

STRENGTHENING DEPARTMENT OF DEFENSE LABORATORIES

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The Problem

Department of Defense (DoD) laboratories primarily focus on sustaining innovation in known areas of application. What mechanisms could be used to foster greater laboratory focus on radical innovation based on commercial industry practices? To address this question, IDA proposed a virtual central lab concept for addressing DoD-wide innovation priorities.

IDA was asked to assess ways to strengthen the DoD laboratories' contributions to DoD-wide innovation priorities. This research builds on DoD's most recent efforts to increase the laboratories' focus on innovation in response to the 2010 Quadrennial Defense Review (QDR). IDA's recommendations are based on a review of current DoD practices, discussions with laboratory management and other stakeholders, and an assessment of relevant best practices for laboratory enterprise management in innovative commercial enterprises. The core recommendation is to create a virtual central DoD laboratory for science and technology (S&T).

The Laboratory Enterprise

The DoD laboratory enterprise comprises 62 facilities owned and operated by the Departments of the Army, Navy, and Air Force in 22 states with 65,000 government employees.

These facilities serve a wide range of functions across the spectrum of S&T. They operate under widely varying funding mechanisms, management approaches, and governance structures. One common characteristic, however, is their close relationship with their parent military departments (MILDEP) and their focus on anticipating and responding to the military services' (hereafter services) mission needs.

The DoD laboratory enterprise executes half of DoD's total S&T budget (about \$7 billion of \$14 billion). Roughly one-third of this funding supports S&T work performed within the labs, while about two-thirds supports companies and universities performing under lab oversight and management. Importantly, while S&T is an essential laboratory responsibility, it represents only a minority of the funding for the DoD laboratory enterprise. About four-fifths of the DoD laboratories' funding is to support current DoD operations, acquisition programs, and in-service engineering for fielded systems.

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Methodology and Findings

To better understand the laboratories' operations, the IDA research team visited a number of DoD laboratories nominated by the MILDEPs. During these visits, a large number of case studies were presented, which IDA used to characterize and evaluate the types of innovation being pursued and supported. The team also examined the structure and associated bodies responsible for governance of the DoD S&T enterprise.

The IDA team found ample innovation within the laboratories' established areas of responsibility, but also observed that the labs' close ties to their parent MILDEPs can create gaps in coverage in areas that are not well aligned with the services' mission needs. Radical or cross-cutting innovation has historically required intervention by top DoD leadership (the Secretary of Defense, his Deputy, or the chief acquisition executive). Early examples include the actions taken to establish nuclear, strategic strike, and satellite programs.

Other notable examples include stealth, unmanned aerial vehicles (UAV), missile defense, and counter improvised explosive device (IED) capabilities. Although DoD leaders can fill such gaps, the fact that it requires extraordinary action underscores the lack of a systematic mechanism for identifying and pursuing such DoD-wide innovation needs. Currently, this weakness is evidenced in the slow response of the DoD laboratory enterprise to the S&T priorities established following the 2010 QDR.

The research team sought possible remedies by examining how leading commercial firms structure and manage research and development (R&D) to drive innovation. The analysis focused on several companies with technologies that are typical of the type addressed in DoD labs. Companies willing to share their practices included Applied Materials (AMAT), The Boeing Company, Exxon Mobil Corporation, General Electric (GE), International Business Machines (IBM), Intel Corporation, and Procter & Gamble (P&G).

The innovation management challenges in these large commercial firms have parallels with the challenges addressed here: commercial firms, too, face tensions between the business-driven innovations pursued by the individual business units and more open-ended, enterprise-wide innovation needs. Companies have failed when their focus on business-driven innovation caused them to miss broader trends in the marketplace. The IDA team identified two common commercial best practices designed to overcome these weaknesses and encourage needed enterprise innovations that are applicable to DoD:

- Top managers provide strong leadership and resources for an enterprise-level innovation process that complements the program of work designed and executed by the business units.
- Top managers treat the laboratory enterprise as a strategic asset, providing the stewardship necessary to maintain a healthy innovation environment.

