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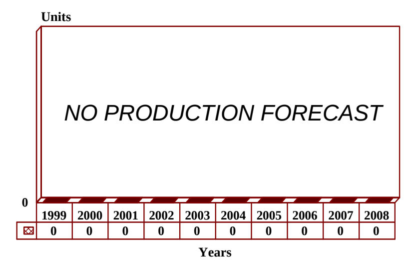
MSR-3/TACJAM-A - Archived 3/2000

Outlook

- The SIGINT/ESM portion of IEWCS
- Testing problems caused program budget rework
- IEWCS renamed Prophet

10 Year Unit Production Forecast
1999-2008



Orientation

Description. Mobile tactical communication intercept, signal data acquisition, direction finding, and countermeasures system.

Sponsor

US Army
Communications-Electronics Command (CECOM)
PEO Intelligence & Electronic Warfare
PM Signals Warfare
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[Acquisition by GEC-Marconi announced.]
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Tel: +1 607 751 5601
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(IEWCS build-to-model production and fielding)

Status. EMD finishing, initial production beginning.

Total Produced. Through 1997, an estimated 15 units had been completed.

Application. The MSR-3 will be the major ground-based portion provided as GFE to the Army's Intelligence and Electronic Warfare Common Sensor (IEWCS) suite, becoming the EW portion of the Ground-Based Common Sensor - Light and Heavy (GBCS-L/H). Components will be installed in the Advanced QUICK FIX helicopter. It will also be part of the US Marine Corps Mobile EW Support System (MEWSS).

Price Range. Unit cost will be an estimated US$2.5 million.

Technical Data

	Metric	US
Dimensions		
ESM Subsystem		
One channel		
Height:	114 cm	45 in
Weight:	214.3 kg	472 lb
Input power:	3.2 kW	
Jamming Subsystem		
One channel		
Height:	119 cm	47 in
Weight:	136 kg	300 lb
Input power:	7.1 kW	
Two channel		
Height:	231 cm	91 in
Weight:	277 kg	610 lb
Input power:	14.3 kW	

Characteristics

Frequency range:	HF through SHF (intercept) HF, VHF (jamming)
Power:	Up to 1.6 kW
Modulation modes:	FM, CW, FSK, AM, Noise, SSB Signal-Initiated Jamming (SIJ) Look-through/read-through capability
Operating temp:	-32^{o} to $+55^{o}$ C
Environmental standard:	MIL-STD-8100

Design Features. The MSR-3(V) (TACJAM-A) replaces the MLQ-34 TACJAM system. It features a common, modular, platform-independent suite for communications intercept, direction finding, and jamming that will support ground forces into the 21st century, providing Electronic Warfare Support (ES) and Electronic Attack (EA) equipment for both the Army and Marine Corps. The subsystems will be scaleable and adaptable so they can be mounted on a variety of wheeled and tracked vehicles, as well as carried by fixed- and rotary-wing aircraft. The MSR-3 can operate either as a stand-alone, self-contained system or be integrated with other systems.

The MSR-3(V) TACJAM-A will expand the coverage and capabilities of field EW, allowing the Army to use a single system instead of the six different systems that currently are fielded to protect a single division. The design exploits the latest communications modulations and can react quickly across a wide frequency band. The system can counter frequency-hopping radios and sophisticated communications modulations that cannot be exploited by electronic warfare (EW) systems operational today.

Automatic search and resource allocations were designed into the system. As much as possible, common modules are used to reduce logistics support complexity. An open architecture will facilitate expansion and upgrades. The goal is to produce a system that has interservice horizontal technology integration across a variety of platforms, programs and missions. The system can implement advanced jamming techniques on request.

Built-in testing enhances the system's maintainability by monitoring performance down to circuit card level without the need for test equipment. Should a component fail, the system will automatically reconfigure itself into a degraded performance but still operational mode and alert the operator to the existence of a problem. Operation against the highest priority tasks is maintained.

Units making up the Electronic Warfare Support (ES):

Radio Frequency Distribution. Provides high system sensitivity by ensuring a low noise figure front end; interfaces the ES system to the antennas in four bands, HF through SHF. Automatic gain control counteracts very strong interference.

Tuner. Combines instantaneous bandwidth with high dynamic range. Down-converts a broad instantaneous bandwidth for digitization. It is channelized for flexibility.

Acquisition Unit. Provides rapid, broadband signal detection and direction finding (DF). Digital FFT-based acquisition and "DF-on-the-fly" ensures fast and agile signals detection. An airborne DF configuration is available. It uses a high re-visit rate and broad instantaneous bandwidth. The unit is pre-wired for growth and expansion. A sophisticated signal detection algorithm and modular VME architecture represent improvements over current equipment.

