United States General Accounting Office

GAO

Report to the Chairman, Subcommittee on Military Research and Development, Committee on Armed Services, House of Representatives

July 2000

ELECTRONIC WARFARE

Phased Approach to Infrared Upgrades Would Reduce Risk to Helicopters

GAO/NSIAD-00-171

GAO
Accountability * Integrity * Reliability

United States General Accounting Office
Washington, D.C. 20548

National Security and
International Affairs Division

B-285362

July 27, 2000

The Honorable Curt Weldon
Chairman, Subcommittee on
Military Research and Development
Committee on Armed Services
House of Representatives

Dear Mr. Chairman:

To survive against infrared guided (or "heat-seeking") missiles on the modern battlefield, Army helicopters require infrared countermeasure systems. However, the Army's currently fielded infrared countermeasure systems are rapidly becoming inadequate to ensure survival against newer generations of heat-seeking missiles.[1] To address this problem, the Army is acquiring a new set of countermeasure systems, referred to as the Suite of Integrated Infrared Countermeasures, with fielding scheduled to begin in 2003. As you requested, we reviewed the Army's acquisition strategy for this equipment to determine whether the strategy satisfies the infrared countermeasure requirements of the Army's helicopters.

Heat-seeking missiles operate on the principle that an aircraft emits more infrared energy (heat) than the surrounding environment. The missile's heat-seeking sensor detects the heat emitted by the aircraft and guides the missile toward the target by following the heat. The Army currently has two types of infrared countermeasure systems fielded to defend its helicopters from heat-seeking missiles. The first type seeks to decoy the missile away from the aircraft by providing alternative heat sources for the missile to follow. This is accomplished by using a missile warning system, which detects approaching missiles and signals countermeasure dispensers on the aircraft to launch flares that burn at high temperatures. The second type of countermeasure system involves directing an infrared energy beam toward the missile to try to confuse its heat-seeking sensor. An onboard device called an infrared jammer produces the energy and then directs it at the incoming missile.

[1]Details about the performance of specific heat-seeking missiles against specific countermeasure devices are considered classified by the Department of Defense.

The new Suite of Integrated Infrared Countermeasures will include four components: a laser-based infrared jammer, a programmable countermeasure dispenser, advanced flares, and a missile warning system. Each of these is expected to perform better than the Army's currently fielded infrared jammer, dispenser, flares, and missile warning system. The laser will deliver more direct energy than the current jammer to more effectively disrupt a missile's seeker. Likewise, advanced flares that burn at temperatures more closely approximating the heat of an aircraft, and launched by a programmable dispenser, present more effective decoy patterns than flares randomly launched from the current non-programmable dispenser. The new missile warning system is being designed to more quickly and accurately detect, identify, locate, and initiate a countermeasure reaction to approaching missiles than the existing missile warning system.

The current procurement unit cost estimate for the entire Suite of Integrated Infrared Countermeasures is about $1.6 million per helicopter.[2] The Army plans to procure a total of 1,047 systems for a total procurement cost of $1.7 billion.[3]

Results in Brief

The Army's strategy for acquiring improved infrared countermeasure systems for its helicopters could be revised to better satisfy the needs of Army helicopters. The current strategy is to defer production and fielding of the Suite of Integrated Infrared Countermeasures until all four components of the system are successfully developed. However, because of delays in developing one of these components, the laser-based infrared jammer, most Army helicopters will remain vulnerable to currently fielded enemy missiles until the second half of this decade or later. If the strategy is revised to take a phased approach, all helicopters scheduled to receive the Suite of Integrated Infrared Countermeasures could be better protected from current heat-seeking missiles much sooner. The phased approach could be accomplished by installing either (1) the existing programmable dispenser, advanced flares, and existing missile warning system in use by the U.S. Army Special Operations Command, for about $175,000 per helicopter or (2) the new programmable dispenser, advanced flares, and

[2]This unit cost does not include the cost of the advanced flares.

