Science and Technology Strategic Plan

Navy Air and Missile Defense Command

January 2013

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1. Introduction

1.1 Background

Since its earliest days, the Navy has relied upon emerging technologies to provide operational advantage and deliver superior warfighting capabilities to Sailors. Today, maintaining the technological edge for Navy Air and Missile Defense Command (NAMDC) means that we must continuously be innovative in developing and acquiring the tools we will need to execute future Integrated Air and Missile Defense (IAMD) missions. At the early stages, many of these tools will require Science and Technology (S&T) investments - - often by the Navy, but also by other government entities, academia, and industry. S&T supplies the pipeline of knowledge, concepts, and prototypes that leads to products and builds a cadre of scientists, engineers, and researchers focused on naval issues and challenges (*Naval S&T Strategic Plan*, 2009).

While S&T is generally considered to be a Service responsibility, Navy leadership has long recognized that warfighters can help ensure limited S&T dollars are spent wisely by offering a unique operational perspective on appropriate objectives for basic and applied research, and advanced technology development. Accordingly and as laid out in the *Naval S&T Strategic Plan,* the Office of Naval Research (ONR) is informed of naval capability needs and technology objectives from a variety of sources, including directly from the Naval Enterprises and the Marine Corps via their individual S&T Strategic Plans.

This document represents the latest effort in a continuously evolving process to shape and link Naval S&T focus areas in support of future Navy Integrated Air and Missile Defense forces.

1.2 Purpose

The NAMDC S&T Strategic Plan exists to refine and update this command's Science and Technology Objectives (STOs). As defined by the *Naval S&T Strategic Plan*, STO is a broad term to describe an area the Navy and Marine Corps consider important for tasking and/or investment in order to achieve a major technological advancement. In the process of developing the NAMDC STOs, consideration has been given to the capability gaps faced by our NAMDC warfighters today and into the future, assessing which of those gaps are best addressed by developing better material solutions, and then identifying where investment in certain technology areas might yield those solutions.

Said another way, the STOs are intended to provide NAMDC's new technology —demand signal. We recognize that many of the enhanced capabilities NAMDC is interested in are also of interest to other organizations inside (and outside) of the Department of Defense, and that in many cases, other activities are already making S&T investments to develop them. In those cases, we want to ensure NAMDC's interests are appropriately represented as well, which may enable opportunities for leveraging Joint Service, and commercial technology investments wherever objectives coincide.

A second purpose for this document is to provide an NAMDC vision for pursuing new technology and new capabilities, particularly in the proof-of concept stage before formal requirements are established. Through simplifying the procedures and maintaining focus

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on the big picture, this document should assist stakeholders in identifying the relevant information required to successfully move forward with acquisitions in support of our Sailors.

Finally, this document includes basic organization information about NAMDC (mission, strategic direction, major components and their functions) to provide common understanding for technologists and others who may not be familiar with our Force.

1.3 NAMDC Overview

NAMDC was established April 30, 2009, by the Chief of Naval Operations (CNO) to be a Warfare Center of Excellence (WCOE) for IAMD at Naval Support Facility Dahlgren, VA. NAMDC is an Echelon IV command with reporting responsibility to CNO via U.S. Third Fleet (COMTHIRDFLT), U.S. Pacific Fleet (COMPACFLT), and U.S. Fleet Forces Command (COMUSFLTFORCOM). COMPACFLTINST 5450.40 establishes the Mission, Functions, and Tasks (MFT) of NAMDC.

> NAMDC was established to provide oversight, alignment, synchronization and end-to-end assessment of Maritime Integrated Air and Missile Defense. NAMDC will execute duties as Fleet Collaborative Team (FCT) lead for maritime IAMD and initiate team tasks with COMTHIRDFLT or NWDC concurrences as needed. These duties include the leading the FCT in executing tasks in the Naval Capabilities Development Process (NCDP) and Concept Development and Experimentation focus areas, including warfighter capability assessments, lessons-learned, validation of formal requirements documents, and Science and Technology investment Strategy.
>
> Additionally, NAMDC will identify and prioritize the specific warfighting capability gap requirements to Office of Naval Research (ONR) Future Naval Capabilities (FNC) proposal developers to assure optimized S&T investment. This task includes supporting COMTHIRDFLT in prioritization of IAMD proposals into ONR-led programs and TYCOMS in prioritization and validation of future IAMD platform capability requirements into ONR FNC programs.
>
> COMPACFLTINST 5450.40, March 2011

NAMDC monitors ONR's Discovery and Innovation (Technical Readiness Level (TRL) 1 through TRL 3) in an effort to stay abreast of technologies that will be forthcoming in the next 10 – 15 years.

Additionally, NAMDC leads the IAMD Warfighter Improvement Process (WIP). The focus of the annual IAMD WIP is to bring together representatives from the Fleet, Resource Sponsors and Material Developers to define the capability gaps currently within the Fleet. Results from the WIP are provided in the form of Integrated Priority Capability List (IPCL) to USFF via COMPACFLT. Concurrently, OPNAV N81 annually produces a Warfighter Campaign Analysis based upon strategic guidance from the Joint Chiefs of Staff and the Chief of Naval Operations (CNO). The results of this analysis are the basis for the

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development of Capability Cards which translate into Operational Needs which are basis for establishment of an ONR FNC.