Recommendations

IDA researchers recommend five actions to help create a virtual central lab for addressing DoD-wide innovation priorities. This virtual central laboratory would be made up of a set of Office of the Secretary of Defense (OSD)-funded programs that are executed through a competition of ideas among cooperating and competing laboratory research teams. This approach embraces proven commercial practices, while preserving the MILDEPs' roles in governing the laboratories. To be successful, this virtual central laboratory would require committed top management leadership and resources.

The ASD(R&E) should lead the effort to identify and fund radical or cross-cutting innovation projects for DoD labs that complement the MILDEPs' existing S&T priorities. The projects would be selected through a competitive process outlined below. The Deputy Secretary, with support from the Under Secretary of Defense for Acquisition, Technology and Logistics (USD(AT&L)), should lead the efforts to ensure that promising innovation projects are successfully transitioned into the acquisition system. To encourage responsiveness, to mitigate delays in the normal DoD multiyear budgeting cycle, and to avoid creating unfunded mandates for the MILDEPs, OSD resources should be used to fund the initial work on these DoD-wide priorities.

First, OSD should forge a DoD-wide innovation vision and process that adopts relevant commercial innovation practices to create a

virtual central laboratory. The virtual central lab would be responsible for fostering DoD-wide innovation, the transition of successful innovation projects into the acquisition system, and the stewardship of necessary S&T capabilities. Proposed details on these mechanisms are described in the next three recommendations.

Second, as the first key function of the virtual central laboratory, the ASD(R&E) should lead a process employing a competition of ideas to identify and fund DoD laboratory projects addressing DoD-wide innovation needs, as depicted in Figure 1. The laboratories' governance structures would remain unchanged, and the labs would continue to address service mission needs. In parallel, the labs would respond to DoD's enterprise-level innovation priorities through OSD-funded projects. Strong preference would be given to projects that involve laboratories from more than one service.

Third, the Deputy Secretary should lead efforts to transition successful DoD-wide innovation projects into the MILDEPs' acquisition systems. The proposed mechanism, as shown in Figure 2, entails a periodic review of the portfolio of DoD-wide innovation projects by the Deputy's Management Action Group (DMAG) (or a functionally similar group chaired by the Deputy Secretary), supported by the ASD(R&E)-led Research and Engineering Executive Committee (R&E EXCOM). This review process should provide resource support to transition successful projects and should terminate projects that do not meet

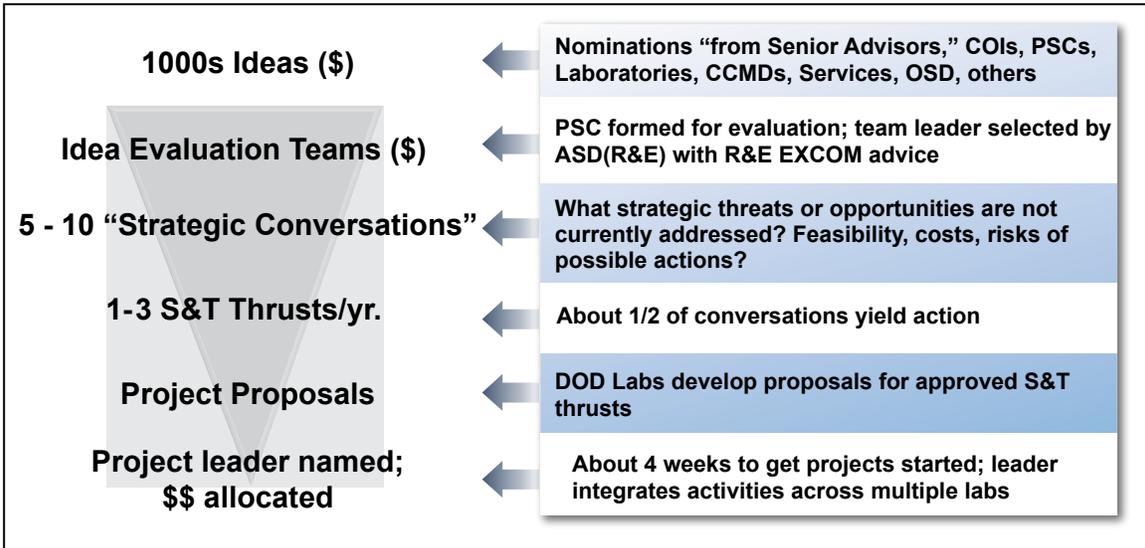


Figure 1. Competition of Ideas for Funding Innovation

milestones after a maximum of three years of exploration. The USD(AT&L) should oversee the progress of programs that successfully transition into the acquisition system.

