NRAC

Naval Research Advisory
Committee Report

Venture Capital

July 2006

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14. ABSTRACT
Leveraging venture capital to the advantage of the Naval Services should be viewed as part of the larger project of reforming the acquisition system to permit rapid introduction of new technologies to the Fleet and Force. There is no need for the Department of the Navy to imitate any of the existing "venture capital" models found in the Defense and Intelligence Communities. These have been of limited value at best, and often simply repeat in a different key the familiar pathologies of the research and development system. Equity investment on the part of the Government is not necessary to gain access to emerging technology. Rather, the Government needs to realize that it's acquisition processes are the obstacle. Fix those, and the technology will be available.

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Venture Capital

July 2006

**OFFICE OF THE ASSISTANT SECRETARY OF THE NAVY
(RESEARCH, DEVELOPMENT AND ACQUISITION)**

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Executive Summary

The Navy and Marine Corps can certainly benefit from technologies funded by venture capital, but they need not become venture capitalists themselves to do so. The panel found that:

It is not necessary to form a "Naval venture capital fund" to gain access to emerging technologies.

There is little point in the Department of the Navy (DON) imitating venture-like initiatives recently established elsewhere in the Defense and Intelligence Communities.

Venture capital has been most successful in a relatively focused range of technologies. The Navy and Marine Corps should devote their attention to harvesting venture-backed technologies from these areas:

- Computing

- Wired and wireless communication

- Enterprise applications

- Devices, sensors, and integrated circuits

- Input/output devices and user interfaces

For the venture capital community to successfully acquire and exploit technologies the DON has developed in-house, the Navy must be willing to part with the key scientists and engineers as well as the technical intellectual property. If the DON wishes to attract venture capital, it should restructure its laboratory and warfare center personnel policies along the lines of those that prevail at research universities.

A strengthened demand-pull, led by a revitalized Naval Research Science Advisors program, and a better-informed capabilities-push, led by a revitalized Commercial Technology Transition Office, could help bring emerging technologies to the Fleet and Force.

Closer relations with the venture capital community alone are unlikely to speed the insertion of new technology into programs of record. A better system of incentives (for both acquisition officials and prime contractors) and a better system of rapid prototyping and experimentation are particularly important reforms.

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Terms of Reference

Objective

- To identify emerging standards and technologies in the technology sector that the Department of the Navy should incorporate into its technology roadmap for providing state-of-the-art capabilities to the Fleet/Force

Background

- The Department of the Navy seeks a relationship with the venture capital community that optimizes the prospects for rapid introduction of innovative technologies into acquisition programs. The following were major conclusions on venture capital engagement that were contained in the HAC response:
  - The greatest value to the Department will be in early awareness of emerging commercial technology trends
  - Venture capitalists can provide awareness in a few areas which, although they do not address all Naval needs, are critical
  - Relationship with the Department of the Navy is of interest to venture capitalists for reasons beyond funding

Naval Research Advisory Committee

Terms of Reference

In House Report 107-532, the House Appropriations Committee encouraged a fresh look at how innovative technologies can be more rapidly introduced into system acquisition in all mission areas. This study's objective is to identify emerging standards and technologies in the technology sector that the DON should incorporate into its technology roadmap for providing state-of-the-art capabilities to the Fleet and Force.

The DON seeks a relationship with the venture capital community that optimizes the prospects for rapid introduction of innovative technologies into acquisition programs. The Department's response to the House Appropriations Committee asserted that the greatest value of such a relationship would lie in early awareness of emerging commercial technology trends. Venture capitalists can provide such awareness in a few areas which—although they do not address all Naval needs—are crucial to the Department, and venture capitalists have an interest in a relationship with the DON for reasons that extend beyond funding.

A complete copy of the Terms of Reference (TOR) can be found in Appendix A.

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Terms of Reference

Specific Tasking

- This NRAC panel will examine current approaches to technology development and transition within the Navy and compare them to commercial approaches. Specifically, the panel will:
  - Review the Navy and Marine Corps technology development plans in mission critical areas (e.g., information technology, communications, logistics, etc.) and provide feedback on ways to more closely align those plans with emerging trends that panel members identify within commercial sectors.
  - Identify emerging commercial sector technologies for potential use by the Navy and Marine Corps. These technologies might be broad trends where the Navy can benefit from an early awareness, or they might be specific technologies that provide disruptive advances.
  - Review technologies within the Naval Research Enterprise that are considered particularly valuable and potentially of commercial interest. Recommend paths to make these technologies available to the commercial sector quicker and for the benefit of the Nation/Navy/Marine Corps.

