

Despite the budget setbacks, there is steady if unspectacular progress in many programs.

Electronics in a Pinch

WITH Air Force budgets being hit by one setback after another, the health of big electronics projects is coming under scrutiny. Among the questions being asked:

What impact is the budget pinch having on high-profile command control communication and warning programs—strategic and tactical—begun in the Reagan era? How are the fiscal troubles affecting USAF's electronic-combat initiatives?

The answer is that times are difficult, with projects being slowed or scaled back. Even so, there is steady if unspectacular progress in many areas, as seen in a survey of selected programs.

Strategic Warning and C³

Gains—and setbacks—can be discerned in projects designed to provide warning and assessment of missile, bomber, and cruise missile attacks on the United States.

Washington is improving its day-to-day warning with the Over-the-Horizon Backscatter (OTH-B) radar system. Air Force Systems Command's Electronic Systems Division (ESD), working with GE, is developing and deploying the far-

seeing radars in four widely dispersed sites.

The OTH-B East Coast system is now becoming operational, the West Coast system is budgeted and under construction, and the Alaskan system is budgeted but not yet on contract. Funding for the Central US system will be requested for 1991. However, fiscal pressures have caused USAF to defer two sixty-degree surveillance sectors from a planned four-sector Central system, cutting costs by \$275 million.

USAF personnel have staffed the East Coast operations center for two years. OTH-B's power to detect bombers approaching North American territory is unparalleled. Tests run in 1988 showed that it has some capability to spot cruise missiles, though not enough for it to be regarded as a fully operational cruise missile detection system.

Elsewhere, the US-Canada North Warning System (NWS) is headed toward full operation in 1993. Comprising fifty-two new radar stations facing into the Arctic, NWS will replace the aging Distant Early Warning (DEW) Line. The NWS's fifteen GE long-range radars were recently activated. Another thirty-nine short-range radars are to be on line in three to four years. The system will provide continuous, unbroken radar coverage from Alaska across Canada and down the east coast of Labrador.

USAF is proceeding steadily on upgrades of the Ballistic Missile Early Warning System (BMEWS), radar sites giving tactical warning and assessment of an ICBM attack. Contractor Raytheon is upgrading the United Kingdom site at RAF Fylingdales, England, with phased-array radar, aiming at completion in the early 1990s. Modernization of the BMEWS radar in Alaska is in prospect. The upgraded BMEWS site in Greenland went into operation in 1987.

In communications, building EHF Milstar satellite terminals is a priority. Under ESD, Raytheon, teamed with Bell Aerospace and Rockwell, is at work on development of nuclear-hardened terminals for Lockheed's Milstar, which will provide secure, jam-resistant voice and data links between various attack sensors and National Command Authorities and between

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NCA and US forces. In 1988, the program passed important testing milestones. ESD thinks most of the technical problems are solved, and the program is making a transition from development to initial production.

Advances also can be seen in development of the Ground Wave Emergency Network (GWEN), a multistation net of LF radio towers and receivers resistant to the effects of electromagnetic nuclear pulse. ESD, working with RCA, has nearly completed installing an initial, fifty-six-node "thin-line" segment for flashing emergency messages to Strategic Air Command units. Budget pressure caused a restructuring of the GWEN program from the proposed 127 relay stations down to ninety-six. Target date for completion is 1992. ESD has completed development tests and is well along in operational test and evaluation.

Tactical Warning and C²

In tactical surveillance, USAF is pressing forward with modifications to its thirty-four sky-sweeping E-3 Sentry Airborne Warning and Control System (AWACS) airplanes. ESD has started full-scale develop-

ment on the AWACS Radar System Improvement Program (RSIP), which will incorporate a new signal processor, a new waveform, and a new data processor to increase detection capabilities as well as reliability and maintainability. Boeing and Westinghouse are contractors.

With the modifications, the Westinghouse APY-1 and APY-2 radar sensitivity will be doubled, giving the AWACS the ability to pick up cruise missile signatures and to serve as a hedge against possible Soviet stealth fighters. RSIP's systems will be entering service in the mid-1990s. Plans call for the upgrade—which will cost \$626 million—to be completed by 1998.

Already, ESD is well along in full-scale development of new equipment and software for its AWACS Block 30/35 Upgrades. The four-part program, managed by Boeing, recently passed critical design review. Tactical Air Command E-3s will begin receiving equipment in 1992. On tap is an upgrade of the main IBM CC-2 computer, increasing its memory by a factor of four; installation of Global Positioning System terminals; and development of electronic support measures. The ESM, a cooperative US-NATO development effort, will give US and the eighteen NATO AWACS aircraft a passive detection system to augment their active radar sensors.

In a fourth step, the Block 30/35 program calls for the integration in AWACS of Joint Tactical Information Distribution System (JTIDS) Class II terminals. AWACS planes currently use the older and larger Class I terminals. Class II terminals, being developed by Singer and Rockwell Collins, are expected to give air defense platforms a high-capacity, secure, jam-resistant data-transfer link for a variety of tactical forces. Greater awareness of the air situation will be achieved by providing information gathered by E-3s and ground stations to fighters, allowing a pilot to put together a broader, clearer picture of the battle.