Analysis Unit. Provides automatic signal recognition and programmable demodulation using parallel channels to permit high throughput. It is wired for adding components for dynamic range growth. It uses a modular VME-based architecture.

Acquisition/Analysis Controller. This unit controls operation of the ES system, automatically optimizing the system in response to tasking by the operator. It selects and schedules signals for jamming, supporting "smart jamming" techniques to reduce fratricide and ensure survivability, even in a dense RF environment. It maintains an active and historical data base.

Units making up the Electronic Attack (EA) subsystem:

Low-Power Transmitter. This is the heart of the jamming system. It interfaces with the ES system over ethernet, a dedicated high-speed bus, and special control lines. The LPT contains subsystem processors and software, providing up to two independently controlled exciter channels. It generates up to two switchable RF outputs at 150 watts.

High-Power Amplifier. Boosts signal power from 150 W to as much as 1.6 kW and supports one, two, or four subchannels of output power. Subchannels consist of a wideband, solid-state amplifier (BPM) and dedicated power supply.

HF and VHF Filter Units. Switched filter units reduce output spurs to specified levels and eliminate out-of-band signals, reducing fratricide. The VHF filter uses electronic switches; the HF filter uses both electronic and mechanical switching to achieve low-end performance.

HF and VHF Combiners. Each Combiner couples output power from two amplifier chains to provide output power. Phase control modules synchronize the amplifier chains, and two antenna outputs maximize transmitter RF power and flexibility.

The Army considers TACJAM-A a leading example of a horizontally integrated system available today to meet the electronic surveillance, communications intercept, and electronic attack needs of tomorrow.

Operational Characteristics. TACJAM-A will enhance a Division Commander's ability to out-maneuver and kill the enemy by isolating and suppressing enemy fire control as well as command and control nets at critical points in the battle. The system provides an electronic overwatch of threat command and control communications, including both conventional and modern conventional, and frequency hopping modulation. By using TACJAM-A, commanders hope to freeze an enemy in place by jamming its command and control.

The system can simultaneously monitor and jam target frequencies using sophisticated computer control techniques and be effective against the latest voice and data communications modulations. Automation and processor control reduces operator workload in tasking and controlling specific equipment operations. TACJAM-A can automatically set itself to the optimal configuration for specific threats.

The system will be highly mobile and able to disrupt enemy communications over a multi-octave frequency range at high power levels. Like the original TACJAM, the MSR-3(V) will be able to range over virtually any terrain at speeds of up to 40 kph or better. The system is rapidly deployable and quickly moved to a new operational site with a mobile combat unit. Set up/teardown times are listed as 10 minutes and 3 minutes, respectively.

A wide variety of modulation modes will be available, including FM, CW, FSK, AM and noise; most modes include several modulation options. Protection is supplied for multiple jamming and friendly communication frequencies. The MSR-3 can constantly monitor the VHF band through the onboard computer and respond instantly to changes in the electromagnetic environment. It will have an improved Signal-Initiated Jamming (SIJ) capability.

The MSR-3(V) uses a Windows-based interface that presents only those signals that match the selected tasking. This improves operator efficiency. A wideband acquisition front-end can acquire, identify, locate, and display signals of interest using frequency, location, or radio type as selection criteria. This eliminates the need to search for individual frequencies using narrow-band tuners. Located signals can be displayed on a geographic map to provide the supported commander with a clear "picture" of the electronic battlefield. This is a new capability for the field.

Variants/Upgrades

There are no specific MSR-3 variants as yet. The system can be configured for the MLQ-39 Ground-Based Common Sensor, Light (GBCS-L); the MLQ-38 Ground-based Common Sensor, Heavy (GBCS-H); Advanced QUICK FIX (AQF); and the Marine Corps Mobile EW Support System (MEWSS).

Program Review

Background. In March 1987, the Army selected a Sanders/AEL joint venture to participate in the early design and analysis of the TACJAM-A system. In 1989, the TACJAM-A engineering and development Phase II contract was awarded to the team which was competing against a team led by Hughes. The developmental contract called for the design, development and fabrication of a prototype in two years, and four engineering development models approximately 14 months thereafter.

Funding shortfalls threatened to delay the program in FY91. Congressional conference action, however, added US$10 million to the Army's EW Development program to move the program along. The Army awarded an engineering development contract in early 1992 for seven engineering development modules. The EDMs were scheduled for delivery by May 1994.