[3]The Army's 232 OH-58 Kiowa Warriors will not receive the laser-based infrared jammer portion of the system.

new missile warning system when those components are ready, for about $300,000 per helicopter. Hence, the Army could provide improved infrared countermeasures for the 1,047 helicopters planned to receive the Suite of Integrated Infrared Countermeasures for about $183 million with the first approach and $314 million with the second approach.

To improve helicopter survivability sooner, we recommend that the Army take a phased approach to acquiring improved infrared countermeasures for Army helicopters as soon as is practical. In commenting on a draft of this report, the Department of Defense agreed in concept to deploy infrared countermeasures at the earliest possible date. However, it stated that our proposed phased approach—using the existing programmable countermeasure dispenser and missile warning system with advanced flares—is not feasible because the Suite of Integrated Infrared Countermeasures is being developed as an integrated system. The Department also stated that a phased approach using the new programmable dispenser and missile warning system with the advanced flares would be possible but unnecessary because the maturity of all four components has converged, so that testing and fielding of the system as planned is very probable. We continue to believe that a phased approach is the fastest, surest way of reducing the vulnerability of Army helicopters to heat-seeking missiles. As our report shows, the Army continues to have problems in developing the new infrared jammer. Also, a phased approach using the existing programmable dispenser and missile warning system with advanced flares has proven feasible on the Army's Special Operations aircraft. In response to the agency's comments, however, we revised our report to recognize that a phased approach using the new programmable dispenser, advanced flares, and new missile warning system is an option because these components are more likely to be ready in the near future than the new infrared jammer.

Acquisition Strategy Could Be Revised to Better Meet Helicopters' Needs

The Army's acquisition strategy for the Suite of Integrated Infrared Countermeasures could be revised to better satisfy the needs of the Army's helicopters. Under the current strategy, most Army helicopters will remain vulnerable to currently fielded enemy missiles until the second half of this decade or later. If the strategy is revised to take a phased approach to upgrades, however, all helicopters scheduled to receive the Suite of Integrated Infrared Countermeasures can be protected many years earlier from such enemy missiles. This could be accomplished for an investment of about $183 million or $314 million, depending on the configuration.

Army's Current Strategy Leaves Most Helicopters Vulnerable for Years

The Army's infrared countermeasure acquisition strategy is to defer production and fielding of improved infrared countermeasures until all four components of the Suite of Integrated Infrared Countermeasures are ready for production. However, technical challenges associated with developing the laser-based infrared jammer have delayed the production schedule more than 3 years, from February 2000 to July 2003. Consequently, under the current schedule, the Army's Apache helicopter will not begin receiving the Suite of Integrated Infrared Countermeasures until fiscal year 2004, the Army Blackhawk until 2006, and the Army Chinook until 2012. (See table 1.)

Table 1: Suite of Integrated Infrared Countermeasures Planned Installations

(Fiscal years 2003-14)

Helicopter type	FY03	FY 04	FY 05	FY 06	FY 07	FY 08	FY 09	FY 10	FY 11	FY 12	FY 13	FY 14	Total
Special Operations Blackhawks	12	17	12	12	7								**60**
Special Operations Chinooks		10	16	11									**37**
Army Apaches		1	40	60	70	70	15						**256**
Army Blackhawks				6	22	35	92	107	108	12			**382**
Army Chinooks										38	35	7	**80**
Army Kiowa Warriors[a]										58	73	101	**232**
Total													**1,047**

[a]These aircraft will not receive the new infrared jammer and will be replaced eventually by new Comanche helicopters.

Source: U.S. Army.

While the Army continues to address the problems with the new jammer, the advanced flares have performed well in testing and are already fielded with an existing programmable dispenser (DOD's joint-service ALE-47 dispenser) and missile warning system (the AAR-47) on Special Operations helicopters. (The Army Special Operations Command has taken this action to reduce the vulnerability of its helicopters while waiting for the new suite.) A programmable dispenser is capable of ejecting a combination of flares in certain sequences at specific time intervals. The advanced flares are more effective than the Army's current flares because their material composition when burning closely matches the aircraft's heat signature. To maximize their effectiveness, the advanced flares require the

programmable dispenser to be cued to launch by a signal from a missile warning system.

