities and obligations. During FY 2002 ONR developed web-based management control training based upon the requirements of DoD Directive 5010.38.4.4: "In the most cost-effective manner, the DoD Components should provide managers throughout their organization with training consistent with their MC responsibilities and obligations."; and SECNAVINST 5200.35D, Enclosure (2).1.f. "Ensure that subordinate commanders/managers are provided with appropriate training concerning their Management Control Program responsibilities." ONR's web-based training covers pertinent SECNAVINST 5200.35D requirements. It is provided in a web-based format in recognition of the need to have a means of delivery available on demand. This training is still augmented by assistance from the Management Control Coordinator when needed, required, or requested.

Appendix A, Material Management Control Weakness:

Adequacy of Management Controls. We identified a material management control weakness for ONR as defined by DOD Instruction 5010.40. ONR management controls for technology transitioning within the S&T Directorate were not adequate to provide reasonable assurance that the transition effort had been executed efficiently and effectively. Recommendations C.1, C.2 and C.3, if implemented, will improve ONR management controls over the technology transition effort. A copy of the report will be provided to the senior Navy official responsible for management controls.

Department of the Navy Response:

Concur. Compliance with recommendations C.1, C.2., and C.3. will be included in the next annual statement of assurance in September 2003.

Appendix C:

Department of the Navy Response:

Page 28 — Page 24. The correct transition date for Image Processing and Exploitation Architecture is FY 2005. The correct date for Integrated Decision Support Suite is FY 2004.

Page 29 — Page 25. The correct transition dates for Multinational Virtual Operations Capabilities are FY 2004 and FY 2007.

Page 30 — Page 26. The correct transition date for the On-hull Extremely Low Frequency Antenna is FY 2005.

Page 32 — Page 28. A signed MOA for the Lightweight Broadband Variable Depth Sonar was provided to the auditors. The column should read "yes."

DIRECTOR OF DEFENSE RESEARCH AND ENGINEERING
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WASHINGTON, D.C 20301-3030

3 Aug 02

03

MEMORANDUM FOR UNDER SECRETARY OF DEFENSE (ACQUISITION, TECHNOLOGY AND LOGISTICS)

Subject: Department of Defense Inspector General (IG) Audit Report on Advanced Technology (S&T) Programs to Military Applications

I am writing this memorandum to make you aware of recommendations by the DoD IG that, if implemented, has a potentially serious impact on the Department of Defense Science and Technology Program.

In 2001, the DoD IG started an audit of the Army S&T program with the stated objective to determine whether the Army was successful in transitioning advanced technology projects to military applications. The report of that audit is at attachment 1. With the exception of one finding, the Army Acquisition Executive concurred with the findings in the report. The one finding where the Army non-concurred, however, is serious, and could have impact on the entire S&T investment in the DoD. Recently, the IG notified the Navy of its plans to start the same investigation of Navy programs and has indicated their intent to subsequently investigate other components.

The one finding that we are concerned about is finding 5 in the subject report, which states:

"Review the technology paths or plans for the 18 S&T projects identified, in this audit and discontinue any project that does not have formal acquisition program support."

The intent of this finding is to force all DoD 6.3 (Advanced Technology Development) investment to support an identified acquisition program or discontinue funding. Had the Department of Defense taken this approach in the past, nearly all transformational technology development would have never been started. Attachment 2 contains a list of recent technology development programs that occurred without acquisition program support. Some of the more notable programs are Predator and Global Hawk UAVs, stealth, uncooled IR sensors (which make today's IR weapons possible), the Portal Shield chemical and bio detection systems, underwater lidar imaging systems, Airborne Laser, and so forth.

We fully support increasing emphasis on technology transition and insertion from the S&T program to acquisition programs. DDR&E has made technology transition one of our management initiatives. However, the philosophy taken by the IG would make all 6.3 programs dependent on a formal acquisition program sponsorship—in effect pushing 6.3 activity into post-milestone B acquisition activity.