The Army decided to incorporate TACJAM-A into the Army Intelligence and Electronic Warfare Common Sensor (IEWCS) program. These considerations caused a delay in the TACJAM-A development as planners reorganized the necessary portions of the effort. A contract award for the IEWCS integration effort was awarded to Electrospace Systems Inc in September 1991.

By November 1994, the Army had completed initial field testing of the TACJAM-A ESM system at Ft. Huachuca, Arizona. The Sanders/AEL Joint Venture was delivering EMD units. The field testing was to determine the readiness for production and to integrate TACJAM-A on as many as eight light truck vehicles to meet an urgent requirement for communications intelligence support to the 82nd Airborne Division. It is manufactured in the Ground-Based Common Sensor-Light configuration.

IEWCS Program Award. In a DoD contract award on November 14, 1995, the Army awarded Loral Federal Systems, Owego, New York, an increment (appropriation number and dollar value would be issued with each delivery order) as part of an estimated not-to-exceed US$276.5 million firm fixed price build-to-model acquisition contract for the production and fielding of the Intelligence Electronic Warfare Common Sensor (IEWCS) systems. This includes the production and integration of IEWCS tactical platforms; the Ground- Based Common Sensor-Light (GBCS-L), a lightweight ground based system; and Advanced QUICK FIX (AQF), the heliborne version. Production of sophisticated sensors for the platforms is included. One is the MSR-3 signal data acquisition system and the other is production of the communications high-accuracy location system (CHALS-X) sensor subsystem. The GBCS-L is mounted on the High Mobility Multi-Wheeled Vehicle (HMMWV) utilized by the Army's light divisions. The AQF is mounted in a modified EH-60 Black Hawk helicopter used by the Army's Air Cavalry and Air Assault Divisions.

These assets will provide tactical commanders the ability to identify, determine the intentions of and precisely locate enemy forces by utilizing state-of-the-art technology to electronically map the battlefield. When deployed, these systems will be able to meet the projected threat out to the year 2005.

PE#0604270A - Electronic Warfare Development, DL12: Signals Warfare Development. This project provides for development and test of the Intelligence and Electronic Warfare Common Sensor subsystems:

In FY93, the Army completed TACJAM-A ESM subsystems and delivered them for integration at a cost of US$7.929 million, conducted a Critical Design Review for TACJAM-A electronic countermeasures (ECM) E&MD, and slowed completion of the EMD effort, at US$8.537 million.

FY94 accomplishments focused on resuming the TACJAM-A ECM E&MD program to include a System critical design review (CDR) funded at US$21.344 million and completion of the development of the

TACJAM-A ESM E&MD subsystem at a cost of US$2.08 million.

FY95 plans were to continue the TACJAM-A ECM development, funded at US$21.618 million, and begin integration of TACJAM-A ECM into the GBCS/AQF. In FY96, the Army planned to continue TACJAM-A ECM Development, spending US$241,000 on the effort. The Army spent US$200,000 in FY96 to complete TACJAM-A ESM development and begin integration of TACJAM-A ECM into AQF.

The FY97 program budgeted US$4.122 million to continue GBCS/AQF improvements that included TACJAM-A Signal Analyzer upgrades, ECM subsystem integration into AQF, and other product improvements identified during the Force XXI Advanced Warfighting Experiment in March 1997.

The FY98 planned program was to continue development and final modification of the CCA boards of TACJAM-A ECM system that would be incorporated in GBCS-H and AQF. Increased TACJAM-A special signal capabilities were to be developed and correct platform integration problems corrected. IOT&E of GBCS-L was planned.

In FY99, the Army will continue integrating the TACJAM-A subsystem into the GBCS-L/H. IOT&E of GBCS-H is planned.

GAO Report - Electronic Warfare: Test Results Do Not Support Buying More Common Sensor Systems (Letter Report, 03/24/98, GAO/NSIAD-98-3). GAO conducted a follow-up review of the IEWCS program, focusing on whether results of testing conducted since its previous review support continued IEWCS production.

The following is a letter from the GAO to the Department of Defense:

B-276172

March 24, 1998

The Honorable William S. Cohen

The Secretary of Defense

Dear Mr. Secretary:

We have completed our follow-up review of the Intelligence and Electronic Warfare Common Sensor (IEWCS) program, which is to provide the Army and the Marine Corps with improved signals intelligence capability. In 1995, we suggested the Army's fiscal year 1996 IEWCS procurement request be reduced because operational testing to prove the system worked properly was not scheduled until fiscal year 1997. 1) In 1996, we reported the Army had prematurely committed to low-rate production the prior year and recommended that additional IEWCS production planned for fiscal year 1997 be canceled. 2) In response, the Department of Defense (DoD) reduced the number of systems to be procured, but permitted the Army to proceed. To assist the Congress in its oversight of DoD's management of systems acquisitions, we conducted this follow-up review to determine whether results of testing conducted since our previous review support continued IEWCS production.

