

Section 2

S&T COLLABORATION AND ENGAGEMENT

Concept to Capability Process

The Concept to Capability process used by PEO LS, depicted in Figure 2-1, is a focused, repeatable process that has proven essential in facilitating effective interaction with S&T stakeholders within the S&T Community.

The PEO LS Concept to Capability process begins with an in-depth understanding and alignment to Expeditionary Force 21 (EF21), the Marine Corps

capstone concept, and its supporting operational concepts. Next, a clear understanding of the core capabilities and technology concepts that support, enable, and underpin the future warfighting concepts. Understanding these top-level strategic and operational concepts as well as their associated issues; particularly those that rely heavily on materiel solutions for resolution is critical. Concepts such as Holistic Modularity and Advanced Force 2020 as

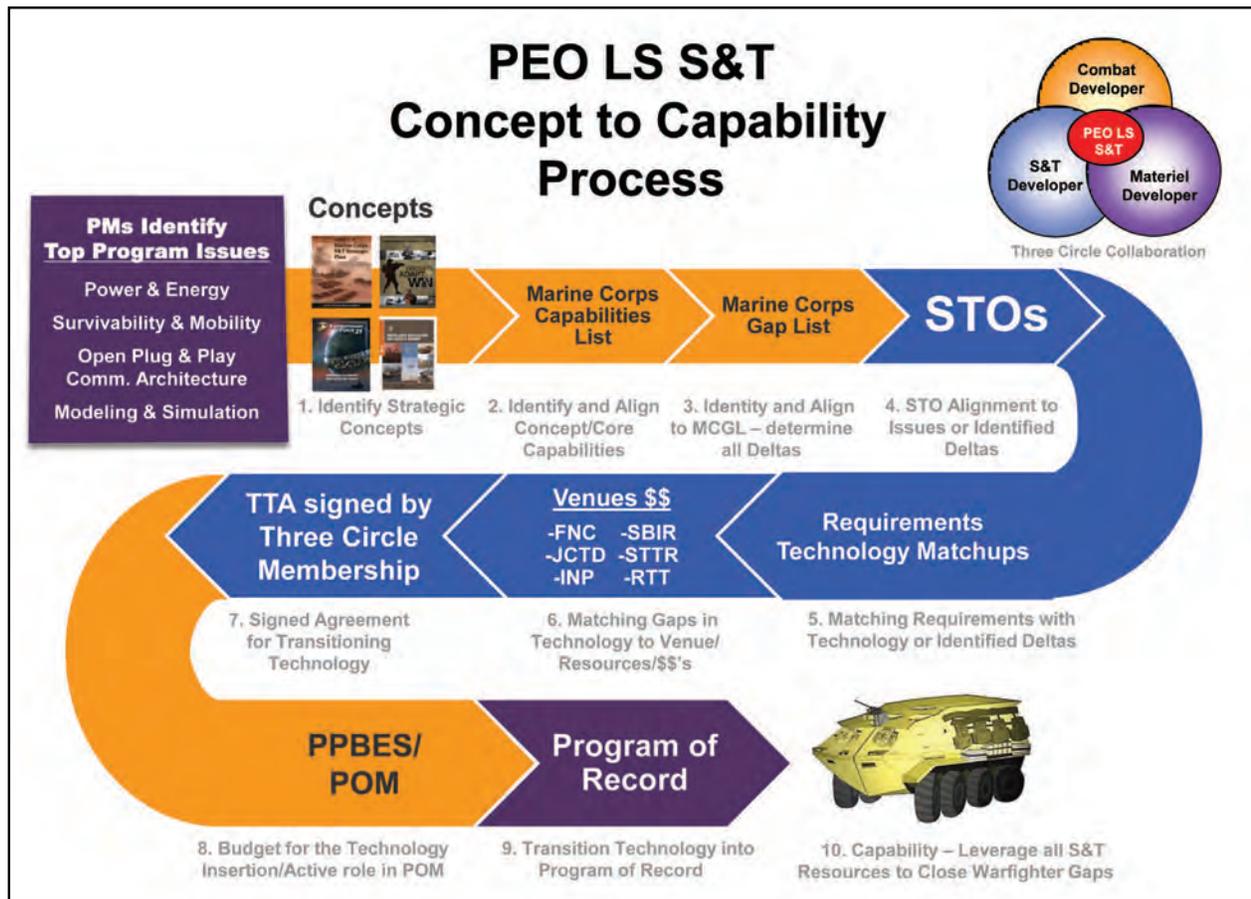


Figure 2-1. Program Executive Officer Land Systems Concept to Capability Process

well as issues such as Re-honing the Expeditionary Edge, Reducing the Sustainment Footprint; Fuel Saving across the Marine Air-Ground Task Force (MAGTF); Lightening the MAGTF Load; and Reducing the MAGTF Footprint will be key to the success of our future warfighters..

Once the operational concepts and capabilities are understood, an analysis is conducted to identify the Marine Corps' capabilities and technology gaps. These capabilities and gaps are categorized in the Marine Corps Capabilities List (MCCL), Marine Corps Gap List (MCGL), Marine Corps Solutions Planning Directive, and the Capability Investment Plan.

The S&T Objectives (STOs) are matched to the technology issue identified by the program office and capability gap. This step is performed to ensure the traceability of S&T investments and to enable stronger support within the Program Objective Memorandum (POM)/Planning, Programming, Budgeting and Execution (PPBE) process.

Once identified, the matching requirement and S&T gap closing initiative, potential S&T Venues are examined and petitioned to fund and mature the needed technology.