ESD officials note that the Class II program has gone back into testing following a one-year hiatus caused by reliability problems in the initial fighter terminals. Flight tests revealed lower-than-expected mean-time-between-failures rates. Now

that a year-long redesign and test of the Class II is complete, a decision to begin low-rate initial production could come this summer.

A spin-off of JTIDS, the new Multifunctional Information Distribution System (MIDS) program, is getting off the ground at ESD. MIDS is a cooperative NATO effort in which the US currently has the lead. The object is to make use of new microelectronics to build a more compact, JTIDS-like terminal that will fit into fighters smaller than the F-15. These could include the multinational European Fighter Aircraft, the French Rafale, the Canadian CF-18, US Navy F/A-18s, and USAF and allied F-16s. MIDS now is in concept definition, with Singer as contractor.

Elsewhere, tactical-force communications are being improved by deployment of TRI-TAC Joint Tactical Communications, digital equipment that replaces less secure analog items. AN/TRC-170 digital troposcatter radio terminals, now in production, will provide secure transmission of messages over a range of 200 miles. Raytheon and Unisys are contractors. The Litton TRI-TAC Modular Control Element, in production, replaces the TSQ-91.

ESD also is pressing ahead with its Joint Services Imagery Processing System (JSIPS), an Air Force/Marine/Army program to develop a ground station to receive, process, and disseminate imagery to combat commanders. E-Systems, the contractor, is in full-scale development on JSIPS. JSIPS ground stations will substitute digital photo-processing and interpretation for the current film-based techniques. Plans call for JSIPS to take electro-optical and infrared data from manned and unmanned aircraft and then process and distribute it directly to theater commanders and Army operation centers. The Air Force Tactical Air Command plans to acquire a ground station for each reconnaissance squadron. JSIPS stations also will be located at Air Force tactical air control centers.

Electronic Combat

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(SEAD) or electronic warfare (EW). The task, notes a Pentagon report, is one "in which we have faced some of our greatest technical challenges."

In weapons for direct-attack SEAD, the AGM-88C High-speed Antiradiation Missile (HARM) is a success story. HARM is a joint service program in which the Navy has the lead. Operational since 1983, HARM is undergoing an upgrade to keep it current. The US is working to improve coverage, effectiveness, and versatility by means of the HARM Block IV upgrade and Low Cost Seeker programs. Initial testing began on the AGM-88C, designed to cope with new frequency-agile threats. It has a new guidance section. Also in the works is an improved warhead. Texas Instruments is the HARM contractor.

In another direct-attack-weapon program, the AGM-136A Tacit Rainbow, the Air Force has experienced some bumps. The Northrop weapon is an antiradiation cruise missile developed jointly by USAF, the Navy, and the Army. A "smart" weapon, it is designed to loiter outside a target area until an enemy radar emits a signal, which the

weapon rides to the ground. Due to developmental difficulty, low-rate initial production—originally planned for 1989—has been moved to 1990. The system is to remain in testing, with 1989 procurement funds used to buy test missiles. A ground-launched variant, BGM-136, may enter development next year.

The two-phase F-4G Wild Weasel Performance Update Program (PUP) has seen mixed results. In the 1970s, the F-4G was modified to be able to locate and destroy enemy radar and SAMs. With McDonnell Douglas as prime contractor, the update of the F-4G's APR-38 system to the APR-47 configuration in an effort to cope with an advancing Soviet threat is under way. In Phase I, Unisys developed a new on-board computer to provide more memory and processing speed. The computer, now in production, will be retrofitted into all F-4Gs. In the second phase, E-Systems was trying to develop an advanced receiver, but the effort did not pan out. The receiver project was halted in 1988, and Phase II has been restructured.

As a result, TAC has placed new emphasis on replacing the aging F-4G with a Follow-on Wild Weasel aircraft. The project is now in the study phase. Air Force electronic combat officers have been gathering contractor information on new technologies that might be used in such an aircraft. The expectation is that it will be years before a new plane—possibly a modified F-15 or F-16—enters service. (*For more on Wild Weasel upgrades, see "Slam 'Em and Jam 'Em," by Jeffrey Rhodes, on p. 50 of this issue.*)

In the field of disruptive SEAD, the EF-111A Raven Update remains an important effort, but it has suffered setbacks. The Air Force's Raven fleet would jam enemy early-warning, acquisition, and ground-control radars. The need is to improve the Tactical Jamming System's ALQ-99E receiver/processor subsystem, a task that has been assigned to Eaton's AIL division. But in 1988 the Air Force, claiming the project had fallen behind schedule, declared the contract in default. The Air Force is now attempting to restructure the program and will apparently try again.

—R.S.D.