1) 1996 Defense Budget: Potential Reductions, Rescissions, and Restrictions in RDT&E and Procurement (GAO/NSIAD-95-218BR, Sept. 15, 1995).

2) Electronic Warfare: Additional Buys of Sensor System Should Be Delayed Pending Satisfactory Testing (GAO/NSIAD-96-175, Sept. 27, 1996).

The report text:

IEWCS objective is to provide improved signals intelligence

IEWCS is being concurrently designed and produced to provide select Army and Marine Corps units with improved signals intelligence and electronic attack capability against communications systems used by hostile forces. Through fiscal year 1997, the Army and the Marine Corps have spent a total of US$750.8 million to develop IEWCS and procure 17 systems for the Army and the Marine Corps. These IEWCS systems have been or are to be fielded on Army light vehicles, heavy armored vehicles, or EH-60 helicopters, and Marine Corps light armored vehicles.

Commitment to IEWCS LRIP was premature

The DoD Comptroller considered our 1995 report in evaluating the Army's fiscal year 1997 budget request and reduced the Army's planned second procurement of EH-60 IEWCS systems from four to one. Subsequently, we monitored the IEWCS program in anticipation of forthcoming 1996 developmental tests.

In September 1996, we concluded on the basis of the developmental test results that the Army had prematurely committed to LRIP of the unproven IEWCS system and planned additional LRIP that was not justified by test results. We also pointed out that the Army had plans to enter full-rate production without demonstrating that IEWCS could meet minimum acceptable operational performance requirements. Furthermore, we concluded that unless this acquisition strategy was changed, the Army was at risk of becoming committed to procuring an unsatisfactory system requiring redesign and retrofit to achieve acceptable system performance.

We recommended that the Secretary of Defense require the Army to cancel the planned fiscal year 1997 procurement of one EH-60 IEWCS system; establish specific, measurable, minimum acceptable performance requirements; and demonstrate IEWCS capability to meet these requirements before proceeding with additional procurement. DoD did not cancel planned fiscal year 1997 production, but did agree that the Army should establish key performance parameters before conducting Initial Operational Test and Evaluation planned for fiscal year 1997. (Operational testing is DoD's primary means of determining if a system will be effective and suitable in a realistic combat environment.)

<u>Results in brief</u>

Test results now available do not support continued IEWCS production. The Army postponed operational testing scheduled for fiscal year 1997 that was to demonstrate IEWCS operational effectiveness and suitability in a realistic combat environment. The Army replaced operational testing with less rigorous developmental testing, which showed that the system has serious hardware and software problems.

Furthermore, fiscal year 1996 tests of IEWCS on a Marine Corps vehicle showed that the Marine Corps' IEWCS prototype also has serious problems, including inaccurately identifying the direction to hostile communication systems by as much as 100 degrees. Although the Army plans to conduct additional research and development work on IEWCS, in the interim, it still intends to contract for five more systems while trying to correct the problems. Lastly, despite the IEWCS system's many problems, the Marine Corps has joined with the Army and is procuring two IEWCS systems.

<u>Operational testing canceled while serious problems remain</u>

Subsequent to our 1996 report, the Army postponed the planned fiscal year 1997 operational test of IEWCS. Instead, the Army conducted additional less rigorous developmental testing of the system on Army vehicles and an operational assessment of IEWCS on a Marine Corps vehicle. These tests revealed that serious problems remain to be corrected for IEWCS on both the Army and the Marine Corps platforms.

<u>Army addressing hardware and software problems</u>

According to the IEWCS Project Manager, the Army is concentrating on overcoming 47 software-related technical issues and 19 hardware and maintenance issues identified during additional developmental testing on Army vehicles. While many of the specifics of the problems are considered classified by the Army, in general, the software issues focus on system robustness, system accuracy, ease of use, and system throughput. According to program officials, there are several software problems for which no short-term fixes exist and additional systems engineering will be required at some later date. The hardware issues deal generally with system accuracy, and the maintenance issues with reliability. In addition to those problems, the Army remains concerned about the inability of IEWCS systems to demonstrate the ability to share data with each other. This is necessary for precisely locating hostile communication sources so they can be attacked, the primary reason why the Army wants IEWCS.