The involvement of top management leadership is especially timely today, given the need to preserve talent and facilities through the coming years of budget stringency.

Fourth, the ASD(R&E) should play a proactive role in the stewardship of the DoD S&T laboratory enterprise.

Fifth, DoD directives should be revised to codify the needed processes, roles, responsibilities, and

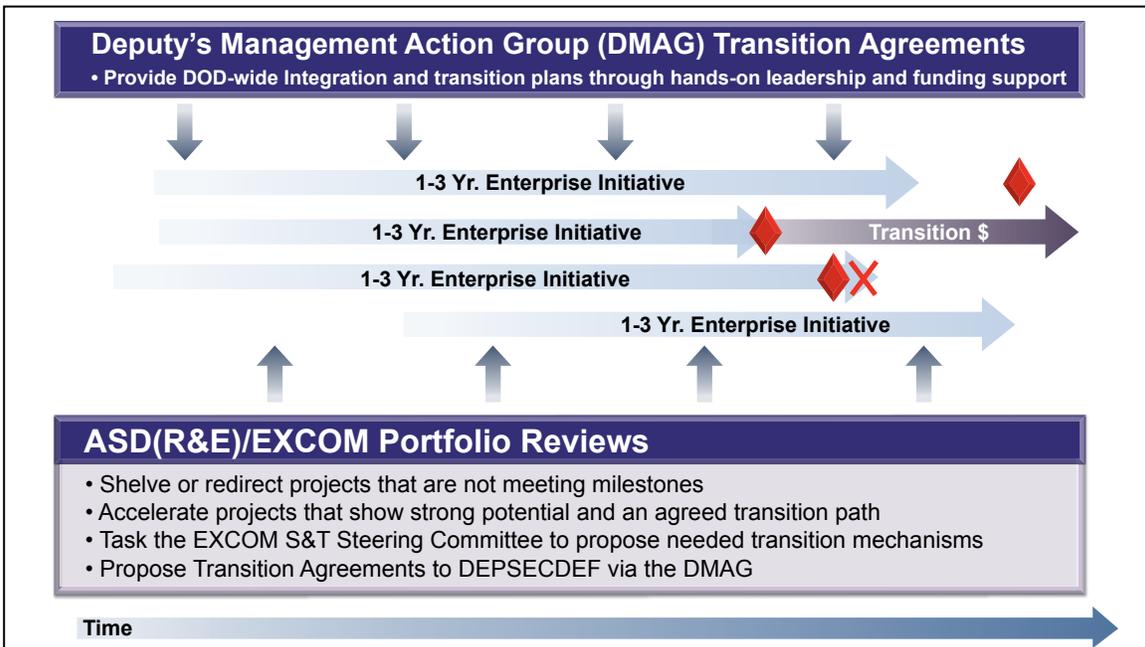


Figure 2. Periodic Review of DoD Innovation Projects

relationships. The virtual central lab should be led by the ASD(R&E), with the active involvement and support of the MILDEPs and the laboratories themselves. To facilitate the needed partnerships, it will be necessary to clarify and document roles, responsibilities, and relationships, including the financial support and administrative structure needed to support the virtual central lab initiative.

This assessment led to a pilot effort under the ASD(R&E) in the area of Autonomy, which is one of the S&T priorities established following the 2010 QDR. A competition in December 2012 was led by the Autonomy Priority Steering Council chairman at the Air Force Research Laboratory. The competition sparked significant interest across the laboratory enterprise, and the proposals included many cross-service laboratory research teams. The review panel was encouraged by the quality and creativity of the top proposals. Thus, of some 50 white

papers submitted, 19 were selected for detailed proposals, which was a significantly higher number than originally anticipated. Approximately \$15 million was expected to be awarded to the winning proposals in the first year of the program (likely the top six projects), with similar funding expected to be provided in the following two fiscal years.

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