Naval Research Advisory Committee

Terms of Reference

This Naval Research Advisory Committee (NRAC) panel was directed to examine current approaches to technology development and transition within the DON, and compare them to commercial approaches.

The panel reviewed the Navy and Marine Corps technology development plans in mission critical areas (information technology (IT), communications, etc.) and provided insight into ways to align these more closely with emerging commercial trends. It also identified emerging commercial technologies for their potential utility to the Navy and Marine Corps. Such emerging technologies included broad technological trends early awareness which might be beneficial to Naval programs; they also included specific technologies with the potential to provide disruptive advances. Finally, the panel reviewed technologies developed within the Naval Research Enterprise for their commercial potential. If such technologies could be made commercially available quickly, the nation as a whole would benefit (as would the Navy and Marine Corps, in more specific and focused ways).
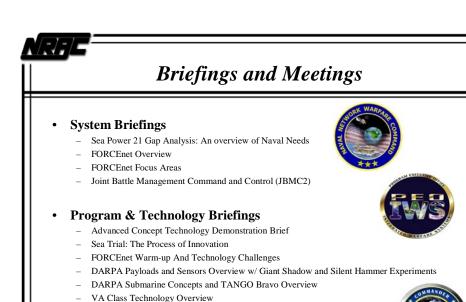
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Panel Participants

Mr. Mark J. Lister (Sarnoff Corporation) chaired the panel. The study was sponsored by the Honorable Mike McGrath, Deputy Assistant Secretary of the Navy (Research, Development, Test, and Evaluation) (DASN(RDT&E)), Mr. Paul Muessig, Office of Naval Research (ONR) served as Executive Secretary for the initial portion of the study, and Dr. Windy Joy Springs, ONR served as Executive Secretary for the latter half of the study. The panel's members included Dr. Alf Andreasen (Paladin Capital Management), Mr. Jack G.W. Biddle, III (Novack Biddle), Ms. Shanda Bahles (El Dorado Ventures), Mr. Tony Sun (Venrock Associates), Dr. Milton M.T. Chang (Incubic), Mr. Warren J. Packard (Draper Fisher Jurveston), and Mr. Robert McCormick (Trident Capital).

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Briefings and Meetings

- **Organizational Briefings**
  - Navy Organization
  - ASN/RDA Organization
  - PEO (C4I & Space) Overview
  - NRL Overview
  - SPAWAR Overview
  - Fleet Forces Command: Naval Organization Alignment and Initiatives
  - Marine Corp Tactical Systems Support Activity
  - The JFCOM Difference
  - OnPoint Technologies
  - In-Q-Tel and its Venture Capital Model
  - Analysis of Government VC Engagement Models
- **Concept Briefings**
  - Open Architecture: An Enterprise Approach to Introducing Open Architectures Into Navy Combat Systems… and Beyond
  - Sea Based Battle Lab
  - The Future of Joint Experimentation
  - J9 Innovations & Experimentation
  - JWFC Capabilities Development
  - Winning Experimentation Strategies Process COMTHIRDFLT

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Briefings and Meetings

The panel held five major fact finding meetings over 2003 and 2004 at which they received more than two dozen briefings and attended about a dozen technical poster sessions. The briefings fell into several categories: organizational, concepts, systems, and programs and technologies. Several of the briefings were focused on familiarizing the panel with the DON, including setting an organizational context with an emphasis on technology development, acquisition, and transition into operational employment. The panel also received briefings on various concepts of development and experimentation to explore available avenues to test the efficacy of emerging commercial technology.

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Briefings and Meetings

The panel was briefed on mission critical naval systems and needs with an emphasis on Command, Control, Communications, Computers, Information, Surveillance and Reconnaissance (C4ISR) systems where there is a large overlap between naval gaps and needs and emerging venture backed technology, products, and services. The final category of briefings focused on naval science and technology (S&T) programs. These technology briefings, poster sessions, and demonstrations enabled the panel to provide feedback on ways to more closely align naval activities with commercial directions, identify relevant emerging commercial sector technologies, and assess the viability of commercializing technology from the Naval Research Enterprise. The panel also visited the USS ROOSEVELT and observed various demonstrations of naval operations.