<u>Test of Marine Corps IEWCS revealed serious problems</u>

Tests of the Marine Corps' prototype IEWCS system have also revealed serious problems. In September 1996, after the planned Army operational test was postponed, the Army's Test and Experimentation Command (TEXCOM) at Fort Huachuca, Arizona, conducted a less rigorous operational assessment of an IEWCS system mounted in a Marine Corps light armored vehicle.

In preparation for the test, the Marine Corps identified criteria to measure 46 parameters of the system. During the assessment, however, Army testers only attempted to achieve 26 of the Marine Corps' criteria, and the system experienced significant problems. For example, the system was expected to identify the direction to the source of an intercepted communications signal within 5 degrees, but experienced inaccuracies of up to 100 degrees.

In addition, other significant weaknesses observed during the assessment of the Marine Corps' IEWCS system included ineffective active noise reduction headsets, leaving operators unable to hear intercepted communications, and IEWCS system crashes when operators used the digital tape recorder storage system. The Marine Corps system also required frequent recalibration to try to get accurate readings of the direction of intercepted signals. As a result of these and other problems, the system failed every 4.08 hours on average, though the desired mean time between operational mission failure rate is 65 hours. Upon completion of the Operational Assessment, TEXCOM described it as an "extremely complex, maintenance heavy, contractor dependent system."

Additionally, the assessment of the Marine Corps' IEWCS system was not representative of expected operational conditions and was hampered due to mechanical problems with the vehicle's generator and air conditioning. As a result, instead of being tested on-the-move, the vehicle sat in place, connected to external electrical power and air conditioning to keep the IEWCS components activated. This limitation precluded testing of the system's capability to operate while moving and therefore 20 of the 46 performance parameters could not be tested.

Marine Corps begins IEWCS LRIP despite poor test results

Despite the poor test results, the Marine Corps approved LRIP of two IEWCS systems. According to officials of the Marine Corps Operational Test and Evaluation Activity who reviewed the results, the assessment (1) demonstrated that the Marine Corps' IEWCS system had potential, (2) provided a yardstick to measure future progress, and (3) provided focus for continued development. Therefore, the Marine Corps decided to award an US$11 million contract for two IEWCS systems in December 1996.

Revised acquisition strategy still allows some production

Since the 1996 test of the Marine Corps' IEWCS prototype, the Army has revised its acquisition strategy and now plans to conduct additional research and development work on the IEWCS system to try to improve its performance. In addition, the Congress denied the Army's fiscal year 1998 budget request for US$26.8 million for continued IEWCS production, citing the failure of the Army to submit the system to operational testing.

However, even though the Army acknowledges the system's problems, it still intends to use funds provided by the Congress prior to fiscal year 1998 to contract for two more IEWCS systems for light vehicles and three more IEWCS for EH-60 helicopters. The Army plans to contract for these five systems before the results of its additional research and development efforts are known and before a rescheduled operational test is conducted in May 1998.

Recommendation

The Army plans to contract for five more IEWCS systems without demonstrating that additional research and development efforts have corrected known deficiencies. Therefore, we recommend that you direct the Secretary of the Army to delay contracting for additional IEWCS systems until operational testing demonstrates that the system's many problems are fixed.

Agency comments

In written comments on a draft of this report, DoD concurred with the report and our recommendation. According to DoD, the Army has revised its plans, taken steps to reduce the technical problems we cited, and no longer intends to procure additional IEWCS systems in fiscal year 1998. Furthermore, DoD stated that the Army has adjusted the program's schedule to ensure that no further procurement decisions will be made without supporting operational test results.

Program Budget Decision No. 290 on Army C^4 Program Army – IEW Ground Based Common Sensor/ Electronic Warfare Development (PE 0604270A, BA 5)

(TOA, Dollars in Millions)	FY 1999	FY 2000	FY 2001
Service Estimate			
IEW Ground Based Sensor (OPA)	**US$12.1**	–	–
RDT&E, A (PE 0604270A, BA 5)	US$16.4	US$38.6	US$55.5
Alternative Estimate	–	US$27.5	

The Army's Intelligence Electronic Warfare Common Sensor (IEWCS) system was intended to modernize the Army's signals intelligence equipment at the division level. Due to problems with achieving a level of maturity and reliability necessary to begin operational testing, the IEWCS program managers deferred five Initial Operational Test and Evaluations (IOT&Es) planned between 1994 and 1998. The Army decided at the May 1998 operational test readiness review to downscope the 1998 IOT&E to a combined Development Test/Operation Test (DT/OT) and restructure the IEWCS program. The Army renamed the restructured IEWCS program Prophet, with a Milestone III production decision moved to the first quarter FY03.