NAMDC is engaged in the FNC process at the working level via participation in the Sea Shield, Sea Strike and FORCEnet Integrated Product Teams (IPTs) with representatives from USFFC, OPNAV N96, Program Executive Office (PEO) – Littoral Combat Ship (LCS), PEO – Integrated Warfare Systems (IWS), and Marine Corps Combat development Command/Headquarters Marine Corps (MCCDC/HQMC). This engagement ensures the IAMD IPCLs are accounted for within the Operational Needs that are provided to ONR. ONR develops proposals to satisfy the Operational Needs which are provided to the various FNC pillar IPTs for consideration and prioritization. Final prioritization is performed by the Technical Oversight Group (TOG) which consists of USFF, ASN (RDA), CNR, OPNAV N2/N6, OPNAV N8, and MCCDC. It is critical that NAMDC's requirements are captured across all the pillars to support achievement of the IAMD across the Fleet. FNCs provide capability to the Fleet within 5 – 10 years and progress the development of a technology from TRL3 to TRL6 within 5 years. At the end of a 5 year FNC, the technology is transitioned to the Acquisition community (ex. PEO-IWS) for consideration for Program of Record insertion.

NAMDC is also interesting in technologies being developed by other government agencies, industry (Independent Research and Development (IRAD)) and academia to address IAMD mission needs. For technologies at or above TRL6, NAMDC works with ONR TechSolutions to identify opportunities for Fleet insertion.

1.4 NAMDC Strategic Direction

NAMDC's direction since establishment has been driven by the stand-up guidance provided by the Chief of Naval Operations (CNO Message 112000Z May 2009) and Commander, Third Fleet (C3F Message 292140Z May 2009).

1. Support NCCs/FCCs with Planning, Analyzing and Executing IAMD
2. IAMD Training, Performance Assessment & Certification
3. Fleet IAMD requirements (Material/Non Material)
    - Improve ability to assess IAMD capabilities and readiness
4. Develop Doctrine, Tactics, Techniques & Procedures
5. Successful Navy contribution to PAA
6. Improve IAMD Integration and Interoperability
7. Promote Interoperability with IAMD coalition Partners and Allies
8. Foster Enterprise construct ; NBMDE and ISG
9. Leverage S&T to Support Future Requirements
10. Maintain NAMDC Program Of Record (POR) as IAMD Warfare Center of Excellence (WCOE)

1.5 Guiding Principles

Fleet Alignment, Advocacy and Support – It is imperative that NAMDC remain attuned to the needs of our primary customer - The Fleet. We will focus on understanding and advocating their requirements to ensure Navy's limited resources are applied where they

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will provide the most return on investment in achieving warfighting capabilities and readiness.

Recognized Expertise – All members of the staff must be masters within their respective area of focus. The IAMD domain is constantly changing as both U.S. and adversary capabilities evolve. The NAMDC staff will stay abreast of these changes and be recognized across the Navy and Joint communities as the subject matter experts to engage in Navy IAMD matters.

Warfighting Focus – The threat of adversary air and missile attack on the U.S. Homeland, our deployed forces, and regional partners is real. NAMDC will act as the Navy's honest broker across the DOTMLPF spectrum to identify and champion superior technologies, capabilities, and processes that will equip Navy warfighters with the capabilities to respond decisively to the entire range of air and missile threats.

- Credibility of Product
- Timely and Decisive Action
- Joint and Partner Engagement
- Workforce Development
- Professionalism and Ethics

2. NAMDC Technology Process

Technology development and transition to a Program of Record (POR) or even a Table of Allowance (TOA) item is often very difficult to accomplish. This discussion outlines the process to connect NAMDC vision to the required resources.

2.1 Background

NAMDC serves as the Navy advocate for Integrated Air and Missile Defense to synchronize and integrate our efforts to maximum effect (CNO Washington DC NAVADMIN 143/09, May 09). As such, NAMDC provides an array of capabilities unique to the Integrated Air and Missile Defense environment.

NAMDC addresses both short and long term technical solutions by identifying the right requirements to drive near term solutions for the Navy's deployed forces and their missions. NAMDC's S&T discovery efforts are focused beyond the Future Years Defense Program (FYDP) that will address OPNAV's future operational capabilities planned for Navy forces.

Traditional pillars of Navy power have capital assets as their centerpiece. Ships, submarines, and aircraft are by nature expensive and complex. Therefore, the processes to develop, procure, and maintain these platforms are equally exacting and lengthy. This approach allows for a methodical process that manages a program from cradle to grave. The Joint Capabilities Integration and Development System (JCIDS) and the Defense

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Acquisition System are well-established and comprehensive processes for identifying needs and fielding Doctrine, Organization, Training, Material, Leadership and Education, Personnel and Facilities (DOTMLPF) solutions.

2.2 New Technology Strategy

There are three pillars to NAMDC's operational requirement development and material solutions strategy:

1. Seek viable technical solutions to known, documented requirements.

2. Leverage existing technology Commercial off the Shelf (COTS) and emerging technical efforts that address capability gaps or provide potential opportunities.

3. Remain vigilant to long term S&T signals based on future community needs, technical trends, and scientific breakthroughs.

A key aspect to successful technology development is maintaining a formal dialogue and continuous communication amongst stakeholders. All stakeholders must remain aware, apprised, and in agreement with the technology concept development to ensure success for future transitioning to a POR or other procurement process. Relevant stakeholders include:

The Capability Needs Community (also known as the Requirements Community) — Warfighters, end-item users, or their representatives who develop new warfighting concepts and outline the capabilities needed to support them. OPNAV Program Sponsors act as the Force Requirements Officers, and are responsible for the development of capability needs documentation.

The Science and Technology (S&T) Community — Scientists and managers of S&T programs who develop knowledge about the key technologies that will be needed for future material solutions to capability needs.