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Takeaway

Government equity investment is
not necessary
to access technology emerging
from the venture capital
community.

Takeaway

The unanimous, overarching conclusion from the panel was that the U.S. Government does not need to make equity investments in companies to gain access to venture-backed emerging technology. The panel consensus was that the relatively small (tens of millions of dollars) Government venture capital investment has had little to no impact compared to the billions of dollars invested by the venture capital community. Additionally, the panel believed that a closer working relationship between the Government and the venture community coupled with more traditional government research and development (R&D) or experimentation investments to demonstrate the efficacy of emerging technology could achieve higher-value results for both communities.

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Findings & Conclusions: **Overall Naval approach to VC Outreach**

- The objective & conclusions on venture capital engagement of the TOR are valid
- Technologies exist where VC investments can be leveraged
- Several models exist to engage VC community
  – Examples: DeVenCI (OSD), In-Q-Tel (CIA), Onpoint (Army)
- Government acquisition process inhibits rapid exploitation of emerging VC technology
  – 2-3 year budgeting cycles
  – Outreach to industry (through primes, BAAs) is not comprehensive

Naval Research Advisory Committee

Overall Naval Approach to VC Outreach

The panel found that the Department's objectives for engaging the venture capital community contained in the study's TOR remained valid. The DON needs to optimize the prospects for rapid introduction of innovative technologies into acquisition programs. To accomplish this, the greatest value to the DON will be in early awareness of emerging commercial technology trends. Therefore, a relationship with the venture capital community can provide awareness in a few areas which, although they do not address all naval needs, are critical for mission success. There are technologies where the Navy and Marine Corps can leverage venture capital investments, and indeed several models exist for doing so. These include the Central Intelligence Agency's (CIA) In-Q-Tel, the Army's Onpoint, and the Office of the Secretary of Defense's (OSD) DeVenCI, yet none of these models seem entirely suitable for the DON. In fact we find that government equity investment is not necessary to gain access to emerging technology, and that government acquisition processes are generally a poor fit with venture capital. They inhibit rapid exploitation of emerging technology funded by venture capital. (This is indeed just a special case of the more general problem of introducing new technology into programs of record, which earlier NRAC studies have described.) The two-to-three-year budgeting cycles resist quick technological innovation and acquisition reform itself, in general, giving prime contractors a more prominent role in determining systems designs. Also, there are larger issues of properly structuring incentives for both program managers and prime contractors here; such issues not surprisingly reappear in attempts to leverage venture initiatives for Naval applications.

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- Information accessibility & packaging lacking
  – Dissemination process classically reaches traditional defense industrial base
  – Typically too high level for specific recommendations
- No clear or disciplined process to propose new approaches
  – Small, non-traditional companies lack resources to break into amorphous government market
  – Navigating the acquisition process is treacherous & costly (intellectual property/capital risk, funding, contracting, DCAA, opportunity costs)
- No clear or disciplined process to harvest new technologies
  – Program managers normally do not have the resources to stay current with accelerating technology change
  – Transition opportunities are rare
- Programs of record are not VC opportunities

Naval Research Advisory Committee

Review Technology Development Plans

The first specific tasking from the study's TOR asked the panel to review the Navy and Marine Corps technology development plans in mission critical areas (e.g., information technology, communications, logistics, etc.) and provide feedback on ways to more closely align those plans with emerging trends that panel members identify within commercial sectors. The panel received briefings on Sea Power 21, FORCEnet, C4I and Space, Fleet/Forces Command initiatives, and Carrier Technology needs. These were all "requirements-pull" presentations, intended to communicate to an audience what the Fleet and Force believed they needed.

We found that in all cases the briefings packaged information poorly. Apart from being disseminated in a way that reaches only the traditional defense industrial base, they were above all else at too high a level to produce specific recommendations. They failed to include any clear process for proposing new approaches. This is further complicated by the fact that companies that do not traditionally work with the Government, Department of Defense (DOD), or the DON, lack the knowledge and/or the resources necessary to penetrate the complicated processes and procedures to break into the government market. Navigating the acquisition process is tricky and costly, requiring an in-depth knowledge of government funding sources and processes, contracting, dealing with the Defense Contract Audit Agency (DCAA), additionally this efforts represents opportunity costs. We concluded that, as presently structured, programs of record are not good venture capital opportunities.

