

ARCHIVED REPORT

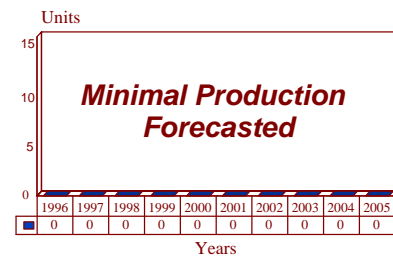
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Airborne Infrared Measurement System (AIRMS) - Archived 8/97

Outlook

- The specific future of AIRMS remains limited.
- Technology developed in this program will serve as a springboard for future developments.

10 Year Unit Production Forecast
1996 - 2005



Orientation

Description. Airborne long-range infrared detection and tracking sensor for limited theater engagement missiles.

Sponsor

Advanced Research Projects Agency (ARPA)
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USA
Tel +1 703-696-2442

Contractors

Hughes Aircraft Co
Aerospace and Defense Sector
7300 Hughes Terrace
P.O. Box 80028
Los Angeles, California (CA) 90080-0028
USA
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Licensee. No known licenses have been granted.

Status. Experimental development; flight trials in progress.

Total Produced. Limited experimental unit(s) to support ground and flight test.

Platform. Boeing 720 (experimental); USAF E-3 AWACS, USN E-2C Hawkeye (Operational - projected).

Application. Airborne Theater Missile Defense.

Price Range. Indeterminate.

Technical Data

Characteristics	Metric	US
Aperture Diameter:	60 cm	23.6 in
Detector:	6000 element focal plane array	

(Note: Only limited technical data are available on this previously classified sensor.)

Design Features. The Airborne Infrared Measurement System (AIRMS) is an adaptation of an advanced IR Sensor previously developed by Hughes for a classified Department of Defense program. The system has been integrated into a Boeing 720 aircraft and is currently undergoing a year of flight trials in which the ability to acquire and track targets at long range is being evaluated. It is reported that targets at altitudes up to 40,000 ft and at ranges of 400 km (216 nm) are included in the test scenario.

Operational Characteristics. The encounter time line associated with either a theater ballistic or cruise missile defensive engagement is characteristically very short. The

time spent during the target acquisition, identification/verification and tracking phase of the end-game encounter thus tends to impose severe, and potentially unrealizable, requirements on the intercept system when high-speed advanced threats are considered. Conversely, the minimization of the time spent in the initial phases of the mission serves to reduce the technical risk of the intercept. This concept has long been recognized but has been hampered by the lack of maturity of the technologies involved. The Air Defense Initiative of which AIRMS is a part acknowledges recent technology advances and serves to prosecute the development of an advanced target acquisition and tracking system to shorten the time spent in this critical mission phase.

Variants/Upgrades

This is a developmental field demonstration using existing unique prototype hardware. There are no known variants or upgrades.

Program Review

Background. Air Defense Initiative (ADI) programs form a critical part of the Advanced Research Project Agency's (ARPA) program to ensure that the US has an effective defense against cruise missiles and manned aircraft. The programs conducted under this project also greatly complement initiatives being conducted by other program offices to counter the proliferation of theater ballistic missile (TBM) threats.

Program EE-41 Air Defense Initiative is a subtier element of Program Element 0603226E Innovative Technologies appearing as a Defense Wide line item in DoD budget documentation. The emphasis of the program is on the accelerated development of advanced adaptive processing technology to better detect, track and engage faint targets in severe natural and man-made interference environments. As one element of this overall effort, the Airborne Infrared Measurement System (AIRMS) program will provide a scientific understanding of the fundamental limits of IR technologies and will develop the analytic tools, models, design methodologies and associated signal processing algorithms and architectures needed to

establish the requirements for a future design. As an element of this activity, the existing AIRMS testbed airborne infrared sensor and aircraft are to be used to gather high-resolution digital imagery data on airborne vehicles, background clutter, clouds and other phenomena that could affect the mission.

Under the FY95 program plan, the AIRMS performed target data collection flights and began evaluation of the operational algorithms to be used for target acquisition and tracking.

Program plans for FY96 have AIRMS continuing the analysis of input from data collection flights, incorporating data in candidate algorithms and performing near-real-time demonstrations with operational algorithms. Additionally, AIRMS will provide data to support other service demonstrations including the US Navy LEAP and US Air Force AWACS EAGLE programs, as well numerous special research activities. The latter are projected to include ship self-defense, countermine detection and nonacoustic ASW technologies.