Table 2: Effectiveness of Army, Special Operations, and Suite of Integrated Infrared Countermeasure Systems Against Infrared Missiles

Infrared missile type[a]	Currently fielded Army infrared countermeasures	Currently Fielded Special Operations infrared countermeasures	Future Suite of Integrated Infrared Countermeasures
1st generation	Yes	Yes	Yes
2nd generation	Partial	Yes	Yes
3rd generation	No	Partial	Yes
Future missiles	No	No	Yes

[a]Thirty-nine percent of currently fielded infrared threats are 1st generation, 37 percent are 2nd generation, and 24 percent are 3rd generation. The different generations are characterized by differing levels of performance and resistance to countermeasures. Further details about these characteristics are considered classified by the Department of Defense.

Source: Department of Defense.

As shown in table 2, in contrast to the performance of the Army's currently fielded infrared countermeasure systems, the current Special Operations infrared countermeasure systems and expected Suite of Integrated Infrared Countermeasures provide greater levels of effectiveness against the three generations of infrared missiles that are currently fielded. The Army's current countermeasure systems can defeat first-generation missiles. Second- and third-generation infrared guided missiles are more difficult to defeat, but the Special Operations' programmable dispenser and missile warning system with advanced flares have demonstrated the ability to defeat second- and some third-generation infrared missiles during flight testing. Looking to the future, more advanced infrared guided missiles are being developed that will have even greater capabilities against current countermeasures. Addressing this last missile category will ultimately require the Army to successfully complete development of and field the new laser-based infrared jammer for itself and for Special Operations Forces.

Risk to Helicopters Could Be Reduced by Revising Strategy

If the Army were to revise its strategy and take a phased approach to upgrading its infrared countermeasures by installing the advanced flares with existing or new programmable countermeasure dispensers and missile warning systems on its helicopters, it could immediately improve the capability of Army helicopters to defeat currently fielded infrared missiles. The Army has an opportunity to begin such installations immediately.

The Army is extending the service life of its helicopters through a series of remanufacturing programs. During the remanufacturing process, the helicopters will be available for lengthy periods of time in a factory environment, creating ideal opportunities for the installation of new equipment. The Army is currently remanufacturing the Apache, will begin remanufacturing programs for the Chinook in fiscal year 2002, and plans to begin remanufacturing the Blackhawk helicopter in fiscal year 2003. By installing existing programmable countermeasure dispensers, advanced flares, and missile warning systems during the remanufacturing period, the Army could improve protection for the Apache 4 years earlier than currently planned, the Chinook 10 years earlier, and the Blackhawk 3 years earlier. We discussed this revised approach with acquisition officials from the Army, the Special Operations Command, and the Office of the Secretary of Defense. All were supportive of getting upgraded infrared countermeasure systems for the Army's helicopters as soon as practical. According to the Army's program manager for the Suite of Integrated Infrared Countermeasures, a phased approach will be considered if the new infrared jammer component fails to meet requirements in upcoming tests.

The Army's current procurement unit cost estimate for the entire Suite of Integrated Infrared Countermeasures is about $1.6 million. According to a rough estimate provided by an infrared countermeasure contractor, the Special Operations' programmable dispensers, advanced flares, and missile warning systems could be installed on Army helicopters for about $175,000 per aircraft. Alternatively, according to the Army's program manager for the Suite of Integrated Infrared Countermeasures program, the new programmable dispenser, advanced flares, and new missile warning system could be installed on Army helicopters for about $300,000 per aircraft. On the basis of these estimates, the Army could provide improved infrared countermeasures for the 1,047 helicopters planned to receive the Suite of Integrated Infrared Countermeasures for about $183 million with the first approach and about $314 million with the latter approach. The

Army's total procurement cost for the complete Suite of Integrated Infrared Countermeasures would remain at $1.7 billion.

Conclusions

Advances in the development of improved infrared guided missiles have made it necessary to develop new infrared countermeasure systems to ensure the survivability of aircraft and aircrews. However, the Army's acquisition strategy for improved infrared countermeasures does not begin to address the risk to Army helicopters from currently fielded heat-seeking missiles until after 2004. Taking a phased approach to upgrades would begin to address this need immediately.