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Review Technology Development Plans

Aligning Navy and Marine Corps technology development plans more closely with emerging trends within commercial sectors requires strengthening two key areas: identifying and communicating naval needs to the venture capital community, and identifying opportunities to transition emerging venture backed technology into naval acquisition programs. This task can be facilitated by establishing dialogue between the Department and the venture community, leading to increased visibility and understanding for both parties. Also, establishing mechanisms and resources to implement identified opportunities will yield value to the Navy, Marine Corps, and venture community.

We recommend that the DON augment, modify, and expand existing processes to consistently and continuously identify and communicate operational needs. In particular, the Naval Research Science Advisors continue to be an underused resource. They are ideally positioned to harvest needs from the operators, in ways that find solutions to challenges while respecting the limits of the possible. This program should certainly be strengthened. We saw a continuing need to establish, within program offices, technology liaisons who could also serve as ombudsmen for commercial venture capitalists. These should be drawn from the acquisition community. And, it would be worth exploring the possibility of placing interns from the DON within venture capital firms.

We also repeat the unimplemented recommendations of earlier NRAC reports on acquisition reform and technology insertion. The Naval Services need an effective mechanism of capabilities-push. A reinvigorated Commercial Technology Transition Office (CTTO) could serve well in this capacity. The CTTO is set up to serve as a liaison between commercial industry (including venture investors) and the naval acquisition community. It has shown an ability to broker memoranda of agreement that have served to introduce new

technologies into acquisition programs. It has done so on a relatively small scale, but its role could be enhanced at relatively modest cost.

The DON should also consider using rapid acquisition vehicles with protection from some of the more onerous elements of the Federal Acquisition Regulation (FAR). It is a well known fact that intellectual property is critical in the commercial world and that some of the cost accounting requirements of the FAR can be costly and burdensome for non-traditional defense contractors to implement. Contracting vehicles such as Other Transaction Authority provide opportunities for the Government to work with commercial companies under mutually beneficial conditions.   Finally, we cannot overemphasize the importance of a budget line that would fund prototypes, experiments, exercises, sea trials, and concept of operations (CONOPS) development, with provisions for technology transition. This funding would enable the Navy and Marine Corps to employ emerging technology that will be commercially available within a few years to understand Naval issues and military implications in inserting, deploying, and operationally using these technologies.   The goals and objectives of these efforts should be to dramatically reduce the time-lag between introduction of a new technology, product, or service and its operational deployment with Navy and Marine Corps warfighters.

Identify Emerging Commercial Technologies

The second specific tasking asked the panel to identify emerging commercial sector technologies for potential use by the Navy and Marine Corps. These technologies might be broad trends where the DON can benefit from an early awareness, or specific technologies that provide potentially disruptive advances. Venture capital is not, in itself, a panacea. However, the DON needs to look for areas where venture capitalists have consistently selected good investments and leveraged those investments. There are about five such areas (elsewhere, venture capitalists are not significantly better at picking winners than anyone else):

- All aspects of computing

- Wired and wireless communications

- Enterprise applications

- Devices, sensors, and chips

- Input/output user interfaces

Venture capital has consistently funded initiatives in these areas, and made money doing so. The DON should look to them for leadership here.

The panel also identified several trends in the commercial community that will have significant impact the DON. These trends include:

- Convergence of cyber and real world

- Convergence of computing, communications, and data access (smart nodes)

- Anywhere, anytime computing

- Unstructured text processing

- Consumer services Voice Over Internet Protocol (VOIP)/broadband/wireless

- Novel processing technology (nanotechnology, Micro Electro-Mechanical Systems (MEMS), etc.)

With the globalization of technology, the Department will need to understand the offensive and defensive application of these technologies and trends.