The Acquisition Community — Program managers, product managers, staffs, and organizations that manage the development, procurement, production, and fielding of systems. This includes Systems Command (SYSCOMs), Program Executive Officers (PEOs), Program Management Offices (PMOs), and Operation Test and Evaluation Force (OPTEVFOR).

The Financial Management Community — Government organizations and personnel who manage the resources needed by the other communities, and secure funding for the programs and systems needed to transition technology. Again, this refers to the OPNAV Sponsor Staff in their role as Resource Sponsors.

The Research and Development (R&D) Community — Scientists, engineers, and other professionals who possess the necessary expertise to field the technologies in military systems. This is typically conducted by Warfare Centers and Labs under the management of activities in the Acquisition Community.

The combined efforts of the above-listed communities will assist in identifying and developing available technologies that may satisfy the material solution to a valid capability need of the warfighter. Once that technology solution reaches an acceptable level

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of maturity, it can then be transitioned to the acquisition community that will, in coordination with the financial community, arrange the necessary resources to further develop the technology along with the R&D community.

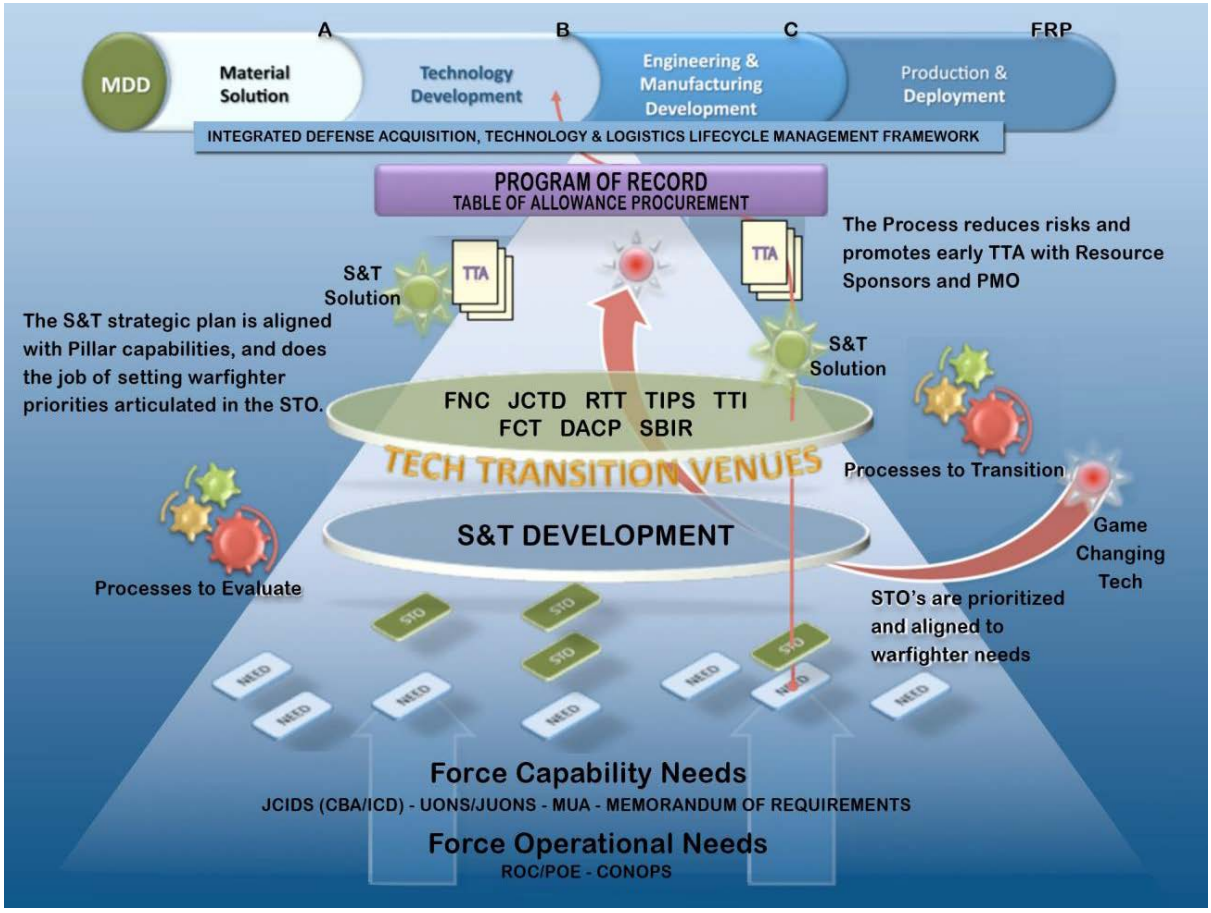

Figure 1: The Technology Transition Process

Figure 1 illustrates the process by which technology development efforts can be identified, aligned to validated needs, and maneuvered through a process of development, assessment, and risk reduction which will eventually lead to a Technology Transition Agreement (TTA) or other defined process, and culminates with insertion into an acquisition milestone or phase as deemed appropriate. A TTA is an agreement to insert the technology into the development process of an identified POR and is signed by the acquisition sponsor.

The process begins at the base of the pyramid with Force Operational Needs. Ranging from very broad or foundational to more specific and executable, these documents provide some description of Department of Defense (DoD) capability needs, derived from the National Security Strategy and then presented in a document such as a Required Operational Capability/Projected Operational Environment (ROC/POE) or a Concept of Operations (CONOPS).