As now envisioned, Prophet is to be a division-level Signals Intelligence (SIGINT) system. Its primary mission will be to electronically map radio frequency emitters on the battlefield. The Army budget includes US$38.6 million in FY00 and US$55.5 million in FY01 in RDT&E funds for Prophet. In addition, US$28.5 million is available in FY99 for IEWCS/Prophet. To date, the Army has identified US$5.5 million of the US$16.4 million in FY99 RDT&E funds to initiate Prophet in FY99. The Army has no current plans for the remaining FY99 resources.

The details of the Prophet program were not articulated with any degree of specificity in the Army's FY00

Budget Estimate Submission (BES) or in subsequent information provided by the Army. In fact, "Prophet" is not referenced in the FY00 BES. The draft Operational Requirement Document (ORD) for Prophet is being coordinated within the Army and completed in January 1999. As a SIGINT program, Prophet must be in compliance with the Joint Airborne SIGINT Architecture (JASA). The JASA determines the system architecture (i.e., designates the protocol, hardware, software, system interfaces, etc.). The Army has earmarked US$1.7 million in the FY99 RDT&E budget for JASA compliance. Eleven months are estimated for this effort (two months formulating the statement of work and revising the contract with Lockheed Martin, six months to develop the JASA itself, and three months for National Security Agency coordination). Since the Army plans to initiate the JASA effort in January 1999, the JASA for Prophet will not be in place until 2QFY00.

The FY99 Prophet requirements (total US$5.46 million) as presented by the Army include:

- US$300,000 to conduct Milestone II for Prophet.
- US$2.3 million to develop communications intelligence (COMINT) subsystem.
- US$800,000 to investigate and demonstrate existing technology and commercial off-the-shelf (COTS) hardware as an alternative COMINT capability for Tactical Communications Jammer (TACJAM- A).
- US$400,000 to conduct initial technical survey of available manpack COMINT receivers in preparation of Milestone II for Prophet.
- US$1.66 million for preliminary design of Common Remote/Reporting Architecture.

The FY00 Prophet requirements (total US$38.55 million) as presented by the Army include:

- US$4 million to procure long-lead items (Advanced QUICK FIX [AQF] aircraft displays).
- US$500,000 to procure COTS manpack radios.
- US$2.5 million to procure modified CDL datalink.
- US$2 million to start integration of manpack radios into HWMMVs.
- US$1 million to start antenna design for Prophet – Ground.
- US$2 million to start antenna design for Prophet – Air.
- US$6 million to upgrade AQF helicopters to current Black Hawk configuration.
- US$5.5 million to start TACJAM-A subsystem development (modified COTS).
- US$2 million to start development of a precision location capability.
- US$5.9 million to start integration of Prophet subsystems.
- US$600,000 to procure non-developmental Prophet Ground Control Stations.
- US$50,000 to procure SICP shelters and incorporate them on HWMMVs.
- US$3.5 million for salaries and operating expenses.
- US$3 million to fix legacy systems based on DT/OT results.

The alternative estimate does not recommend funding the following FY99/00 amounts for Prophet given a realistic program start date of January 2000:

US$3.8 million for FY99 Prophet (FY99 RDT&E, A) — Undertaking initiatives in FY99 to conduct a Milestone II, to develop COMINT subsystems, and to investigate/demonstrate hardware as alternatives for Prophet are premature when the Joint Airborne SIGINT Architecture (JASA), which will designate the protocol, hardware, software and interfaces, will not be completed until the second quarter FY00.

US$6 million to upgrade AQF helicopters to current Black Hawk configuration (FY00 RDT&E, A) — Upgrading two Black Hawk helicopters to fleet standards is not a functional part of the Prophet system itself, and the Army has the option to provide a "conditional release" to fly these helicopters as needed for Prophet. Therefore, this effort may be delayed.

US$5.9 million to start integration of Prophet subsystems (FY00 RDT&E, A) — Integration of Prophet subsystems in FY00 is premature and should be delayed to FY01 and FY02. This will allow for a complete maturing of the various Prophet software subsystems/datalinks being procured in FY00 as COTS, new development or upgrades.

In addition, the Army plans to utilize the US$3 million of FY00 RDT&E, A funds for follow-on efforts related to the IEWCS legacy system. This item must be funded with the available FY99 Other Procurement, Army (OPA) funds since it is for repairs of OPA-procured items.

The net impact is a reduction of US$27.5 million in FY00 RDT&E, A funds to the Electronic Warfare Development program. The alternative estimate offsets the recommended FY00 Prophet program budget of US$23.7 million with the FY99 RDT&E, A carryover of US$12.6 million, since the Army has not provided any rationale on the use of FY99 funds. In addition, the alternative identifies a FY99 OPA asset of US$9.1 million available for Army reprogramming to other priorities.