Recommendations

To reduce the risk to the Army's helicopters from heat-seeking missiles, we recommend that the Army acquire and install programmable countermeasure dispensers, advanced flares, and missile warning systems as part of a revised acquisition strategy that takes a phased approach to fielding improved infrared countermeasures. These installations should be done during the Army's ongoing and planned helicopter remanufacturing programs.

Agency Comments

In commenting on a draft of this report, the Department of Defense agreed in concept to deploy infrared countermeasures at the earliest possible date. (See app. I.) However, it stated that our proposed phased approach—using the existing programmable countermeasure dispenser and missile warning system with advanced flares—is not feasible because the Suite of Integrated Infrared Countermeasures is being developed as an integrated system. The Department also stated that a phased approach using the new programmable dispenser and missile warning system with the advanced flares would be possible but unnecessary because the maturity of all four components has converged, so that testing and fielding of the system as planned is very probable. We continue to believe that a phased approach is the fastest, surest way of reducing the vulnerability of Army helicopters to heat-seeking missiles. As our report shows, the Army continues to have problems in developing the new infrared jammer. Also, a phased approach using the existing programmable dispenser and missile warning system with advanced flares has proven feasible on the Army's Special Operations aircraft. In response to the agency's comments, however, we revised our report to recognize that a phased approach using the new programmable dispenser, advanced flares, and new missile warning system is an option

because those components are more likely to be ready in the near future than the new infrared jammer.

Scope and Methodology

To determine whether the Army's acquisition strategy can be revised to better satisfy the infrared countermeasure requirements of the Army's helicopters, we analyzed the Army's modernization, acquisition, and fielding plans for infrared countermeasures and reviewed related classified test reports, requirements documents, and threat information. We also reviewed Selected Acquisition Reports and other program documentation for the Suite of Integrated Infrared Countermeasures program.

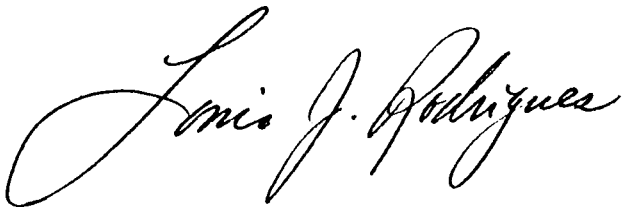
We discussed the Army's infrared countermeasure acquisition strategy and the Suite of Integrated Infrared Countermeasures program with knowledgeable officials of the Office of the Secretary of Defense and Department of the Army, at Alexandria, Virginia; the Program Executive Office for Army Aviation, and Missile and Space Intelligence Center at Redstone Arsenal, Alabama; the 101st Airborne Division and 160th Special Operations Aviation Regiment at Fort Campbell, Kentucky; the Army Aviation Directorate of Combat Development at Fort Rucker, Alabama; and the Suite of Integrated Infrared Countermeasures contractor, Lockheed Martin—Sanders Division, in Nashua, New Hampshire.

We conducted our work from June 1999 through June 2000 in accordance with generally accepted government auditing standards.

We will send copies of this report to interested congressional committees, the Honorable William S. Cohen, Secretary of Defense; the Honorable Louis Caldera, Secretary of the Army; and the Honorable Jacob Lew, Director, Office of Management and Budget. Copies will also be made available to other interested parties.

If you or your staff have any questions about this report, please contact me or Robert Levin at (202)512-4841. Key contributors to this assignment were Marcus Ferguson, Dana Solomon, Charles Ward, and John Warren.

Sincerely yours,



Louis J. Rodrigues
Director, Defense Acquisitions Issues

Comments From the Department of Defense

Note:GAO comments supplementing those in the report text appear at the end of this appendix.