The formal DoD process for determining Force Capability Needs is the Joint Capabilities Integration and Development System (JCIDS). Integral to the JCIDS process is a series of analytical studies that make up the Capabilities Based Assessment (CBA) which identifies

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Force Capability Needs. Also known as capability gaps, capability needs are defined as follows:

> The inability to achieve a desired effect under specified standards and conditions through combinations of means and ways to perform a set of standard tasks.

A capability need occurs when an operational need (a requirement to perform a task) cannot be fulfilled. The gap may result from a lack of existing capability, lack of proficiency or sufficiency in existing capability, or the need to replace an existing capability (represented by the chips labeled —NEED in Figure 1).

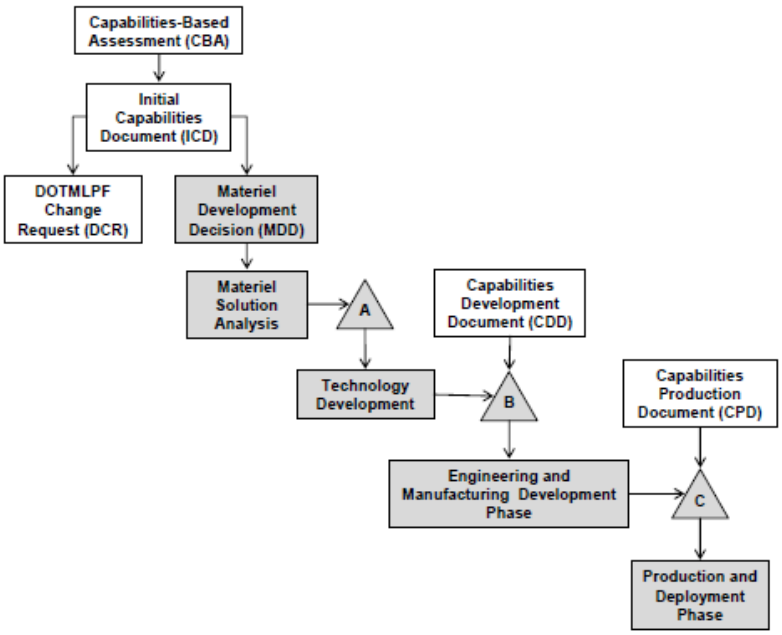

Figure 2: Capability Based Assessment Process

The first step in the CBA process (see Figure 2) involves combining existing guidance and specifying the military problem to be studied. Once identified, the problem is then examined to assess how well the DoD can address it given its current capabilities. Where the problem cannot be adequately addressed, a capability gap exists and an identified force capability need will be defined by DoD. The final step in the process involves using the assessment to generate recommendations for solutions to the need. This is accomplished by examining the gaps for possible solutions through the (DOTMLPF) analysis which looks at a set of change categories that may provide a resolution to the capability deficit. If other solutions are not appropriate, the final option is a material one. The process must specify the questions, estimate current and projected capabilities, and recommended actions.

The Joint Urgent Operational Needs Statement (JUONS), Military Utility Assessment (MUA) and Memorandum of Requirements are some alternatives to conducting a CBA for documentation of Force Capability Needs. Included in the —Need chip is a description of attributes (physical or functional characteristics) required to effectively and suitably execute one or more tasks, that when combined, provide a needed capability to the warfighter. The chip in this example is not a single attribute, but representative of a type of need defined by one of the processes listed above.

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Further up the pyramid in Figure 1 are chips labeled STO which is a broad term to describe an area that the Navy and Marine Corps considers important for tasking and/or investment for achieving a major technological advancement. The STOs are aligned with a NEED. In practice, one or more STOs may be aligned with more than one capability need. The key element is aligning with a known need. The STO itself may read very much like the capability need, but is expressed in terms of a type of technology solution, and more importantly, for NAMDC, represents the types of potential technology solutions that best fit the battlespace, organization, operational environment, CONOPs, tactics, and doctrine. NAMDC's STOs, validated by their alignment to approved capability gaps and needs, are prioritized by Commander, NAMDC. The importance of prioritization has to do with the interplay and close coordination of the stakeholders in the S&T, R&D, Acquisition, Financial, and Capability Needs communities as described above. Understanding and knowing the priorities of the Fleet is invaluable to applying limited resources to address the capability gaps, and guiding S&T development in finding, developing, and maturing emerging technologies with the potential to transition to an acquisition program.

While TTAs are not the only defined process to inject technology solutions into the Acquisition Framework, it is a key example of a document that acts as a formal agreement between technology developers and the Acquisition Community that a particular technology solution meets the minimum risk criteria under which the program manager and resource sponsor can agree to fund and further develop the technology into a POR. The shared goal is to rapidly deliver the capability, enabled by the technology, into the warfighter's hands. Furthermore, and assuming all the stakeholders maintained close communication within a formal process, the proposed technology solution meets the attributes and conditions set in the operational needs source document from which this process began.

The following sections provide additional information regarding STO definition and funding venues not previously discussed above.

2.3 Science and Technology Objectives (STOs) Defined

S&T solutions that support resolution of the STOs may come from the warfighting community, ONR, government labs, industry, or academia. Concepts are vetted through analysis, requirements review, and validation. The Navy has established S&T focus areas based upon guidance and demand signals from the Secretary of the Navy (SECNAV), Combatant Commanders (COCOMS), OPNAV, and Navy and U. S. Marine Corps (USMC) customers. In addition, these focus areas are constructed to capitalize on emerging technologies and S&T opportunities to assist in reducing future surprise threats.

STOs represent technology areas that NAMDC desires to address through the technology development community. STOs are technology —demand signals from the warfighter that are viewed as critical to closing capability gaps and are derived from the assessment of the NAMDC IAMD requirements.