Before resources are applied a transition path must be identified. The Program Manager (PM) collaborates with the resource sponsor and the S&T Developer to ensure a successful transition. This 'shared commitment' is usually documented in a Technology Transition Agreement (TTA) that is signed by all parties. After the TTA is signed by the appropriate level of Three -Circle leadership, the S&T representative continues to work closely with the PM to ensure funding support is available (in the POM). POM funding is essential in order to integrate and transition the technology to the appropriate POR and close the associated warfighter gap. Currently, TTAs are only required for a specific venue, Future Naval Capability (FNC). All other venues and core

funding initiatives do not require a TTA but should have a transition path and a requirement.

Utilizing the Concept to Capability process enables potential S&T opportunities and solutions to be identified, which allows the S&T representatives to better inform requirements, provide the best value for S&T investment, and transition these needed gap-closing technologies to the POR.

S&T investment is one of the earliest and necessary steps in the process of properly equipping the future force. Applied correctly, it can result in a balanced Marine Corps that is postured for the future with new state-of-the-art equipment that has been developed through rigorous analysis, targeted investment, aggressive experimentation, and, most importantly, through the active collaboration and engagement of all stakeholders.

S&T Objectives

The most important objective of S&T development is to ensure the United States Marine Corps (USMC) always has an overmatching technological advantage. Preserving technological superiority, a cornerstone of our National Military Strategy, is critically important as high-technology weapons become less expensive and made more readily available to non-traditional adversaries. Additionally, USMC S&T has the following specific goals:

- ▶ Inform the Marine Corps Combat Development Process;
- ▶ Encourage, promote, plan, initiate, execute, and coordinate research and technology development;
- ▶ Identify and assess technologies;
- ▶ Develop and demonstrate technologies;
- ▶ Reduce technical risks;
- ▶ Protect against technology surprise;