ACQUISITION AND TECHNOLOGY

OFFICE OF THE UNDER SECRETARY OF DEFENSE

3000 DEFENSE PENTAGON
WASHINGTON DC 20301-3000

20 JUN 2000

Mr. Louis J. Rodriques
Director, Defense Acquisition Issues
National Security and International
Affairs Division
United States General Accounting Office
Washington, D.C. 20548

Dear Mr. Rodriques:

This is the Department of Defense (DoD) response to the General Accounting Office (GAO) draft report, "ELECTRONIC WARFARE: Phased Approach to Infrared Upgrades Would Reduce Risk to Helicopters," dated May 22, 2000 (GAO Code 707434/OSD Case 2015).

See comment 1.

See comment 2.

See comment 3.

DoD agrees that it is desirable in concept to deploy infrared countermeasures on Army helicopters at the earliest date, but believes that implementation of the proposed phased approach is not feasible. When data were collected for this report, the Suite of Integrated Infrared Countermeasures (SIIRCM) components were at different levels of maturity. In recent months, the maturity of SIIRCM's components has converged so that testing and fielding the complete SIIRCM system as planned in the acquisition strategy is very probable, making a phased implementation of SIIRCM unnecessary. Most important, in any deployment scheme, the programmable dispenser and flares cannot be deployed without the Common Missile Warning Sensor and its Electronic Control Unit that includes the programmable capability for the dispenser. Unless all of these components are ready, the phased approach is not possible. As a result, the Department believes that the SIIRCM program should continue with its current acquisition strategy. Department comments on the GAO recommendation are enclosed.

The Department appreciates the opportunity to comment on the draft report. Detail comments for technical correctness and accuracy have been forwarded under separate cover.

Sincerely,

George R. Schneiter
Director
Strategic and Tactical Systems

Enclosure: Response to GAO Draft Report

GAO DRAFT REPORT DATED MAY 22, 2000
(GAO CODE 707434) OSD CASE 2015

"ELECTRONIC WARFARE: PHASED APPROACH
TO INFRARED UPGRADES WOULD REDUCE RISK
TO HELICOPTERS"

DEPARTMENT OF DEFENSE COMMENTS
ON THE GAO RECOMMENDATION

RECOMMENDATION: The GAO recommended that the Army acquire and install programmable countermeasure dispensers and advanced flares as part of a revised acquisition strategy that takes a phased approach to fielding a full Suite of Integrated Infrared Countermeasures capability. These installations would be done during the Army's ongoing and planned helicopter remanufacture programs. (p. 8/Draft Report)

DoD RESPONSE: Non-concur. DoD agrees that it is desirable in concept to deploy infrared countermeasures on Army helicopters at the earliest possible date, but believes that implementation of the proposed phased approach is not feasible. The Suite of Integrated Infrared Countermeasures (SIIRCM) system is being developed as an integrated system. It is in late engineering and manufacturing and will enter developmental testing/operational testing (DT/OT) during early FY01, with a low-rate initial production decision in FY02 and a full-rate production decision in FY03. Although the new flares have successfully completed Contractor Qualification Testing, they and the programmable dispenser have not begun the DT/OT that is required before fielding. Most important, the programmable dispenser and flares cannot be deployed without the Common Missile Warning Sensor (CMWS) and its Electronic Control Unit (ECU) that includes the programmable capability for the dispenser. These SIIRCM components are required for missile warning, decision processing, and dispenser cueing and thus must all be ready simultaneously for deployment. This CMWS-ECU-programmable dispenser configuration is planned for 232 OH-58 helicopters that will not get the full Advanced Threat Infrared Countermeasures (ATIRCM) system.

The proposed phased fielding would require a second downtime to retrofit the other components of SIIRCM. That has not been planned. The Department believes that the SIIRCM program should continue with its current acquisition strategy which supports fielding missile warning, the Advanced Threat Infrared Countermeasures, the programmable dispenser, and advanced flares as quickly as possible as a complete system.

Attachment

See comment 1.

See comment 4.

See comment 3.

See comment 5.

See comment 6.

The following are GAO's comments on the Department of Defense's (DOD) letter dated June 20, 2000.