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2.4 Roles and Responsibilities

IAMD warfighters only benefit in the long term from successful S&T projects that transition to acquisition programs. Successful transition depends on close partnership of the three principal communities involved in delivering science and technology to the forces: Combat Development, Technology Development and Material Development. *Figure 3* provides a pictorial view of the relationship and responsibilities of these Communities:

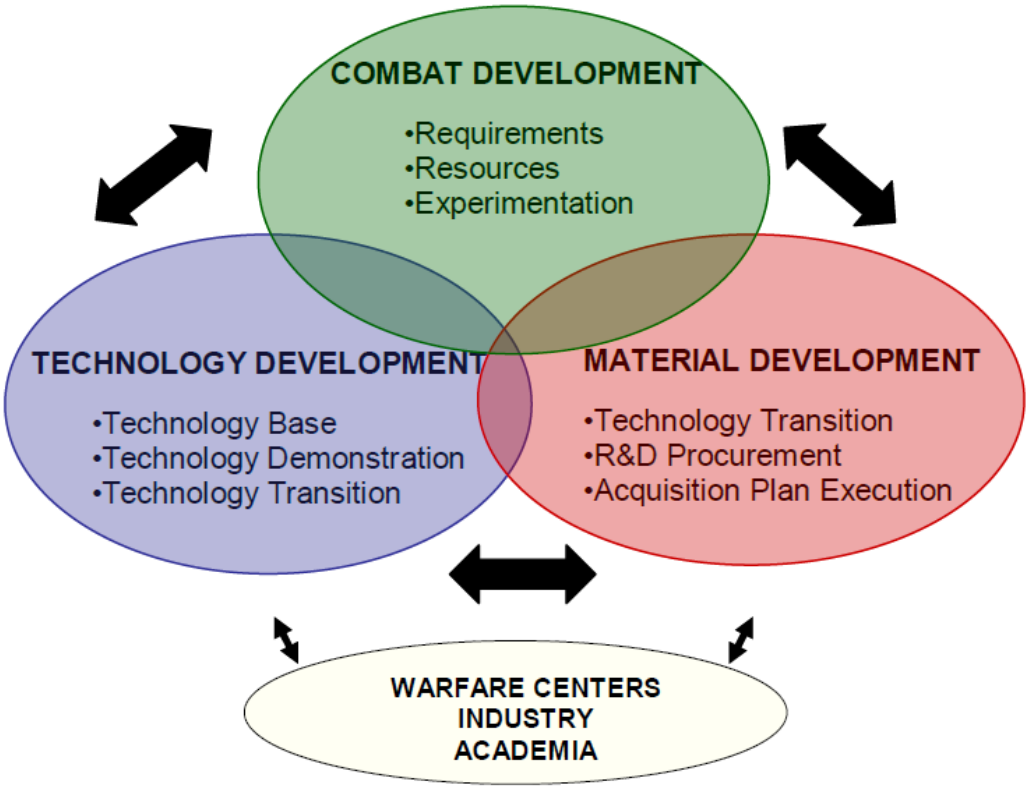

Figure 3: Collaborative Technology Environment

Combat Development – Combat development is the responsibility of the NAMDC Commander, U. S. Fleet Forces Command (USFFC) and OPNAV. They develop and validate requirements, provide resourcing strategy, and conduct or augment experimentation of promising new concepts.

Technology Development – Technology development is performed by ONR, the Naval Research Laboratory (NRL) and/or other elements of a Research Enterprise, or DoD research establishment. Technology developers create the technology base, perform technology demonstrations, provide resources, and play a critical role in technology transition.

Material Development – Material development is conducted by the applicable SYSCOMs and/or Research Laboratory development divisions. Technical manager responsibilities include: technology transition path, R&D testing, Plan of Action and Milestones (POA&M) development, acquisition plan development, and R&D contracting. Technical Managers are the primary liaisons with industry to develop and test a product to requirement specifications.

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2.5 Technology Transition Venues

Specific programs designed to assist in developing new successfully transitioned technologies are available. These and other venues provide a marketplace for the technology and appropriate applications for those technologies. In some cases, the programs offer another source of funds in addition to the specific program that supports the transition. These programs, as illustrated in *Figure 1*, are listed in order of current application to NAMDC.

2.5.1 Future Naval Capabilities (FNC) Program

As part of its execution of the Naval S&T program, ONR has developed the Future Naval Capabilities Program. This Program is under the oversight of the Technology Oversight Group (TOG), which is chaired by OPNAV N8, Marine Corps Combat Development Command (MCCDC) Commanding General, USFF Deputy Commander (DCOM), Assistant Secretary of the Navy for Research, Development and Acquisition, (ASN RDA) and the Chief of Naval Research (CNR). This effort provides a three to five year technology development path with the purpose of ultimately transitioning a capability into a program. The day-to-day planning and execution of the effort is managed through the following Integrated Product Teams (IPTs):

- Sea Shield (SHD)
- FORCEnet (FNT)
- Naval Expeditionary Maneuver Warfare (EMW)
- Sea Strike (STK)
- Sea Base (BAS)
- Enterprise and Platform Enablers (EPE)
- Capable Manpower (CMP)
- Force Health Protection (FHP)
- Power and Energy (P&E)

FNC Warfighting Gaps are defined under the appropriate IPT by incorporating input from the warfighting entities. After the gaps are identified, ONR and the research enterprise develop proposals to flesh out Enabling Capabilities (EC) in order to address those gaps. These proposals are evaluated internally within ONR and a list of proposed ECs is developed for execution in the appropriate fiscal year and submitted for approval by the TOG. Due to yearly fiscal constraints, many FNC gaps are not addressed, and not all of the proposed ECs are funded.