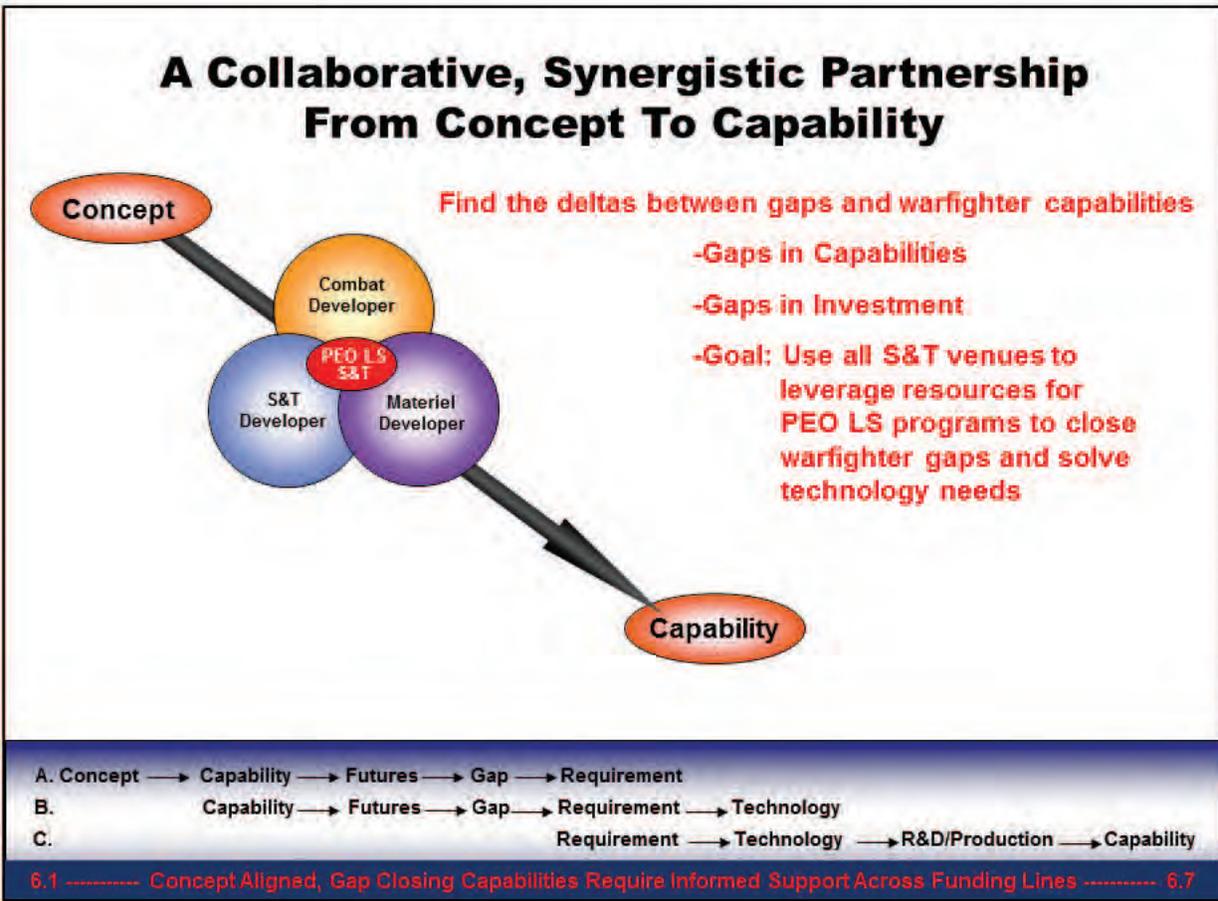


Figure 2-2. The Collaborative, Synergistic Partnership From Concept to Capability

- ▶ Conduct warfighting experimentation; and
- ▶ Transition mature technology to Acquisition PORs.

and strategy in the areas of scientific innovation, to include cosponsoring annual roundtables to identify Marine Corps S&T requirements.

The Executive Agent for USMC S&T

Commanding General (CG), Marine Corps Combat Development Command (MCCDC) tasked the Director Futures Directorate/CG, Marine Corps Warfighting Laboratory (MCWL) to act as the Executive Agent (EA) for S&T, thereby consolidating responsibility for coordinating all aspects of Marine Corps S&T requirement generation and coordination to the EA. Inherent in this transfer of responsibility was the transfer of staff cognizance to the Office of Science and Technology Integration (OSTI) from MCCDC Headquarters to the Warfighting Lab. OSTI is responsible for providing policy, guidance,

Science and Technology

Science and Technology, within the Defense Department, encompasses the earliest forms of Research, Development, and Test and Evaluation (RDT&E) funding in the Federal Budget. S&T is comprised of three categories: Basic Research, Applied Research, and Advanced Technology Development. It is the path by which new ideas are investigated (Basic Research-Phenomenology), and, if further research shows a military applicability (Applied Research-Connectivity), the process continues until the technology is demonstrated (Advanced Technology Development) at a level

where it is transferred to a program office (utility) to finalize the research and development (R&D) process. USMC S&T efforts are assisted by close coordination with the S&T Community, other services, academia, and industry leaders to bring together and fund relevant S&T efforts. The ultimate goal is to investigate, develop, demonstrate, and deliver affordable state-of-the-art technologies to the Warfighter.

