

VINCENT L. PISACANE

## AN OVERVIEW

Many believe that the Allied victory in World War II was in a large part due to superior technology exemplified by the development and effective use of radar, atomic weapons, and the proximity fuze, the latter developed at the Applied Physics Laboratory. During Desert Storm, we saw on Cable News Network the effectiveness of air superiority; the pinpoint delivery of weapons on targets to minimize collateral damage; the institution of real-time modifications to the Patriot system to afford protection against the first use of ballistic missiles; and the ability to command, control, and coordinate our forces to gain locally superior numbers to achieve our objectives with minimal casualties. The ability to defend our country and to help maintain peace in the world through our economic strength will require the United States to continue to be at the forefront of the development of advanced systems. How to achieve this objective with declining defense budgets remains a challenging but largely unanswered question at this time. One response by the Department of Defense (DoD) is the expectation of increased investment by its suppliers and the increased utilization of commercial and dual-use technology where possible. For the Laboratory to continue to contribute to the country's military defense and be able to address other technologically significant and important national problems will depend largely on the continued enhanced technical competence of the staff and the development of new products and services useful to our sponsors.

One means of making investments in research and technology development is APL's Independent Research and Development (IR&D) Program. Funding for this program is provided by an overhead expense on funded work that can be used to develop products and services of potential use to the government. To qualify for IR&D funding, a project must be either research, applied research, development, or systems or other concept formulation studies. Specifically banned are training, vendor product surveys, consulting, literature searches, facility development, market analyses, unplanned projects, manufacturing and production engineering efforts, and efforts in support of a contract or grant. Because of declining defense budgets and the anticipated synergy between industrial and defense research, the rules governing the nature of IR&D projects have recently been relaxed. Specifically, the Laboratory's IR&D Program operates in accordance with the objectives described in Public Law 102-190, Section 802. This law encourages research and development activities of potential interest to the DoD, including activities that accomplish any of the following:

1. Enable superior performance of future U.S. weapon systems and components
2. Reduce acquisition costs and life-cycle costs of military systems
3. Strengthen the defense industrial base and technology base of the United States
4. Enhance the industrial competitiveness of the United States
5. Promote the development of DoD critical technologies
6. Increase the development and promotion of efficient and effective applications of dual-use technologies
7. Provide efficient and effective technologies for achieving environmental benefits such as improved environmental data gathering, environmental cleanup and restoration, pollution reduction in manufacturing, environmental conservation, and environmentally safe management of facilities

To assure that the Laboratory's IR&D investment strategy is consistent with the changing times, the program has been modified in recent years. A top-down approach in selecting some projects now complements the traditional bottom-up approach. The top-down approach allows for the concentration of resources to satisfy specific Laboratory objectives such as selected business opportunities, whereas the bottom-up approach allows the staff to propose projects of interest that are consistent with the broad Laboratory objectives. The longer-range research conducted by the Research Center is now more integrated with Laboratory objectives, and collaboration on research and development with staff from other departments is explicitly encouraged and has increased.

The Director of the Laboratory establishes the general goals and relative levels of effort for the two components of the IR&D Program: (1) the long-term basic research carried out primarily, but not exclusively, by the Research Center, and (2) the applied research and development conducted primarily by the science- and technology-oriented departments. The Laboratory's IR&D Program has four principal objectives:

1. To maintain and strengthen staff expertise in ongoing Laboratory mission areas to assure that the Laboratory continues to be of high value to current sponsors
2. To advance technologies applicable to current Laboratory mission areas to assure that the Laboratory increases its value to current sponsors and attracts new sponsors with similar needs
3. To develop capabilities leading to new programs and to establish competency in selected new program areas

4. To conduct basic research throughout the Laboratory in fields relevant to the Laboratory's current and planned mission areas

In accomplishing the preceding goals, a collateral objective is to disseminate the results of the work through publications, presentations, and technology demonstrations.

The selection of projects involves several stages of competition and begins with an announcement of opportunity circulated throughout the Laboratory that solicits proposals in the categories of departmental initiatives and specified thrust areas. The responsibility for the IR&D Program is vested in the Assistant Director for Research and Exploratory Development, who has as a resource an IR&D Advisory Council of representatives from the technical departments appointed by the Director.

The portion of IR&D funding allocated to the Research Center is used to conduct long-term research in support of current and potential mission areas. The purpose of the departmental initiatives is primarily to support projects consistent with the strategic plans of the following departments: Aeronautics, Fleet Systems, Naval Warfare Analysis, Space, Strategic Systems, and Submarine Technology. The projects are by nature generally directed to positioning these departments to continue to be of value to current and potential sponsors. The thrust areas, described in detail in the following articles, are typically planned to last 3 to 5 years to achieve specific objectives of two types: (1) those dedicated to enhancing the science and technology base of the Laboratory, and (2) those tailored to specific business initiatives. Thrust areas are required to be interdepartmental in order to encourage the establishment of collaborative R&D relationships. For 1995, the thrust areas with the dates established are Biomedical Sciences (continuing), Photonics

and Electro-optics (1992), Environment (1992), Information Science and Technology (1992), Transportation (1993), Advanced Engineering Research and Development (1994), and Modeling and Simulation (1995). An additional category entitled Exceptional Science and Technology was established to consider projects of exceptional merit and importance to the Laboratory that are proposed by the staff but fall outside the scope of the established thrust areas and departmental initiatives.

#### THE AUTHOR



VINCENT L. PISACANE is a member of APL's Principal Staff and has been the Assistant Director for Research and Exploratory Development since 1991. He also holds a joint appointment with The Johns Hopkins University School of Medicine as an Associate Professor of Biomedical Engineering. He is a fellow of the American Institute of Aeronautics and Astronautics, from which he received the Information Systems Award in 1991. He received a B.S. degree in mechanical engineering from Drexel University in 1955,

and M.S. and Ph.D. degrees in applied mechanics from Michigan State University in 1957 and 1962, respectively. Dr. Pisacane joined APL's Space Department in 1967 and was Department Head from 1985 to 1991. He also teaches several courses in applied physics at The Johns Hopkins University G.W.C. Whiting School of Engineering. He has published over 50 articles and reports and was recently a co-editor of a book entitled *Fundamentals of Space Systems*, in which he was also the author of several chapters.