GAO's Comments

1. A phased approach to fielding is feasible if DOD and the Army are willing to consider using the existing programmable dispenser, advanced flares, and missile warning system configuration that has already been tested and fielded on the Army's Special Operations aircraft. Alternatively, our recommendation does not preclude inclusion of the Common Missile Warning Sensor (new missile warning system) in a phased fielding approach if, as indicated in DOD's comments, development has now progressed to the point where it could be fielded with the new programmable dispenser and advanced flares.

2. According to the system contractor's latest monthly progress report to the Army, the new infrared jammer continues to have problems. Consequently, we believe a phased approach is still likely to be the most expeditious way to field an improved infrared capability.

3. DOD's comment that "the programmable dispenser and (advanced) flares cannot be deployed without the Common Missile Warning Sensor and its Electronic Control Unit" is incomplete. DOD is referring to the new programmable dispenser, a close derivative of the existing ALE-47 programmable dispenser currently fielded on numerous aircraft, including U.S. Army Special Operations helicopters. The major difference between the two dispensers is that the new dispenser's programming function has been moved to the Common Missile Warning Sensor's Electronic Control Unit. Hence, as DOD's comment indicates, the new programmable dispenser and the Common Missile Warning Sensor must be fielded together. However, the existing ALE-47 programmable dispenser and advanced flares could be fielded with the existing AAR-47 missile warning system, as in the U.S. Army Special Operations helicopter configuration. We did not intend to imply that components of the new system could be easily mixed and matched with components of the existing Special Operations configuration. We have modified our report to clarify this.

4. DOD's existing joint service ALE-47 programmable dispenser with advanced flares has been successfully tested and is currently fielded on Army Special Operations helicopters. DOD's comment refers to the new programmable dispenser being used in the Suite of Integrated Infrared Countermeasures program. (See also comment 3.)

5. If, as indicated by DOD's comment, the Common Missile Warning Sensor development has progressed to the point where it can be fielded with the new programmable dispenser and advanced flares, our recommendation does not preclude DOD from adopting the OH-58 Kiowa Warrior configuration as an interim improved infrared countermeasure solution for Army helicopters until the new infrared jammer is ready for fielding.

6. DOD's comment that "proposed phased fielding would require a second downtime to retrofit" would be accurate if the Army were not already planning to take helicopters out of the field for remanufacturing. However, our report clearly indicates that the first "downtime" is already scheduled as part of ongoing remanufacturing efforts for Army Helicopters. The second "downtime" to which DOD refers is required to install Suite of Integrated Infrared Countermeasures components, regardless of whether or not a phased approach is taken. Moreover, by not taking a phased approach, DOD's acquisition strategy leaves Army aviators at risk while they attempt to complete development of the new infrared jammer.

Ordering Information

The first copy of each GAO report is free. Additional copies of reports are $2 each. A check or money order should be made out to the Superintendent of Documents. VISA and MasterCard credit cards are accepted, also.

Orders for 100 or more copies to be mailed to a single address are discounted 25 percent.

Orders by mail:
U.S. General Accounting Office
P.O. Box 37050
Washington, DC 20013

***Orders by visiting*:**
Room 1100
700 4th St. NW (corner of 4th and G Sts. NW)
U.S. General Accounting Office
Washington, DC

Orders by phone:
(202) 512-6000
fax: (202) 512-6061
TDD (202) 512-2537

Each day, GAO issues a list of newly available reports and testimony. To receive facsimile copies of the daily list or any list from the past 30 days, please call (202) 512-6000 using a touchtone phone. A recorded menu will provide information on how to obtain these lists.

Orders by Internet:
For information on how to access GAO reports on the Internet, send an e-mail message with "info" in the body to:

info@www.gao.gov

or visit GAO's World Wide Web home page at:

http://www.gao.gov

To Report Fraud, Waste, or Abuse in Federal Programs

Contact one:

- **Web site: http://www.gao.gov/fraudnet/fraudnet.htm**
- **e-mail: fraudnet@gao.gov**
- **1-800-424-5454 (automated answering system)**

United States
General Accounting Office
Washington, D.C. 20548-0001

Official Business
Penalty for Private Use $300

Address Correction Requested

Bulk Rate
Postage & Fees Paid
GAO
Permit No. GI00