Collaboration

Each circle has a unique and pivotal role in the S&T process within the Three-Circles S&T Community. Although they have overlapping interests and influences regarding the likelihood of the transition, the collaboration, and engagement of these communities is critical for successful transitions (see Figure 2-2).

S&T Developers transition their technology to the Materiel Developers, but the Materiel Developers must first have a requirement from the Combat Developer. Therefore, stakeholder involvement is critical to ensure warfighter priorities are adequately addressed (requirements) and that the technologies being developed are aligned with a POR's resources and schedule.

The S&T Community Stakeholders

The USMC S&T Enterprise, which is an integral part of the larger Naval Research Enterprise (NRE), is a collaborative effort led by the Deputy Commandant, Combat Development & Integration, but it also involves the Futures Directorate, MCWL, Office of Naval Research, MCSC, PEO LS, and the EA (CG MCWL) for S&T. This Three-Circles relationship is depicted in Figure 2-3.



Deputy Commandant, Combat Development & Integration

Deputy Commandant, Combat Development & Integration (DC, CD&I) is the principal agent in the Combat Developer circle. The Combat Developer represents the warfighters who will deploy, operate, and maintain the systems needed for military operations. Combat Developers write the requirements that the Materiel Developers must have in order to develop and procure materiel. Combat Developers also generate new operational concepts, define future capability needs, identify new capability gaps/shortfalls, and state capability requirements. CD&I receives the Commandant's guidance, develops Marine Corps warfighting concepts, and determines required capabilities to enable the Marine Corps to field combat-ready and relevant forces.

- ▶ **Director, Capabilities Development Directorate** develops warfighting capabilities and requirements through the Marine Corps Force Development System (MCFDS). The Director, Capabilities Development Directorate accomplishes this activity through a Capability Based Assessment (CBA) by refining and validating the MCCL, analyzing and identifying the MCGL, and developing the Marine Corps Solutions Planning Directive to identify possible materiel and non-materiel solutions. This process culminates in creation of the Marine Corps Enterprise Integration Plan, which serves as the long-range plan to integrate capability investments. The STOs articulated in the U.S. Marine Corps S&T Strategic Plan are products of the MCFDS Process and are developed in coordination within the Marine Corps S&T Enterprise.
- ▶ The **Director, Futures Directorate/CG, MCWL** determines the future Marine Corps strategic landscape by assessing emerging security

