



Introductory Remarks

This issue of the *Technical Digest* marks the 40th anniversary of the APL Strategic Systems Department (SSD). On 1 August 1958, the APL Polaris Division, which subsequently became the Strategic Systems Department, was founded to assist the Navy's Special Projects Office in developing the Fleet Ballistic Missile (FBM) Strategic Weapon System. The Navy asked the Laboratory to provide independent, objective technical advice and to assist in planning the operational test and evaluation programs. Polaris was developed on a breathtaking schedule, beginning the evolution of three generations of increasingly capable FBM weapon systems, each serving, in turn, as the premier leg of the nation's strategic nuclear deterrent. The test and evaluation programs proved to be an important element in the success of Polaris and have continued, with equal success, for Poseidon, Trident I, and Trident II.

Throughout this 40-year association with the FBM Program, SSD has supported what is now called the Navy Strategic Systems Programs with a comprehensive test and evaluation effort that provides them and the National Command Authority with high-confidence, credible estimates of the readiness, reliability, and accuracy of each of these weapon systems. These continuing evaluations provide current operational planning factors and allow detection of deficiencies or trends that warrant material or procedural improvements. Our contributions have been recognized as a significant factor in maintaining the high level of readiness and exceptional reliability of the strategic fleet.

The initial FBM task expanded into evaluations of strategic submarine sonar systems as well as the range safety and instrumentation systems needed to conduct the test programs. The integrated test and evaluation approach that we developed for the Navy proved so useful that the Army asked us to apply it to their Pershing weapon system. For 25 years SSD conducted a thorough systems evaluation of the Pershing mobile theater-strategic weapon system deployed in Europe.

Due in no small part to the existence and success of the FBM Program, as well as the NATO decision to confront massive Soviet buildups in Europe with advanced U.S. theater-strategic weapons, the Cold War is now history. Our staff can be proud that their collective efforts in support of the FBM and Pershing programs have contributed to this result.

But we do not yet live in a perfect world. New adversaries are emerging, and the nature of the threat they pose is not completely understood. Our national leadership recognizes the importance of maintaining a robust strategic nuclear deterrent as a key component of our defense policy. The Laboratory and SSD are committed to supporting the ongoing needs of these critical programs.

The world continues to evolve in the post-Cold War era and so, too, does SSD. Our efforts now encompass a variety of programs in support of the Navy as well as other military and

civilian sponsors. The skills and capabilities that we developed and honed over the decades to further the strategic programs are being applied to challenging problems in new arenas. Our evaluation expertise is being applied to tactical weapons and to the nation's ballistic missile defensive systems. The fundamental engineering and scientific skills that were central to the success of the evaluation programs have been the basis for the engineering development of prototype systems that are leading to new opportunities. These new systems include the development and installation of nonacoustic sensor suites for the Navy, physiological sensing and monitoring systems for the government and medical communities, unmanned aerial vehicle control systems, and novel submarine communications

antennas. The skills and experience we developed collecting, storing, and analyzing large quantities of engineering data in support of the FBM Program are now being applied to programs we are undertaking for the Department of Transportation that are aimed at making the operation of interstate commercial vehicles more efficient and safer.

The articles in this issue provide a sampling of the breadth and depth of our current activities and a look back at what we have achieved over the past 40 years. We are proud of those achievements—40 years of service to the nation and society. Today, our efforts are designed to ensure that two-score years hence, another generation will be able to look back and be equally proud of what has been accomplished in that span.

Donald L. Eddins



Department Head

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THE AUTHORS



DONALD L. EDDINS received a B.S.E.E. and a Master's in engineering administration/operations research from The George Washington University. He joined APL in 1963 and worked initially on the test and evaluation of the Navy's Polaris and Poseidon weapon systems. In 1971, Mr. Eddins was assigned to represent APL on the staff of COMSUBLANT, Norfolk, where he conducted studies and consulted on SSBN operations, weapons systems tests and evaluations, and analytical approaches to staffing/scheduling. Upon his return to APL in 1973, he was appointed Manager of the SSBN Patrol Analysis Program. In 1976 he served on the team developing the SSBN Sonar Evaluation Program, and in 1981 became the Program Manager. Mr. Eddins was appointed Supervisor of the Systems Development and Evaluation Branch in 1985 while retaining his assignment as Manager of the SSBN Sonar Evaluation Program. In 1988, he was named Head of SSD. His e-mail address is donald.eddins@jhuapl.edu.



PHILLIP S. SUGG received a B.E.E. degree in electrical engineering from Auburn University (1957) and completed graduate studies at Villanova University (1959–1961). He joined APL in 1964 as part of the Polaris missile evaluation effort. Mr. Sugg participated in flash X-ray experiments in underground nuclear tests, including system design and device installation at the Nevada Test Site. He was closely involved with the APL-developed SATRACK Missile Tracking System. He was appointed to the Principal Professional Staff in 1972. For the past 12 years, Mr. Sugg has been an Assistant/Associate Department Head of SSD. His e-mail address is samuel.sugg@jhuapl.edu.



DIRECTOR, STRATEGIC SYSTEMS PROGRAMS

1 August 1998

Dr. Gary L. Smith, Director
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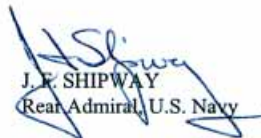
Dear Dr. Smith,

On 1 August 1998, the Laboratory celebrates the fortieth anniversary of the POLARIS Division created to support the Fleet Ballistic Missile program led by my office. During this period, the Navy and its family of contractors have produced and sustained three generations of increasingly capable weapon systems (POLARIS, POSEIDON, and TRIDENT) which have provided the premier element of the nation's strategic deterrent force. I would like to take this opportunity to thank your fine organization for its important contributions to these programs.

The technical advice and inventions provided by the Laboratory at the start of the POLARIS program were critical to establishing the viability of the sea-based ballistic missile concept. The invention of satellite navigation allowed the submarine inertial navigator to be reset anywhere in the world, thereby enabling the weapon system to covertly maintain its accuracy during extended deterrent patrols. The rotatable nozzle development provided breakthrough technology that improved the reliability and range of both POLARIS and Minuteman missiles by enabling the use of more powerful solid propellants. The technical evaluations of the early POLARIS developmental missile flight tests and associated weapon subsystems provided crucial insight that isolated significant problems and contributed to a successfully integrated weapon system.

Subsequently, the Laboratory has provided invaluable assistance in the planning, conduct, and evaluation of a comprehensive test program for the FBM fleet. The success of our programs is due, in no small part, to the sustained quality of the testing and analysis provided by the Laboratory over these forty years. I extend my sincere appreciation for the dedication and contributions of your staff. The Laboratory has been, and continues to be, a crucial part of the Navy's strategic deterrent structure.

Sincerely,


J. F. SHIPWAY
Rear Admiral, U.S. Navy