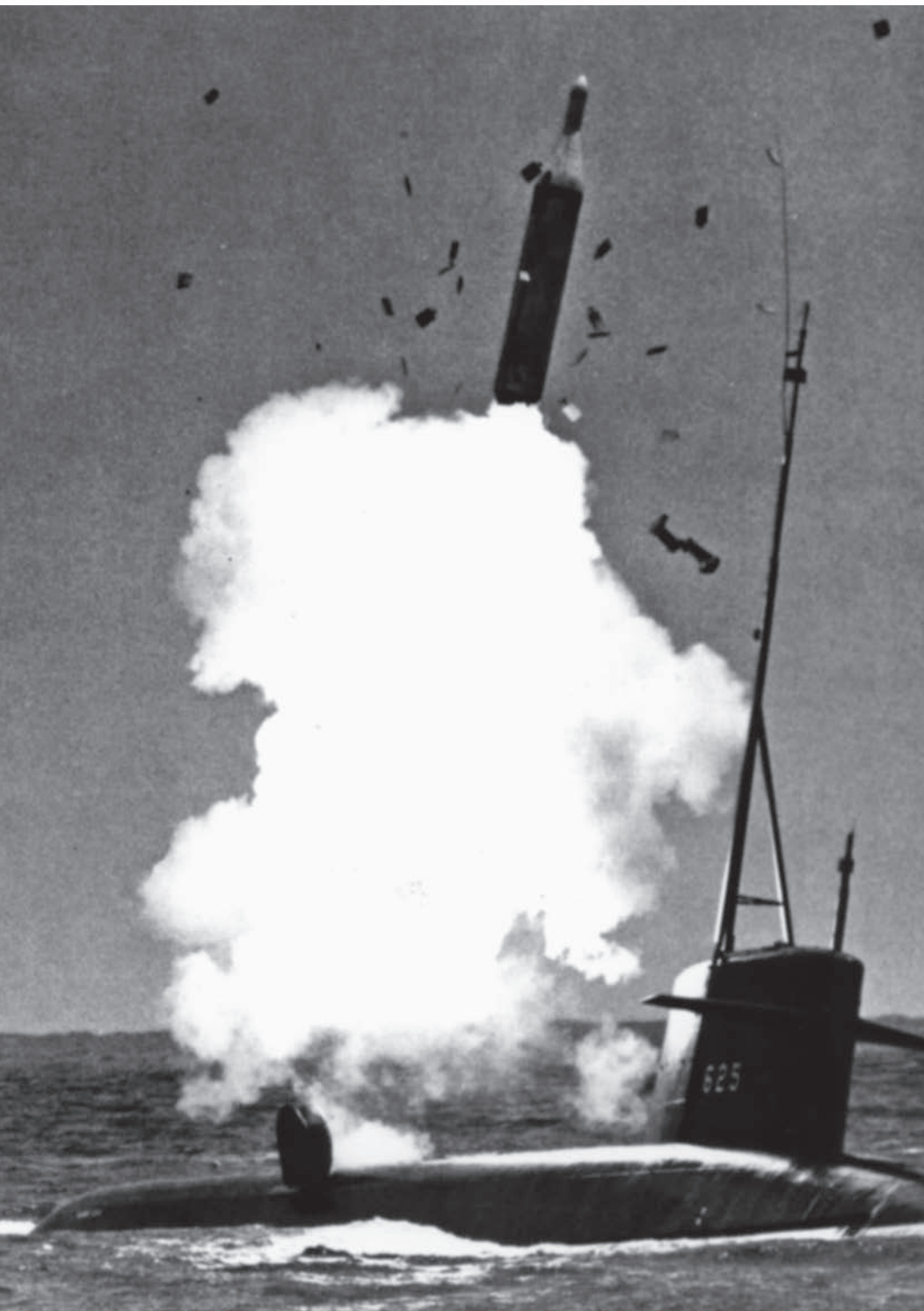


A Strategic Breakthrough



In the summer of 1956, a U.S. Navy-sponsored study on antisubmarine warfare was held at Nobska Point in Woods Hole, Massachusetts. Edward Teller attended the Project Nobska study. His bold input would profoundly affect the course of the Navy's Fleet Ballistic Missile Program and the future of the Laboratory. At the time, the approved program plans called for the deployment in 1965 of submarines that would carry horizontally four 80-ton Jupiter S ballistic missiles, which were large enough to carry existing thermonuclear warheads.