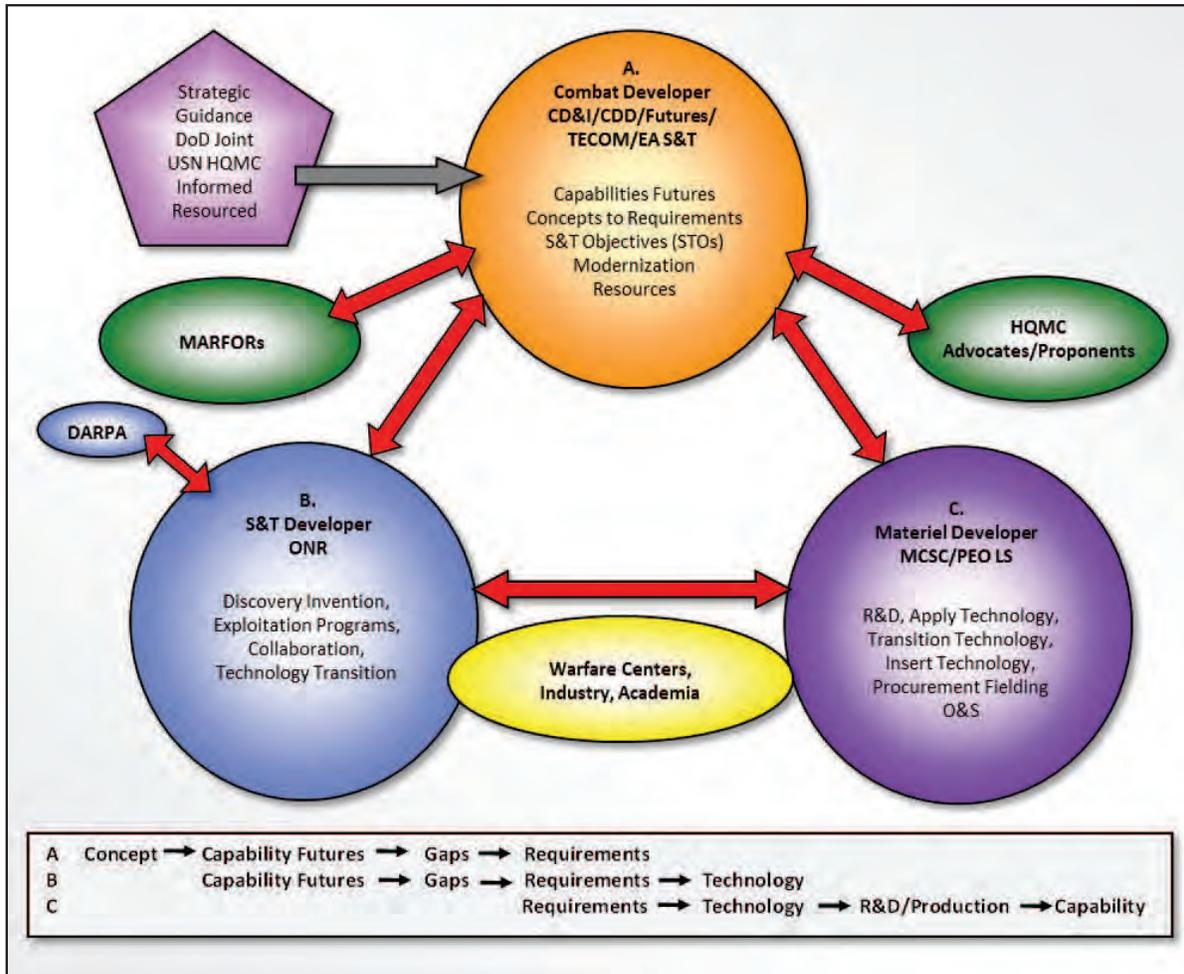


Figure 2-3. The Three-Circles S&T Community

environments and by developing and evaluating Marine Corps operating concepts by integrating these concepts into Naval and Joint concepts. The Futures Directorate helps to identify potential gaps and opportunities which inform the force development process.



- ▶ **The Office of Science and Technology Integration** is tasked with implementing the Director, Futures Directorate/CG, MCWL S&T responsibility as the USMC Commandant's EA for S&T. OSTI functions to coordinate S&T within the combat development life cycle from requirement to transition. Through coordination with the Three-Circles S&T Community, OSTI develops the vision, policies,

and strategies needed to exploit scientific research and technical development. A Defense Advanced Research Projects Agency (DARPA) Transition Officer is assigned to OSTI to stay abreast of DARPA's ongoing efforts and to ensure MCWL's ability to incorporate relevant technologies into future experimentation. OSTI provides technical oversight of proposals submitted to Office of the Secretary of Defense (OSD) and Department of Defense (DoD) and manages/monitors the daily operations of the S&T programs under the OSTI portfolio. Additionally, OSTI develops and coordinates the prioritization of S&T requirements for OSD and the Department of the Navy.

Marine Corps Systems Command and PEO Land Systems

MCSC and PEO LS are principal agents in the Materiel Developer circle. The Materiel Developer administers and manages the activities of the workforce to meet the modernization requirements and enhanced capabilities efficiently and effectively. The Materiel Developer community includes the Acquisition Executives, Program Executive Officers, Program Managers, Project Officers, and support staffs. In response to a validated operational requirement from the Combat Developer, the Materiel Developer is responsible for assessing alternatives, conducting cost/benefit analysis, establishing R&D requirements, defining S&T performance and maturity thresholds, and procuring and fielding the required operational capability.