NRAC
Identify emerging commercial technologies…
(second specific tasking)
Recommendations:

- Create processes to continuously vet ongoing programs and plans with VC community
  – Visibility combined with dialog leads to understanding
    - Interns at VC firms
    - VCs at Sea
  – Understanding combined with programmatic mechanisms leads to implementation
    - Proactive program to engage VCs: "Sherpa" model
    - Funding to experiment with technology today that will be available in 3 years to understand Naval issues in employing or deploying

Naval Research Advisory Committee

Identify Emerging Commercial Technologies

The DON should create processes to continuously vet its ongoing programs and plans with the venture capital community. It should do so in the context of broader reforms of technology insertion recommended by earlier NRAC studies, and it should concentrate on areas likely to have the greatest payoff.

Establishing dialogue between the DON and the venture community will lead to better visibility and understanding for both parties. Two recommendations to accomplish this are to work with the venture capital community to place interns from the DON at several top tier venture firms to work side by side with investors, and to re-institute the VCs-at-Sea program that had been previously successfully employed.

Also, establishing mechanisms and resources to implement identified opportunities will yield value to the Navy, Marine Corps, and venture community. Creating a program that venture-backed or other non-traditional companies can work with; to be guided through the process and procedures leading to procurement opportunities; would facilitate accelerated access, insertion, and deployment of emerging innovative technologies and applications.

As previously emphasized, a budget line that would fund prototypes, experiments, exercises, sea trials, and CONOPS development, with provisions for technology transition, is critical for the DON to leverage the massive venture community investment.

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- Investment community looks to Government to invest in basic research
    - Creates pool of technology to harvest
    - Examples: Nanotechnology, biotechnology
- Limited opportunities to commercialize specific Naval technology initiatives
    - Process inhibitors – will key personnel go with NewCo?
    - No unique competitive commercial advantage
    - No market

Naval Research Advisory Committee

Recommend Paths to Commercialize Naval Technologies

The third specific tasking asked the panel to review technologies within the Naval Research Enterprise that are considered particularly valuable and of potential commercial interest. Recommend paths to make these technologies available to the commercial sector quicker than present and for the benefit of the Nation/Navy/Marine Corps. The panel concluded that there is no easy or straightforward way to commercialize naval technologies—for example those developed in naval laboratories and warfare centers. Venture capitalists look to the Government to invest in basic research. This creates a pool of technology to harvest, as we see in both nanotechnology and biotechnology. There are, however, only limited opportunities to commercialize specific technologies developed by the DON. Such technologies typically offer no unique competitive advantage, often lack a natural market, and come with built-in process inhibitors.

This last point is worth elaboration. The panel found itself (and believes this to be typical of venture capitalists generally) content with the existing model in which the government funds basic research at academic institutions. Note that venture capital clusters around universities, and not government laboratories. This is because venture capitalists are at least as interested in acquiring the researchers as they are in buying the technology. Universities are sophisticated enough to realize that this is a win-win proposition. They are content to let their researchers go, to spin-off companies or join existing ones, because they realize that the researchers in the long-run tend to come back (and come back wealthier and more experienced). The naval laboratories have resisted this. They try to license technology and keep the researchers. They would be better off if they acted more like universities in this regard. The labs would feel some short-term pain, but in the long run this might attract venture capital and better researchers as well.

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- Technology investment and development roles for Government, industry, and capital communities need to be defined
  - Prevents Government from competing with industry
  - Enables better leverage opportunity
  - Requires closer communications

Naval Research Advisory Committee

Recommend Paths to Commercialize Naval Technologies

There is significant overlap and redundancy within the government, industry, and capital science and technology investment and development communities. A clear definition of the government S&T strategy could be convolved with industry and the capital communities to reduce unnecessarily duplicative efforts. This would require close communications, but result in better leverage by all parties and increase technology availability for the Warfighter.

The DON should consider adapting the university model to its own purposes. Universities have figured out how to leverage venture capital opportunities without competing with industry, and have succeeded in establishing close links with venture capitalists. The key, we believe, is to find a way of giving up both technology and people. The venture capitalists recognize that the greatest value lies in the people, not the patents.

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The Bottom Line

- Government equity investment is *not necessary* to access technology emerging from the venture capital community.

- The DoN should create a program to identify technology opportunities emerging from the VC community and fund experimentation to determine the efficacy, CONOPS, and transition issues of these technologies.