Execution reviews are conducted throughout the three to five year process to ensure sufficient technical progress and a viable transition path. If progress stalls or a transition path fails, the TOG may cancel an EC and shift the funds to other ongoing efforts, or initiate a new EC that may not have been addressed.

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2.5.2 Joint Capability Technology Demonstration (JCTD)

A JCTD is an Office of the Secretary of Defense (OSD) funded program to exploit mature technologies that solve important military problems and rapidly transition new capabilities to COCOMs. Emphasis is placed on the COCOMs' demand signal and funding is shared between OSD and the services.

2.5.3 Rapid Technology Transition (RTT)

Administered by ONR, this program provides for a rapid technology transition from any source into a DoN POR to meet emergent and urgent naval needs. The TOG that approves FNC efforts also has oversight of RTT efforts.

2.5.4 Rapid Innovation Fund (RIF)

This program is designed to advance technology by validating and demonstrating the capability in a realistic environment (Technology Readiness levels 6 and 7, respectively). Those selected for award may receive up to $3M in RIF funding; developmental efforts should be completed within 24 months, with fielding scheduled for not more than 36 months after contract award.

2.5.5 Technology Transition Initiative (TTI)

This program is designed to facilitate rapid transition of new technologies into operational capabilities after demonstrating that capability in an operationally relevant environment.

2.5.6 Joint Experimentation Program

The Director Joint Force Development (DJ7) retains responsibility within the Joint Staff to support the Joint Warfighter through Joint Force Development, defined as the deliberate, iterative and continuous process of planning and developing the current and future joint force. This mission set combines responsibility for joint training, exercises, professional military education, doctrine, concept development, experimentation, lessons learned and operational analysis.

2.5.7 Defense Acquisition Challenge Program (DACP)

The DACP provides opportunities for both innovators and the DoD. It can provide a faster entry into the defense acquisition system for innovators, and may assist with the increase of technology insertions to improve systems for the DoD PM. The DACP provides opportunities for the introduction of innovative and cost-saving commercial technologies or products into existing DoD acquisition programs. Furthermore, the DACP is specifically designed to provide small and medium-sized companies with the opportunity to introduce new technologies and inject innovation into current DoD Programs. The DACP ultimately expands opportunities for emerging defense suppliers, widens the U.S. defense industrial base, and leverages unique innovations for the benefit of the warfighter.

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2.5.8 Small Business Innovative Research Program (SBIR)

This program uses DoD RTD&E funds to increase small business participation in early-stage R&D projects that serve DoD needs, and have commercial applications.

2.5.9 ONR Tech Solutions

An innovative, transformational business process created by the CNO, Tech Solutions is focused solely on rapidly delivering needed technology to the Fleet/Force. The goal is to provide Sailors and Marines web-based access to the Naval Research Enterprise (NRE). This access, via both the Internet and Secret Internet Protocol Router Network (SIPRnet), targets the E-4 through O-4 at the deckplate/ground level on finding ways to improve mission effectiveness through the application of technology. Improvements from this effort are intended to assist the sea services in moving toward a more effective and efficient use of personnel.

Tech Solutions is not a substitute for the acquisition process and is not a replacement for the SYSCOMs. Its goal is to provide the Fleet/Force with prototypes that deliver 50–70% solutions addressing immediate requirements that can be easily transitioned by the acquisition community. Tech Solutions works with appropriate SYSCOM elements in an Integrated Product Team concept which ensures that transition hook points are built into the solution which enables the acquisition authority to move directly to final prototyping or a decision to buy.

Regardless of the venue or process utilized to facilitate the transition, the job is not complete until the capability is in the warfighter's hands and is fully supported in the life cycle. For NAMDC, the last step in the process is transitioning a capability/system into a POR or TOA.

3. Science & Technology Objectives

This section provides supporting background and a comprehensive listing of NAMDC Science & Technology Priorities and the Science and Technology Objectives (STOs) for 2013. The NAMDC S&T Priorities identify areas in which S&T can provide additional capability to the Fleet. The NAMDC STOs identify technology areas that NAMDC desires to be addressed by the Navy and DoD Technology Development Community to meet present and future mission needs.

3.1 NAMDC Science and Technology Priorities

Presently, the highest priority NAMDC S&T Priorities are as follows: Directed Energy, Network Architectures and Combat Identification.

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3.1.1 Directed Energy

Directed Energy (DE) technology not only offers the prospect for a major return on investment over the long term, it could begin paying significant dividends within the current future years defense plan (FYDP) by addressing immediate combatant commander requirements and enabling fleet experimentation focused on emerging threats, including anti-access and area-denial challenges. Directed energy weapons (DEWs) offer several potentially "game changing" advantages: very rapid engagement, low cost per engagement, essentially infinite magazines, and low total ownership costs.

3.1.2 Network Architectures

It is vital that the Fleet remain connected at all times and that the network architectures are dynamically scalable and agile enough to predict and avoid loss of connectivity. Large amounts of data passed across multiple domains continue to provide challenges to developing and maintain a Common Operational Picture. Cloud technologies and open architectures are among a few of the technologies that provide opportunity for addressing the complex network environment in use by our Fleet today.

3.1.3 Combat Identification

Combat identification is critical in achieving a Common Operational Picture (COP). Common sensor capability to detect, identify/classify, determine intent, produce a track file on potential threats outside threat ability to engage, automation to aid in display and consumption of the COP, and seamless integration of multiple sources and sensors, including, radar, EW, EO, IR and visual inputs into a COP are critical technologies needed to ensure correct Combat Identification.

