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Ballistic Missile Defense

Ballistic missile defense (BMD) research and development continued this year, a hedge against the strategic uncertainties associated with the ballistic missile threat to the United States. Perimeter Acquisition Radar (PAR) functions were transferred from the Army to the Air Force. The ballistic missile defense program was authorized 65 military and 431 civilian spaces for fiscal year 1978, and funds of $295,724,000: $107,297,000 for the Advanced Technology Program, $106,188,000 for the Systems Technology Program, and $82,239,000 for the Kwajalein Missile Range.

The Advanced Technology Program continued to place increasing emphasis on transfer of mature technologies to the systems technology program and pursuing more advanced and innovative technologies. Major accomplishments during fiscal year 1978 were in data processing, discrimination, missiles, optics, radar, and technology analysis. Comparative analysis verified a millimeter wave radar homing guidance construct as an approach to endoatmospheric non-nuclear kill ballistic' missile defense systems. Design was completed for a liquid bipropellant propulsion subsystem for testing as an exoatmospheric direct impact interceptor vehicle. Subscale hot gas tests of a high-force, movable booster control nozzle were conducted. An optical signal processor with an increased capability over those of conventional signal processors was tested. The design of a modular missile-borne computer that will perform on-board data processing for an advanced ballistic missile defense interceptor was completed. Studies of particle beam technology for potential BMD application have been conducted.

The Systems Technology Program in fiscal year 1978 centered on reducing system cost, improving effectiveness, and reducing lead time in the face of a growing and increasingly sophisticated threat. Analysis progressed of the layered defense system and the Low-Altitude Defense (LoAD) System. A contract was let for the homing overlay experiment interceptor; and the systems technology testing program went forward at the Kwajalein Missile Range.

Layered defense is a defense system with two layers operating cooperatively and selectively. It is a cost-effective source of exoatmospheric and endoatmospheric protection against Soviet reentry vehicles and sophisticated multiple target reentry vehicles (MIRVs). The system began early in fiscal year 1978, following an analysis in fiscal year 1977. The analysis showed that layered defense would be more robust and cost-effective than any of the other options available to counter the advancing Soviet threat to U.S. inter-continental ballistic missile (ICBM) forces.

The Homing Overlay Experiment (HOE) has two phases. The goal is to verify the technology associated with the overlay portion of the layered defense system. The first phase was a competitively awarded, multiple contractor study. In September 1977, the Ballistic Missile Defense Systems Command awarded contracts to the Boeing Company, Vought Corporation, and Lockheed Missiles and Space Company. Lockheed won the competition and was awarded a contract on 3 August 1978 to conduct the homing and kill phase of the experiment. Lockheed has the option to provide hardware and engineering services for the second phase of the experiment, demonstrating the technology necessary to detect, discriminate, and designate reentry vehicles at a range of several hundred miles in the presence of other objects.

The Low-Altitude Defense (LoAD) System analysis effort was initiated in fiscal year 1977. This year's work was devoted to examining in more depth the most promising concepts that had been analyzed. The effort pinpointed the technological problems of operating the system, especially in the severe nuclear environment associated with deploying an MX ICBM. It also evaluated available and potential solutions. The results of the analysis are favorable enough to ensure it will continue in fiscal year 1979.

This year systems technology testing at the Kwajalein Missile Range focused upon the key hardware and software associated with the terminal ballistic missile defense system. Late in fiscal year 1977, the radar and data processors were tested separately.

Integration testing using limited capability software was begun, continuing into this year. It included detecting, tracking, and discriminating reentry vehicles from target of opportunity "threat clouds" launched from Vandenberg Air Force base, California. The software was steadily upgraded. The test is nearly over, and results indicate that the radar, data processing hardware, and software will meet or exceed design goals.

The U.S. Army Ballistic Missile Defense System Command operates the Kwajalein Missile Range. The range successfully supported Air Force tests of ICBMs launched from Vandenberg Air Force base. Numerous agencies benefited from the results.

The Army's System Technology and Test Facility phased array radar continued receiving extensive base and technical support. The Ballistic Missile Defense Advanced Technology Center's optical station was supported to a lesser degree.

The Army made preparations for testing the designating optical tracker. Costs were considerably reduced by a high-speed data link between components of the data processing center. Test plans were completed, and steps were taken to meet U.S. Air Force requirements for collecting data on land impacts of reentry vehicles. Alternatives were studied for meeting these requirements for impacts approximately 200 kilometers up range. Space object identification efforts continued, and satellite track files were

improved. Tests over a three-month period confirmed an expanded satellite detection and tracking capability.

The ARPA (Advanced Research Projects Agency) Long-Range Tracking and Instrumentation Radar (ALTAIR) demonstrated the ability to support Army and Air Force requirements for detecting and tracking foreign launches and cataloging other space objects: This successful effort determined the ALTAIR's adequacy as a contributing sensor to the Air Force's Pacific Radar Barrier and National Space Surveillance Control Center surveillance networks.

The Kwajalein multistatic measurement system was designed and initiated. It will perform target resolution discrimination experiments using the ALTAIR long-range tracking and instrumentation radar with bistatic receivers on remote sites. It will also provide an all-weather, highly accurate trajectory for intercontinental ballistic missile and other tests at the Kwajalein Missile Range.