

Chapter II

THE PLANNING PROCESS

As discussed in Chapter I, the basic research planning process is an integral part of the DoD science and technology (S&T) planning process. The Office of Basic Sciences in OSD and the individual service basic research offices have the responsibility to jointly develop the DoD *Basic Research Plan* (BRP).

The biennial basic research cycle begins with project-level reviews at the individual research agencies—the Air Force Office of Scientific Research (AFOSR), the Army Research Office (ARO), the Office of Naval Research (ONR), and the Defense Advanced Research Projects Agency (DARPA). These sessions are followed by a biennial program-level review, called the Defense Basic Research Review, by a panel of non-DoD experts from universities, industry, and nonprofit research institutions. Budget projections for the next year are prepared and submitted as part of this process. The BRP is based in part on the results of the Defense Basic Research Review.

A. ROLE OF SERVICES AND AGENCIES IN BASIC RESEARCH PROGRAM

The DoD services and agencies develop their own specific basic research plans and goals. As many of their technology goals overlap, plans for basic research are coordinated through the Basic Sciences Office as part of the Defense S&T Reliance Process. The majority of the scientific work constituting the DoD Basic Research Program involves the 12 technical disciplines, which are coordinated by Scientific Planning Groups (SPGs) consisting of disciplinary program managers from each of the services and DARPA. The SPGs and the Strategic Research Area (SRA) Coordinating Committees provide coordinated tri-service oversight for research in their respective areas. The SPGs concentrate on their specific disciplinary areas, whereas the SRA Coordinating Committees concentrate on interdisciplinary approaches in their focus areas.

Each service and agency is responsible for developing, reviewing, and assessing its individual research plans, which are coordinated by the SPGs. As part of the Defense Basic Research Review process, the Office of Basic Sciences reviews and assesses the quality, technical content, relevance, and focus of the overall service and DoD-wide programs.

B. BASIC RESEARCH AND THE RELIANCE PROCESS

The DoD Basic Research Program is executed within the framework of the DoD S&T Reliance process and is overseen by the Office of Basic Sciences. The biennial Defense Basic Research Review process is used to monitor the quality, coordination, DoD relevance, and realistic funding of the research projects. The Defense Basic Research Review Panel, consisting of technical experts from academia, industry, and non-for-profit research organizations, conducts the biennial review of the defense basic research programs. The Defense Basic Research Advisory Group (DBRAG) provides oversight of the DoD Basic Research Program. Chaired by the Director of the Office of Basic Sciences, the DBRAG includes the Army Director of Research and Laboratory Management and the directors of the Army, Navy, Air Force, and DARPA basic research organizations. The DBRAG meets on a regular basis (typically monthly) to share information and coordinate among the participants.

The role of these and other groups in evaluating the Basic Research Program as a whole is discussed in Section D of this chapter.

C. A FLEXIBLE AND BALANCED INVESTMENT PORTFOLIO

The military services and defense agencies coordinate their individual research investment plans through the Defense S&T Reliance process as described in the previous section. The Defense S&T Reliance process establishes and implements joint planning, joint research partnerships, or lead-service assignments among the military services for the technical disciplines of the BRP. Each research area is examined closely by its participants to establish areas of common interest and to provide opportunities for cooperative leverage. Such joint planning and coordination of programs provides a broader research effort and more efficient support of a more balanced investment portfolio than could be provided by a single-service effort. For example:

- The Army emphasizes information technologies (mathematics, computer sciences, electronics) for digitizing the battlefield, materials science for armor and soldier protection, optical sciences for target recognition, chemistry and biological sciences for chemical and biological agent defense, and geosciences for terrain-related knowledge relevant to battlefield mobility prediction.
- The Navy has a full-spectrum program that places special emphasis on a wide range of ocean science activities, including predicting weather and currents, mapping the ocean floor, using acoustics to detect objects in the ocean, and conducting biotechnological research such as understanding and mimicking communications between mammals.
- Air Force expertise is concentrated in the aerospace sciences, materials, physics, electronics, chemistry, life sciences, and mathematics. Applications include air vehicles, space systems, and command, control, communications, computers, and intelligence (C⁴I).

Besides directly supporting their military departments, the DoD laboratories serve as agents for DARPA, the Missile Defense Agency, and other defense agencies. These programs interact and are coordinated by the SPGs, discipline by discipline, and through the OSD-sponsored multidisciplinary programs. The OSD Basic Sciences Office, working with the DBRAG, exercises oversight over the research program as a whole.

Even though DoD provides only about 6.7 percent of all federal basic research funding (Chapter IV, Figure IV-1), DoD is a significant source of federal funding of university research in several disciplines. DoD is a major funding source in electrical and mechanical engineering (providing 71.8 percent and 74.5 percent, respectively, of the R&D support in this area), computer sciences (11.4 percent), and mathematics (11.4 percent) (details in Chapter IV, Table IV-1). DoD is a major source of funding in materials, optics, and oceanography. In some specific areas, DoD is the only source of basic research funding (e.g., in the support of vacuum electronics needed for radiation-hardened electronics used in radar and space systems).

D. QUALITY AND RELEVANCE OF BASIC RESEARCH PROGRAM

1. Scientific Planning Groups

The primary responsibility for ensuring the quality and relevance of the basic research in the basic research areas rests with the Scientific Planning Groups. The SPGs involve all three services and DARPA. A list of the current SPGs and their membership is provided in Appendix A. The SPGs meet regularly to coordinate related activities in their disciplinary areas. The coordination of the DoD Basic Research Program is successful because of the quality of the service program managers who serve as the SPG leadership.