3.2 Organization of NAMDC STOs

The NAMDC STOs which are presented in Section 3.2 are organized according to the Joint Capability Areas.

3.2.1 Training

STO-12-01 Integrated Air and Missile Defense Training

- Develop tools and techniques to achieve sustained performance through scenario-based training
- Develop methods to shorten training time, reduce training cost and maximize training impact

3.2.2 Networks

STO-12-02 Maintain Information Dominance

Today's Navy has an increasing demand to share information across platforms. Network architectures and communications enable this information sharing and as such should be secure, timely and robust.

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- Develop dynamic, scalable tactical communication networks that reduce bandwidth and improve efficiency
- Develop beyond-line-of-sight communication technologies
- Develop open architectures
- Develop technologies to support mission planning information sharing
- Develop technologies to enable electronic protection via networking and robust sensors allowing for control of Electromagnetic Spectrum through sensing
- Develop technologies to protect the network against attack and exploitation
- Develop low cost , high performance communication solutions
- Develop and maintain a common operational picture
- Develop technologies to support Fleet operations in the absence of Global Positioning System (GPS) Information

3.2.3 Air Defense

STO-12-03 Develop Persistent Intelligence, Surveillance and Reconnaissance

- Develop technologies that enable near real-time detection, tracking, and positive combat identification of Unmanned Aerial Systems (UAS), low slow-flyers, and high speed watercraft to support cooperative engagement in a littoral environment

STO-12-04 Advance Non-Lethal/Equipment Disabling Technologies

- Develop non-lethal technologies to warn, disable and/or suppress threats which minimize the risk of significant collateral damage, that produce reversible effects, and that maximize stand-off distance

3.2.4 Cruise and Ballistic Missile Defense

STO-12-05 Detect and Defeat against Electronic Warfare

- Develop distributed and coordinated onboard and offboard systems that provide detection and countermeasures to defeat surveillance, targeting and terminal threats
- Develop technologies to be incorporated into a layered defense including all aspects of Electronic Warfare (i.e. Electronic Attack (EA), Electronic Support (ES) and Electronic Protection(EP))
- Develop Electronic Warfare Battle Management capabilities

STO-12-06 Deter/Detect/Defeat Cruise and Ballistic Missile Threats

- Develop dynamic mission planning technologies to prepare fleet to engage threats
- Develop targeting and engagement technologies to detect, track, identify and engage threats
- Develop speed-of-light engagement technologies through electronic warfare, directed energy and hypervelocity weapons

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STO-12-07 Detect and Defend against Irregular Warfare Threats

- Develop technologies to detect and defeat stand-alone or swarm, manned and unmanned air and surface threats

4. Way Ahead

4.1 Discussion

In the preceding pages, this document has described an S&T vision, technology process, and specific Science and Technology Objectives (STOs) for the Navy Air and Missile Defense Command.

As NAMDC's technology demand signals, the STOs in this document offer one perspective by which to guide Navy S&T investment, and are designed to assist the S&T community in focusing efforts on behalf of NAMDC where we believe the greatest gains can be realized. These STOs also inform other activities where NAMDC may share similar interests and goals in technology development. As always, continuous communication among all communities involved, leveraging efforts where appropriate, can be the key to rapidly filling warfighter capability needs. This document is an integral part of that dialog.

Good S&T planning balances the need to support future warfighter concepts with the need to support research in other areas that may produce breakthroughs warfighters have not yet envisioned.

4.2 S&T Operational Goals

The following S&T Operational Goals and Initiatives are provided to guide NAMDC's interaction with the Naval Science and Technology Enterprise.

S&T Operational Goal #1

Identify and maintain Science and Technology Objectives (STOs) deemed important to close recognized capability gaps.

Initiative 1.1: Establish a working document to track NAMDC STOs though identification and mapping of their respective source documentation, requirements statements (if any), ongoing or proposed development efforts, and other key factors.

Initiative 1.2: Closely monitor the S&T needs of the force, and update the 2012 NAMDC STOs as required, at not more than a two-year interval.

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S&T Operational Goal #2

Leverage the greater DoD S&T community in developing, evaluating, and transitioning innovative technology solutions to address key NAMDC Science and Technology Objectives (STOs)

Initiative 2.1: Refine internal NAMDC processes to encourage and stimulate new research in areas that address NAMDC needs.

Initiative 2.2: Seek S&T partnerships and leveraging opportunities with organizations that share NAMDC technology objectives.

Initiative 2.3: Seek out appropriate S&T funding venues to pursue NAMDC technology objectives, such as Small Business Innovation Research (SBIR), Advanced Concept Technology Demonstrations (ACTDs), Joint Capability Technology Demonstrations (JCTDs), Rapid Technology Transition (RTT), and others.

Initiative 2.4: Build pathways for transitioning S&T outputs, through early and sustained interaction with resource sponsors, PEO and SYSCOM program offices, and S&T developers.

Initiative 2.5: Support an NAMDC technology outlook that spans from the present (near-term) out to 25 years or more (long-term), while maintaining focus upon 2-5 year development projects.

4.3 Feedback and Updates to this Plan

The NAMDC S&T Strategic Plan is intended as a living document. While the preceding paragraph established a two-year maximum interval between updates, ideas are welcome anytime from any source.