Request for Information/Sources Sought Notices. The Army began issuing a series of *Commerce Business Daily* notices seeking sources and input on COTS-based hardware and software which can meet battlefield electronic warfare needs for Prophet. According to program executives, the restructuring of the GBCS program will still provide an organic tactical signal intelligence capability that provides electronic mapping of the battlefield.

A January 12, 1999, request for information announced that the Product Manager for GBCS was conducting an industry survey for a datalink system to be used "to transmit/receive data from a ground control station to up to six airborne platforms. The system must have the capability to transmit/receive data among all six airborne platforms." The ground control link must be able to maintain communications with the airborne platforms even during on-the-move operations on the ground.

The Forward Link (FL) and the Return Link (RL) data rates must support airborne SIGINT data collection missions and be able to transmit up to 150 kilometers with hemispherical coverage both from the ground and from the air. The system shall operate at the SECRET Collateral security level. The ground control link will have to maintain communications with airborne platforms even during ground on-the-move operations (assuming unobstructed Line of Sight).

Both uploading and downloading will occur on the same link, with the downloading capability higher than the link uploading capability. This is to accommodate higher demands of downloading mapping data vs. uploading commands to the system. Program officials would like to procure a common datalink to increase interoperability with assets like the Guardrail Common Sensor and unmanned aerial vehicles.

As one of the key differences between Prophet and the GBCS is that GBCS focused on the procurement of cutting-edge technology whereas officials now have a strong preference for commercial off-the-shelf or non-developmental equipment for Prophet. The request encouraged those sources who thought they had a system that could meet the requirements or can be easily modified to meet the requirements. These companies were asked to provide specifications, item description, and other pertinent material which would help program officials develop an acquisition strategy toward acquiring such a capability.

Program officials also set up an independent study team to examine the equipment for the communications-intelligence component of Prophet. The COMINT unit was called the "heart of the system." It will monitor the battle environment and capture and demodulate radio signals so commanders can understand them.

Initial reports were that a team evaluating responses to an RfI found that at least half of those responding had viable submissions.

In a December 1998 *Commerce Business Daily*, Army CECOM sought industry information on COTS or Non-Developmental Items (NDI) Electronic Attack systems that can support tactical operations. These electronic systems would be considered for integration into heliborne and/or ground vehicle platforms. Under this Request for Information (RfI), the US Army solicited information on currently available systems or systems that could be modified in a quick and economical fashion. In addition, information submitted should show the maturity level of the system (i.e., customer test results, fielding data, etc.), or a demonstration should be provided in the near future.

System characteristics included:

- The capability to jam fixed frequency, burst and low probability of intercept signals within the VHF band (frequency extension will be a future desire) with a minimum effective radiated power of 550 W out of a directional antenna,
- Jam signals having voice and data content with various modulation,
- Jam signals while on the move, and
- Operation independent of any other systems.

The respondents were asked to describe the signal environment and emitter density in which their system was evaluated. Respondents were to provide the maximum number of simultaneous emitters that the system can jam (convention or low probability of intercept signals or a combination of the two) and provide the time allotted for look-through.

Respondents were also to describe the types of jamming techniques and modulation types used, and report jammer effectiveness to the operator. They were also asked to describe harmonic suppression and intermodulation prevention characteristics and methods, along with the suitability for mounting their system in a single light tactical vehicle (i.e., HMMWV, amphibious) and in an Army helicopter.

Proposed systems were to comply with DoD standards, specifically Joint Technical Architecture-Army, Version 2. (This JTA may be viewed at: http://www-jta.itsi.disa.mil/) A proposed system should be capable of operation in a tactical environment, including heat, cold, rain, fog, dust, sand, wind, shock and vibration, explosive atmosphere, and other conditions found on the battlefield.

The respondents were to describe system power requirements, provide mean time between failure data for hardware and software, and provide a concept of operations. In addition, a description of any special maintainability requirements and built-in-test capability was to be provided.

Responses to this RfI were due on January 15, 1999.

Army officials have said that Prophet will key primarily on Prophet AIR (PA) airborne systems. It will build on a core system in the 20 to 2000 MHz frequency range, and feature LPI operations, data mapping, and datalink to ground stations. An interim capability will use the PRD-13 manpack SIGINT system, but plans are to leverage about 60 percent of existing INEWS technology into the new system.

Prophet program management has initial plans for installing 72 to 74 Electronic Attack systems on UH-60 Black Hawk helicopters and about the same number on HMWWVs. There are to be 14 Ground Control Stations. The Marine Corps is interested in 12 units for inclusion in its Mobile Electronic Warfare Support System (MEWSS). The Army plans to budget US$2.6 billion in production costs from FY06 through FY14.