2. Strategic Research Area Coordinating Groups

The primary responsibility for ensuring that the Strategic Research Areas are coordinated and are emphasized by the services and DARPA rests with the SRA Coordinating Groups. As is the case for the SPGs, the SRA Coordinating Groups involve all three services and DARPA and meet regularly to coordinate the activities in their specific strategic areas. A list of the SRA Coordinating Group membership is included in Appendix A.

3. Basic Research Panel

The 2005 Basic Research Panel is responsible for oversight of the preparation of the 2005 *Basic Research Plan*. A list of the Basic Research Panel membership is included in Appendix A. Responsibility for preparation of the *Basic Research Plan* rotates between the services every 2 years. For the 2005 *Basic Research Plan*, the Army has the overall responsibility. The 2005 Basic Research Panel is chaired by Dr. Jim C.I. Chang, Director of the U.S. Army Research Office. Dr. Chang appointed a 2005 Basic Research Panel preparation team to handle the administrative and editing functions associated with the production of the 2005 *Basic Research Plan*. A list of the preparation team members (chaired by Dr. Kenneth E. Harwell) is included in Appendix A.

4. Defense Basic Research Advisory Group

The Defense Basic Research Advisory Group coordinates at the next higher level among the service and DARPA basic research offices. The DBRAG serves as the primary organization to establish a coordinated research program that supports the DoD science and technology mission. The DBRAG also assists in the clarification of issues and policy. The DBRAG supports the overall preparation of the BRP submitted to the Deputy Under Secretary of Defense for Laboratories and Basic Sciences (DUSD(LABS)). The following are members of the DBRAG: Director of the Office of Basic Sciences; Director, Army Research and Laboratory Management; Director, Army Research Office; Chief Scientist, Office of Naval Research; Director, Air Force Office of Scientific Research; and Director, Defense Sciences Office, Defense Advanced Research Projects Agency.

5. Defense Basic Research Review Panel

The Defense Basic Research Review Panel, consisting of technical experts from academia, industry, and not-for-profit organizations, evaluates the DoD basic research programs for vision, technical content, depth, relevance, and quality. The results of the reviews are provided to the DBRAG. A list of the Defense Basic Research Review Panel membership is included in Appendix A.

6. Non-DoD Government Scientific Planning Group Review Panel

For the Defense Basic Research Review conducted in May 2004, a review panel composed of members from other federal research agencies was assembled to review the specific SPG areas. A list of the non-DoD government SPG Review Panel members involved in the 2004 Defense Basic Research Review is included in Appendix A. This panel provided an evaluation from the perspective of the basic research being conducted by their organizations. This provided a checklist to ensure that the DoD research funds were being invested wisely and did not significantly duplicate or overlap other agency programs.

7. Office of Management and Budget Program Performance Assessment

Program performance assessments developed using the Program Assessment Rating Tool (PART) are integral components of the President's budget process. Each year, the administration undertakes a comprehensive review of 20 percent of the programs of the Executive Branch. The President's Annual Budget submission process includes these ratings as part of the data submitted to the Congress.

The Defense Basic Research Program was reviewed by the President's Office of Management and Budget in 2003 and 2004. The DoD basic research programs were reviewed as a whole, including the basic research programs of the Army, Navy, Air Force, DARPA, and OSD. Four areas were assessed: *purpose*, *planning*, *management*, and *results/accountability*. The Basic Research Program merited a rating of "effective"—OMB's highest rating, earned by only 11 percent of the 400 programs rated for 2004.

The OMB assessment indicated that the Basic Research Program has clear purposes of providing options for new weapon systems, helping prevent technological surprise by adversaries, and developing new scientists who will contribute to the DoD mission in the future. DoD can document—through its contracts and grants management regulations, public announcements of award competitions, and results from independent review panels—the methodical management of its program. Additional findings included the following:

- The grant/contract solicitation, review, and award processes are competitive.
- The program is reviewed regularly by technically capable outside reviewers, who recommend improvements they would like to be implemented. They indicate that the work is of overall high quality.
- The program has competent planning and management.
- Earmarking of projects in the program has increased in the past decade and contributes less than the typical research project to meeting the agency's mission.

Key performance measures used in the OMB review include the following:

- *Near-term measure*—certification in biennial reviews by technically competent independent reviewers that the supported work, as a portfolio, is of high quality, serves to advance the national security, and is efficiently managed and carried out.
- *Long-term measure*—a portion of funded research that is chosen on the basis of merit review. OMB recommended that DoD reduce non-merit-reviewed and -determined projects by one half in 2 years (from 6 percent to 3 percent).

The administration responded that DoD will:

- Continue to emphasize the use of independent review panels in assessing the performance of the Basic Research Program.
- Work with the research community and Congress to explain the need to limit claims on research grant funds to proposals that independently can meet the standards of a strict merit-review process.

8. Deputy Under Secretary of Defense for Laboratories and Basic Sciences

The Office of the Deputy Under Secretary of Defense for Laboratories and Basic Sciences uses the basic research review process to ensure the quality and relevance of the research conducted by the DoD components, and to keep the focus on the DoD mission. The Director for Basic Sciences exercises oversight over the entire DoD Basic Research Program and reports to the DUSD(LABS), who provides feedback and guidance to the Director for Basic Sciences in the context of the larger S&T program and other DoD strategic interests.