- ▶ **Systems Engineering, Interoperability, Architectures & Technology (SIAT)** is responsible for leading MAGTF systems engineering and integration efforts, ensuring Marine Corps systems interoperability with coalition and Joint forces, and identifying and pursuing S&T transition opportunities for Marine Corps systems. Deputy Commander, SIAT Technology Transition Office develops an S&T Portfolio for MCSC that responds to capability needs with innovative technology solutions.
- ▶ MCSC and PEO LS conducts a monthly **S&T Working Group (S&T WG)** to enhance S&T collaboration and to expand technology into PORs. The S&T WG assists in developing S&T processes and S&T transitions, establishing roadmaps, discussing timelines, and enhancing internal and external S&T project awareness.
- ▶ The **PEO LS S&T Director** serves as the primary advisor for all S&T policy/process issues and as a conduit for the flow of critical

S&T information between all applicable S&T forums and PEO LS, and ensures the timely delivery of technology solutions to the Warfighter. The Director accomplishes this activity by working closely with PEO LS PMs (and S&T stakeholders) to resolve program technical issues, reduce program risk, and deliver state-of-the-art technology via PORs.

Office of Naval Research

The Office of Naval Research (ONR) is the principal agent in the S&T Developer circle. The S&T Developer delivers technologies that enable future warfighters to maintain their technical edge over our adversaries. The community consists of scientists, engineers, and academics who understand the technological frontier and what developments are possible for future systems. This group examines technical possibilities, identifies scientific gaps, develops S&T requirements, and executes scientific efforts. The S&T Developer is also responsible for exploring the phenomenology, feasibility, and utility of S&T as it pertains to the improvement of legacy systems, the realization of future capabilities under development, and the advancement of discovery in areas yet to be exploited.

ONR identifies S&T solutions to address Navy and Marine Corps plans and scientific research as it relates to the maintenance of future naval power. ONR also manages the Navy's S&T funds to foster transition from S&T to higher levels of RDT&E. The Director, Futures Directorate/CG, MCWL also serves as the Vice Chief Naval Research.

- ▶ **ONR Global Science Advisors** are civilian scientists, engineers, and technologists selected to participate in a one- to three-year career development tour. Science Advisors serve as a Command's senior liaison with S&T organizations in Government, academia, and industry. They communicate needs and requirements to the ONR and NRE to help



shape S&T investments. They are worldwide in Joint, Navy, and Marine Corps Commands. Specifically, each Marine Expeditionary Force (MEF) has a Science Advisor on Staff to assist in providing operational ground truth for the S&T Community.

- ▶ **Expeditionary Maneuver Warfare & Combating Terrorism Department (Code 30)**, one of ONR's S&T departments, develops and transitions technologies to enable the Navy-Marine Corps team to win and survive on the battlefield both today and tomorrow. Its primary focus is on the Marine Corps, but it also supports the Marine Corps Special Operations Command (MARSOC), Naval Special Warfare Command (NSWC), and Navy Expeditionary Combat Command.

Other S&T Stakeholders

- ▶ **DARPA** relies on diverse performers to apply multidisciplinary approaches both to advance knowledge through basic research and to create innovative technologies that address current practical problems through applied research. DARPA's scientific investigations range from laboratory efforts to creation of full-scale technology demonstrations in the fields of biology, medicine, computer science, chemistry, physics, engineering, mathematics, material sciences, social sciences, neurosciences, and more. As the DoD's primary innovation engine, DARPA undertakes projects that are finite in duration but that create lasting, revolutionary change. The Marine Corps maintains awareness of DARPA's initiatives by assigning a Marine Corps Operational Liaison to DARPA and assigning a DARPA

Transition Officer to MCWL (OSTI).

- ▶ **Tank Automotive Research, Development and Engineering Center (TARDEC)** develops, integrates, and sustains the right technology solutions for all manned and unmanned DoD ground systems and combat support systems to improve Current Force effectiveness and provide superior capabilities for the Future Force. It is the Nation's laboratory for developing advanced military ground vehicle technologies, for process integration expertise, and for system-of-systems engineering solutions for Force Projection Technology, Ground Vehicle Power and Mobility, Ground Vehicle Robotics, Ground Systems Survivability, and Vehicle Electronics and Architecture.
- ▶ The **Joint Center for Ground Vehicles (JCGV)** focuses on collaboration and synchronization of portfolios for ground vehicles across the services, leveraging industry and academia to better use resources. This effort provides a key resource for Marine Corps and Army collaboration in vehicle development.
- ▶ **Industry.** Independent Research and Development (IR&D) is a program designed to enable superior performance of future United States weapon systems and components by reducing the acquisition and life cycle costs of military systems; strengthening the defense industrial base and the technology base of the United States; enhancing the industrial competitiveness of the United States; promoting development of technologies identified as critical; and increasing the development and promotion of efficient and effective applications of dual-use technologies. IR&D

is a contractor's own investment in basic and applied research and development that DoD may reimburse the company for making.