The Bottom Line

Leveraging venture capital to the advantage of the Naval Services should be viewed as part of the larger project of reforming the acquisition system to permit rapid introduction of new technologies to the Fleet and Force. There is no need for the DON to imitate any of the existing "venture capital" models found in the Defense and Intelligence Communities. These have been of limited value at best, and often simply repeat in a different key the familiar pathologies of the research and development system. Equity investment on the part of the government is not necessary to gain access to emerging technology. Rather, the government needs to realize that its acquisition processes are the obstacle. Fix those, and the technology will be available.

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Appendix A

Terms of Reference

Objective

To identify emerging standards and technologies in the technology sector that the Department of the Navy should incorporate into its technology roadmap, and by extension to the Fleet/Force.

Background

In House Report 107-532, the House Appropriations Committee encouraged a fresh look at how innovative technologies can be more rapidly introduced into system acquisition in all mission areas. The Committee specifically asked the Department of the Navy to evaluate venture capital initiatives within the Army and the CIA, and directed that a report on Navy plans be provided to the Congress.

Several long-term trends make it critical that the Department of the Navy improve its ability to identify potentially significant new technologies from commercial sources, and to rapidly and efficiently exploit them. First, the proportion of the United States total research and development investment (federal and non-federal) dedicated to defense is declining. Additionally, the service lives of major weapons systems are being extended at the same time that they are increasingly reliant on commercial components, many of which have a short lifecycle. The commercial technology consumption is increasing, and the "half-life" of technology – how long it is relevant in the marketplace – is decreasing.

The Department of the Navy seeks a relationship with venture capital that optimizes the prospects for rapid introduction of innovative technologies into acquisition. To this end the Commercial Technology Transition Office (CTTO) of the Office of Naval Research began over a year ago to study the issues involved. The CTTO recently conducted two role-playing "wargames" with venture capital, industry and government players in order to evaluate specific partnering models. The following major conclusions on venture capital engagement emerged from those efforts:

- <u>The greatest value to the Department will be in early awareness of emerging</u> commercial technology trends, allowing time to plan ahead for their potential use in Naval systems. Some venture capitalists are willing to invest their time to understand Naval technology needs and to recommend potential solutions in the sectors where they invest.

- <u>Venture capitalists can provide awareness in a few areas which, although they do not address all Naval needs, are critical</u>. Knowing the direction of prominent investors with insight into the commercial market can aid the DON in developing systems that leverage commercial investment.

- The Department of the Navy may be able to interest venture capitalists in areas of interest to DON. By creating a forum for the exchange of ideas, the subcommittee might interest commercial sector development dollars into areas of interest to the Navy.

This NRAC study aims for a dialogue with the venture capital community aimed at early awareness of emerging trends in critical high-technology areas such as information technology, advanced microelectronics and photonics, wireless networking, and biotech. This panel is anticipated to run for two years, providing guidance semiannually to NRAC.

Specific Tasking

This NRAC study will examine current approaches to technology within the Navy and compare to commercial approaches. Specifically, this NRAC study will:

- Review the Navy and Marine Corps development plans in areas of its expertise (IT, communications, logistics, etc.) and provide feedback on ways to more closely align those plans with emerging trends that panel members see in the commercial sectors.
- Identify emerging commercial sector technologies for potential use by the Navy and Marine Corps. These technologies might be broad trends where the Navy can benefit from an early awareness, or it might be specific technologies that provide disruptive advances that the Navy could benefit from early adoption or development.
- Review technologies within the naval research enterprise that are considered particularly valuable and potentially of commercial interest. Recommend paths to make these technologies available to the commercial sector quicker and for the benefit of the Nation/Navy/Marine Corps.

Appendix B

ACRONYMS

CONOPS	Concept of Operations
CTTO	Commercial Technology Transition Office
DON	Department of the Navy
NRAC	Naval Research Advisory Committee
IT	Information Technology
DASN (RDT&E)	Deputy Assistant Secretary of the Navy (Research, Development, Test, & Evaluation
ONR	Office of Naval Research
C4ISR	Command, Control, Communication, Computer, Information, Surveillance and Reconnaissance
S&T	Science and Technology
R&D	Research and Development
CIA	Center Intelligence Agency
OSD	Office of the Secretary of Defense
TOR	Terms of Reference
DOD	Department of Defense
DCAA	Defense Control Audit Agency
CTTO	Commercial Technology Transition Office
FAR	Federal Acquisition Regulation
VOIP	Voice Oven Internet Protocol
MEMS	Micro Electro-Mechanical Systems

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