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Appendix A: NAMDC STO Cross Reference Table

NAMDC STO 2012	Related FNC Pillar	Related POM-14 FNC Gap	Related ONR Focus Area	Joint Capability Areas	Related 2010 SWE STO	Related USMC STO	Related NAE STO
STO-12-1	Capable Manpower	33,35	Warfighter Performance	JCA 1.1, JCA 1.2	10-10		NWP STO-1, NWP STO-2
STO-12-2	ForceNet	33,35	Information Dominance	JCA 2.1, JCA6.1, JCA6.2, JCA6.3, JCA6.4	10-2	PG11, PG12	C4ISR STO-2, C4ISR STO-3
STO-12-3	Sea Shield	33,35	Power Projection and Integrated Defense	JCA 2.2, JCA 2.3, JCA2.4, JCA3.2, JCA7.1, JCA7.2	10-6		FP STO-3
STO-12-4	Sea Shield	33,35	Power Projection and Integrated Defense	JCA 2.2, JCA 2.3, JCA2.4, JCA3.2, JCA7.1, JCA7.2	10-7	PG11	TAMD STO-1, C4ISR STO-4, C4ISR STO-6
STO-12-5	Sea Shield	33,35	Power Projection and Integrated Defense	JCA 2.2, JCA 2.3, JCA2.4, JCA3.2, JCA7.1, JCA7.2	10-13	PG11	
STO-12-6	Sea Shield	33,35	Power Projection and Integrated Defense	JCA 2.2, JCA 2.3, JCA2.4, JCA3.2, JCA7.1, JCA7.2	10-12		
STO-12-7	Sea Shield	33,35	Power Projection and Integrated Defense	JCA 2.2, JCA 2.3, JCA2.4, JCA3.2, JCA7.1, JCA7.2	10-3		

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Appendix B: References and Web Links

Joint and Naval Strategic Documents

- Joint Capabilities Areas Document

Defense S&T Documents

- Naval S&T Strategic Plan (2011)
- Marine Corps Science and Technology Strategic Plan (2009)
- Navy Expeditionary Combat Command Science and Technology Strategic Plan (2011)
- Surface Warfare Enterprise Science and Technology Strategic Plan (2010)
- Naval Aviation Enterprise Science and Technology Objectives (2008)

Web Links

FNC: http://www.onr.navy.mil/Science-Technology/Directorates/Transition/Future-Naval-Capabilities-FNC.aspx

SBIR at ONR: http://www.onr.navy.mil/Contracts-Grants/small-business.aspx

SBIR at Navy: http://www.navysbir.com

ManTech: http://www.onr.navy.mil/Science-Technology/Directorates/Transition/Manufacturing-ManTech/Planning-Execution.aspx

RTT: http://www.onr.navy.mil/Science-Technology/Directorates/Transition/Technology-Transfer-T2.aspx

TechSolutions: http://www.onr.navy.mil/Science-Technology/Directorates/office-innovation/tech-solutions-innovation.aspx

SwampWorks: http://www.onr.navy.mil/Science-Technology/Directorates/Transition/office-innovation/swampworks-innovation.aspx

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Appendix C: Acronyms

ACTD – Advanced Concept Technology Demonstration

ASN RDA - Assistant Secretary of the Navy for Research, Development and Acquisition

BAS – Sea Base

CBA - Capabilities Based Assessment

C4ISR – Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance

COE – Center of Excellence

COCOMS - Combatant Commanders

COMPACFLT - U.S. Pacific Fleet

COMTHIRDFLT - U.S. Third Fleet

COMUSFLTFORCOM – U.S. Fleet Forces Command

COTS - Commercial off the Shelf

CMP – Capable Manpower

CNO – Chief of Naval Operations

CNR – Chief of Naval Research

COP – Common Operational Picture

DCOM – USFF Deputy Commander

DoD -Department of Defense

DOTMLPF - Doctrine, Organization, Training, Material, Leadership and Education, Personnel and Facilities

EA – Electronic Attack

EC – Enabling Capabilities

EP – Electronic Protect

EPE – Enterprise and Platform Enablers

ES – Electronic Support

EMW - Expeditionary Maneuver Warfare

EWBM – Electronic Warfare Battle Management

FHP – Force Health Protection

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Appendix C: Acronyms (Cont.)

FCT – Fleet Collaborative Team

FNC - Future Naval Capabilities

FNT – FORCEnet

FYDP - Future Years Defense Program

GPS – Global Positioning System

IAMD – Integrated Air and Missile Defense

IPT - Integrated Product Teams

JCIDS - Joint Capabilities Integration and Development System

JUONS - Joint Urgent Operational Needs Statement

ONR – Office of Naval Research

MUA – Military Utility Assessment

MCCDC - Marine Corps Combat Development Command

MFT - Mission, Functions, and Tasks

NAMDC – Navy Air and Missile Defense Command

NCDP - Naval Capabilities Development Process

NRE - Naval Research Enterprise

NRL - Naval Research Laboratory

P&E – Power and Energy

PEO -Program Executive Officer

PMO - Program Management Office

POAM - Plan of Action and Milestones

POE -Projected Operational Environment

POR - Program of Record

R&D – Research and Development

ROC - Required Operational Capability

S&T – Science and Technology

SECNAV - Secretary of the Navy

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Appendix C: Acronyms (Cont.)

SHD – Sea Shield

SIPRnet - Secret Internet Protocol Router Network

STK – Sea Strike

STO – Science and Technology Objective

SYSCOM - Systems Command

TOA - Table of Allowance

TOG - Technology Oversight Group

TRL – Technical Readiness Level

TTA - Technology Transition Agreement

UAS – Unmanned Aerial System

USFFC - U. S. Fleet Forces Command

USMC - U. S. Marine Corps

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