Neither the financial management regulations nor the DoD acquisition series regulations prescribe making all 6.3 funding dependent upon acquisition sponsorship. Bringing many technical options forward to a state that military worth can be assessed to meet current and projected needs should be encouraged.

Ronald M. Sega

Sample List of Recent Projects that Did Not Have Acquisition Sponsorship

Predator/Global Hawk - concept of unmanned aerial vehicles unacceptable at the time no PE

Portal Shield - basis of many deployed systems for chem./bio detection at bases all over world including Pentagon. Had no PE at the time.

Automated Deep Operations Coordination System - Joint C4ISR currently has no PE and no home now but CENTCOM raves about its capability to allow much faster accurate decision making.

C4I for Coalition Warfare - Automating ATO transfer between US and UK ... no PE.

Personnel Recovery Mission Software - Joint Search and Rescue applications didn't have a PE at the time.

Rapid Terrain Visualization - Still no PE to accept this powerful processing of geospatial imagery for fast and accurate situational awareness, targeting and rebuilding of the Pentagon

Situation Awareness Data Link - Had no PE to provide 3-D picture of potential targets passed between multi Service aircraft

Area Cruise Missile Defense - No PE for joint composite tracking "Network Based Expeditionary Command Center" software that integrates radar systems and fuses data from them as well as airborne, land and sea-based sensors. Now being used to execute the CAP at the 1st Air Force!

Stealth Technology – Original stealth Technology was not dependent upon acquisition program

Interactive Multisensor Analysis Training (IMAT) -- IMAT was a 6.3 funded program developed for teaching underlying physics for ASW in Aviation Warfare Operator (AW) Apprentice School. IMAT was successfully extended to Apprentice, Advanced and Officer Courses in Air, Surface, and Sub Communities. The visualization and Sensor Performance Modeling technologies became the basis for next-generation tactical displays in submarine AN/BQQ-10 (ARCI) combat system, AN/SQQ-89 Surface Ship Sonar System, and IUSS. In addition to being used for training, IMAT is now a fleet-approved tactical decision aid on all submarines and surface ships, DESRONS, and CTFs. It is IT-21 certified for use on afloat systems and networks.

Virtual At Sea Training (VAST) -- Expense and uncertainties in scheduling and range availability make live-fire training for naval forces against realistic land-based target ranges difficult to guarantee and costly to sustain. The solution was to develop

technology incorporating live-fire exercises with virtual reality displays so that Naval Surface Fire Support (NSFS) training can be conducted for ships' crews and USMC forward observers anywhere at sea. ONR invested 6.3 funds to integrate live and virtual systems that became the backbone of the VAST system. Atlantic and Pacific Fleets have requested a minimum of 17 Advanced NSFS VAST systems in the FY04 timeframe.

Streak Tube Imaging LIDAR -- This 6.3 program was started in FY97 to demonstrate underwater imaging using an ONR developed (6.2) streak tube imaging technology. At the time, there was no acquisition program, or programmatic interest in rapid mine identification. As a result of this work (along with ONR funded research in laser line scan technology) an acquisition program was established in FY02. This technology has transitioned to two acquisition programs (AQS-20 and ALMDS).

Laser Line Scan imaging technology demonstration -- This 6.3 program was successfully demonstrated during KB99 and Fleet Battle Experiment Hotel. Navy has now procured 5 systems that are currently in service (AQS-14B).

AUVs for very shallow water -- This 6.3 program development and demonstration began in FY99. As a result of this program, a shallow water AUV acquisition program was initiated during PR01 budget process.

Airborne Laser -- The original work came out of the Air Force Airborne Laser Laboratory—a 6.2 and 6.3 activity to demonstrate the feasibility of laser on a platform

Team Members

The Acquisition Management Directorate, Office of the Assistant Inspector General for Auditing of the Department of Defense prepared this report. Personnel of the Office of the Inspector General of the Department of Defense who contributed to the report are listed below.

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