During Project Nobska, Frank E. Bothwell from the Naval Ordnance Test Station raised the possibility of designing ballistic missiles 5 to 10 times lighter than the Jupiter S missiles, with a range of 1,000 to 1,500 miles; however, they would be able to carry only a relatively low-yield nuclear weapon. Teller discussed the feasibility of a 1-megaton warhead compact enough to fit onto a torpedo—a radical concept. When asked whether his ideas could be applied to the Navy's ballistic missile program, Teller replied with a question, "Why use a 1958 warhead in a 1965 weapon system?" He opened the door to development of Polaris: a highly efficient deterrent system in which 16 compact missiles would be placed vertically aboard a submarine for launch on demand.

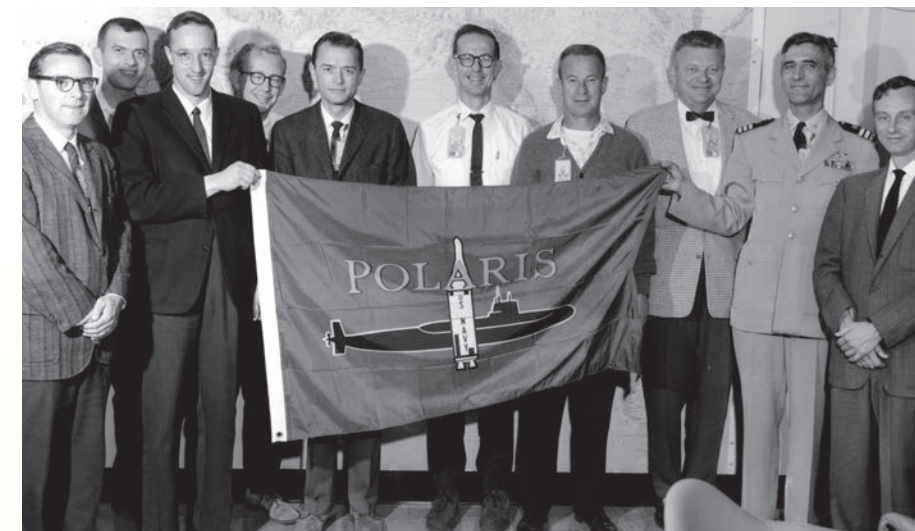
So began a crash, three-year effort. In early 1957, the Navy issued a requirement for an underwater-launched

The Laboratory's design for the W47 Polaris warhead made it practical for U.S. nuclear deterrent forces to be deployed in highly survivable submarines.

solid-fuel missile system by 1965. By the end of the year, following successful tests of Livermore's warhead design at the Nevada Test Site, the Secretary of Defense authorized a step-up to deploy the system by 1960, which was accomplished.

The summer of 1958 brought genuine breakthroughs based on ingenious proposals by Carl Haussmann, Kenneth Bandtel, Jack Rosengren, Peter Moulthrop, and David Hall in A Division and by B Division's John Foster (Laboratory Director, 1961–1965), Chuck Godfrey, and Wally Birnbaum. The significance of the innovations was confirmed during tests in the Pacific only a few months before the 1958–1961 nuclear testing moratorium began. Work continued at the Livermore and Sandia laboratories, and through the efforts of weapons designers and engineers, computer specialists, and other experts, the W47 Polaris warhead was created.

The program's remarkable achievements were demonstrated in spectacular fashion on May 6, 1962.



The Polaris flag was presented by the Navy to Livermore scientists and engineers for the Laboratory's outstanding work in the development of the Polaris warhead.

The USS *Ethan Allen*, the sixth-launched Polaris submarine, conducted a complete operational test of the Polaris A-1 missile system, culminating with the successful detonation of the Livermore-designed megaton-class warhead (see Year 1962).

Conceived as a highly survivable system able to counterattack in the event of a Soviet first strike, Polaris

has a unique place in American nuclear weapons history.

The Laboratory's innovative design and development of the W47 as part of a crash program established Livermore's reputation as a major nuclear weapons design facility. The work spurred additional innovations and provided a model for future strategic weapon development.

Teller Recalling Project Nobska

"The Navy asked if we could make a nuclear explosive of such and such dimensions and such and such a yield. What they wanted was a small, light, nuclear warhead in the 1-megaton range. Everyone at the meeting, including representatives from Los Alamos, said it could not be done—at least in the near future. But I stood up and said, 'We at Livermore can deliver it in five years and it will yield 1 megaton.' On the one hand, the Navy went away happy, and the program got approved. On the other hand, when I came back to Livermore and told them of the work that was in store for them, people's hair stood on end. They said, 'What have you done? We can't get a megaton out of such a small device, not in five years!'"