In FY97 AIRMS will demonstrate ground-based, real-time detection and tracking of airborne targets and continue optimization of the advanced algorithm set.

So it could support the data-gathering aspect of these activities, in August 1993, Hughes Aircraft Electro-Optical and Data Systems received a US\$17 million contract from Defense Advanced Research Project Agency (DARPA) (since renamed ARPA) for the

integration and field operation of the AIRMS optical acquisition and tracking system. According to the contract description, the contract covered the integration and checkout of the sensor and aircraft, support of FAA certification, shakedown flights, airborne characterization of the system and a one-year test program. The contract also included provisions for test planning, operations support, test execution and data analysis.

Funding

Funding for AIRMS is not separately identified but is provided as a subtask under Project EE-41 Air Defense Initiative. Due to the disproportionately small size of the AIRMS with respect to the overall Project EE-41 effort, however, it would be misleading to attempt to draw an assessment of the value of the task from an analysis of the total project.

Recent Contracts

Award		
Contract	(\$ millions)	Date/Description
Hughes	17.0	Aug 1993 - Letter contract for integration, checkout and field operation of AIRMS (MDA972-93-C-0059)

Timetable

Aug	1993	Hughes awarded AIRMS contract
	FY95	One year field trials

Worldwide Distribution

This is a US only program.

Forecast Rationale

In the effort toward developing an effective ballistic missile defense capability, the emphasis has shifted from a Cold War scenario of a massive global attack from the former USSR to the current threat of theater ballistic and/or cruise missiles in a limited regional conflict. Despite the political unpopularity of "Star Wars" after the end of the Cold War, it now appears that a Theater Missile Defense (TMD) need has been acknowledged, driven perhaps by the events in Iraq, Somalia and Bosnia, and/or by doubts of the political stability of some countries or their leaders. Funding support for core elements of a Theater Missile Defense system is being sustained in an austere budget environment although there have been well publicized casualties sustained by some advanced concept

programs. Included in this category is the 1995 cancellation of the Boost Phase Intercept Kinetic Kill Vehicle (KKV) program. The big money continues to be spent on core elements of the program which are focused on end-game encounters using advanced, but conventional, radar tracking and missile interceptor technologies. There is a very high probability that this technology base will form the first-generation Theater Defense System.

The operational advantages of providing an early detection and tracking capability have long been acknowledged but have remained elusive due to the need for advanced technologies. Steady technical progress, however, appears

to have been made: field demonstrations of key technologies are feasible, and indeed in progress. AIRMS is a prime example as is the USAF program which plans to fly a similar system as an element of its Early Airborne Global Launch Evaluation (EAGLE) effort. In the current conservative Congressional environment, the continued technical success of these and similar programs will go a long way toward reestablishing the possibility of a "Star Wars" derivative as the next-generation TMD system.

In an operational implementation, an airborne TMD system must compete against a space-based counterpart of which a reconnaissance system such as Brilliant Pebbles may be a part. As in any system design, there are tradeoffs. Proponents of the space-based system argue that it provides true global coverage whereas the airborne system must be in the region and on station to be effective. They also maintain that an airborne system is more vulnerable to attack. Airborne supporters counter with the arguments that political "hot spots" develop slowly enough to give adequate advanced notice, an airborne system is

less expensive to acquire and operate, and furthermore it can be operationally ready in a briefer time-span. For long as the world threat scenario remains one of local conflicts, we believe there is a future for an airborne TMD system.

Regardless of the outcome, of this program, AIRMS will serve as a one-of-a-kind tool, useful for gathering the technical data and developing the acquisition, identification and precise tracking technology base required for the final design of either approach. The specific future of AIRMS remains limited. Its developers, however, should enjoy a distinct advantage in a future competition for an operational system.

The usefulness of AIRMS in its present configuration lies in its role as technology demonstrator. Design attributes may be applied to a future operational system; however, applications remain speculative at this time. Consequently, the following forecast has been based solely on AIRMS development program expenditures as estimated from the FY95/96 Biennial RDT&E Descriptive Summary provided for Project EE-41.

Ten-Year Outlook

ESTIMATED CALENDAR YEAR FUNDING (\$ in millions)													
Designation	Application	thru 95	High Confidence Level				Good Confidence Level				Speculative		Total 96-05
			96	97	98	99	00	01	02	03	04	05	
AIRMS	THEATER BALLISTIC MISSILE DEFENSE (ARPA)	28.10	4.30	4.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.80