- ▶ **Academia.** Educational partnerships between academia and the S&T Community provide a means for organizations to assist universities in extending their research capabilities in areas relevant to the needs of the Navy/Marine Corps, and they provide an opportunity for students to work on degrees in programs of interest to these organizations. The benefits are two-fold. First, the university develops scientific and engineering expertise applicable to future needs. Second, students working on Navy/Marine Corps sponsored research receive an early exposure to those organizations, thereby expanding the possible talent pool for future recruitment.
- ▶ **Government Laboratories** execute long-term Government scientific and technological missions, often with complex security, safety, project management, or other operational challenges. Government labs develop unique, often multidisciplinary, scientific capabilities beyond the scope of academic and industrial institutions to benefit the Nation's researchers and national strategic priorities and sustain critical scientific/technical capabilities to which the Government requires assured access.
- ▶ The **Joint Non-Lethal Weapons Directorate (JNLWD)** was established in 1996 with the Commandant of the Marine Corps as the DoD Non-Lethal Weapon (NLW) Executive Agent. JNLWD receives ONR funding for developing and advancing the suite of NLW available to U.S. forces. The military services (Army, Air Force, Navy, and Marine Corps) are responsible for NLW procurement and sustainment. Non-lethal weapons provide warfighters with additional escalation-of-force options while minimizing casualties and collateral damage. The JNLWD stimulates

innovative solutions to the toughest non-lethal technology challenges and conducts scientific research necessary to understand the risk of injury and build confidence in the effectiveness of emerging technology solutions.

How to Get Involved in the Process

The PEO LS S&T community fosters the cooperative development of requirements, informs, and influences S&T budgeting resources, and advances the state of the art for the PEO LS portfolio.

The first step for a business, college department, or independent researcher to become involved is a period of investigation and preparation. Having a thorough understanding of the S&T challenges facing PEO LS programs and how your proposed solution can meet those challenges is vital to participating in S&T projects. The subsequent chapters of the 2015 ATIP provide an outline of technical challenges facing the PEO LS portfolio. After you have reviewed the challenges and opportunities for the PEO LS S&T Enterprise, the following sections in this chapter address the methods and venues and provide a jumping off point for your involvement.

In an environment of fiscal austerity, changing requirements, and rapid technical innovation, being engaged and knowing with whom to discuss new ideas is vital to fostering opportunities across the S&T Enterprise. With your participation, we can maximize ingenuity in a constrained environment and "Focus the Future Faster" for our warfighters.

National Advanced Mobility Consortium

There are many ways for industry to engage with PEO LS and one of them is the National Advanced Mobility Consortium (NAMC). PEO LS is in partnership with NAMC



which is a non-profit, nation-wide alliance of traditional and non-traditional small businesses, large defense contractors, academic institutions, and other research organizations involved with the translational research and development of the complete range of prototype, ground vehicle and robotics systems and technologies. Via a Section 845 Other Transaction Agreement, the NAMC accelerates the transition of innovative technology into transformative ground vehicles and systems in several important ways:

- ▶ readily getting projects under contract,
- ▶ enabling technology developers to better understand warfighter needs, and
- ▶ empowering Government technical managers to broadly solicit ideas and concepts from industry and academia.

In order to get more information about NAMC please

visit their website at <http://namconsortium.org/>

Defense Innovation Marketplace

The Defense Innovation Marketplace (DIM) [defenseinnovationmarketplace.mil] is a web-based forum that brings together the entire Defense R&D Enterprise to enable successful technology development and transition. Organized and managed by the Assistant Secretary of Defense for Research and Engineering, it is the central resource for DoD investment priorities and capability needs. Government and DoD agencies provide updated strategic documents, congressional testimony, and a list of opportunities for researchers. As a hub of resources, the DIM is a critical resource to enable interested organization to become involved in the R&D Enterprise.



Figure 2-4. The Defense Innovation Marketplace Home Page