Funding

US FUNDING

	FY97		FY98		FY99(Req)		FY00(Req)	
	QTY	AMT	QTY	AMT	QTY	AMT	QTY	AMT
PE#0604270A								
Electronic Warfare Development								
DL12 Development total	-	15.7	-	28.1	-	20.4	-	8.7
TACJAM-A specific lines	-	4.1	-	-	-	-	-	-

NOTE: DL12 includes several IEWCS efforts. The new effort will probably change this funding profile significantly.

All US$ are in millions.

Recent Contracts

(Contracts over $5 million)

Contractor	Award ($ millions)	Date/Description
Sanders/AEL	24.9	Jan 1995 – Delivery order as part of a US$55.5 million (potential cumulative total) indefinite delivery/indefinite quantity contract for six TACJAM-A MSR-3 systems. Completed Mar 1996. (DAAB10-95-D-0502)
Sanders/AEL	12.5	Jan 1995 – Delivery order as part of a potential cumulative total US$17 million FFP indefinite delivery/indefinite quantity contract for TACJAM-A MSR-3 spare parts. Completed Mar 1997. (DAAB10-95-D-R009)
Loral (LMCo)	29.5	Dec 1995 – Production and integration of IEWCS platforms, production of TACJAM-A, production of CHALS-X. (DAAB10-96-D-Q002)

Timetable

Month	Year	Major Development
Jul	1986	TACJAM-A ROC
	1987	Program initiated
Jul	1988	82nd Airborne Operational Needs Statement
Jul	1989	TACJAM-A EMD ESM prototype effort started
Sep	1991	Integration contract awarded
Jan	1992	TACJAM-A EMD contract
Feb	1992	First EFVS delivered (GBCS-H)
Mar	1992	Option exercised for first ESM EMD prototype to IEWCS contractor
Jun	1992	First ESM EMD prototype delivered to integration contractor; Preliminary Design Review conducted
Jul	1992	First GBCS-L prototype platform delivered to integration contractor
Nov	1992	Option for GBCS-L EMD exercised; CDR conducted; three GBCS-L platforms delivered to integration contractor
Jun	1993	Delivery of TACJAM-A ESM subsystems for integration begun
Sep	1993	Second ESM prototype delivered
Jun	1994	Special In-Process Review on GBCS-L conducted
Sep	1994	DT/OT begun on GBCS/AQF
Oct	1994	Contracts awarded for procurement of IEW Common Sensor subsystems for GBCS-L
Jan	1995	Contract for six TACJAM-A MSR-3 ESM systems
	FY95	TACJAM-A ECM EMD completed; incorporated into GBCS/AQF
Mar	1995	RDT&E models GBCS-L fielded to XVII Airborne Corps
Jul	1995	Selection decision on GBCS/AQF integration contract award
Nov	1995	Contract awarded for GBCS/AQF system integration
Oct	1996	EMD Block I improvements initiated
3Q	FY98	AQF IOT&E
Nov	1998	PBD No. 290 published
4Q	FY98	IOT&E on GBCS-L (old)
Jan	1999	Prophet draft Operational Requirements Document
2Q	FY99	GBCS-L, Milestone III (old)
3Q	FY99	IOT&E on GBCS-H (old)
1Q	FY00	GBCS-H, Milestone III (old), Prophet development contract possible
	FY05	Prophet IOT&E

Worldwide Distribution

This is a **US** only program.

Forecast Rationale

Electronic combat and battlefield digitization is a top Army priority and driving force in equipment and tactics development. Exercises and combat experience have revealed the need for an aggressive approach to develop capabilities for operation on an increasingly sophisticated battlefield of the future. In the Advanced Warfighting Experiment at the National Training Center in March 1997, the Army's Force XXI showed how the US will be fighting in the future, and how hostile forces are expected to be fighting as well.

Developing the US electronic battlefield of the future has supported and encouraged the development of equipment and tactics to counter a foe's likely communications developments. The Army Modernization Plan noted that over the next decade, military forces worldwide will be improving their combat capabilities. Acquisition of advanced weapons and communications equipment is increasing, with an emphasis on quality, not just quantity.

The increased interconnectivity and the ability to interface with other developing information systems coming to the battlefield will be important in ensuring that the Army has an electronic warfare capability suitable to future combat. Standardization would reduce the cost and complexity of logistics support, an important consideration as defense budgets are reduced.

The new electronic combat strategy emphasizes smaller but technologically superior forces that are versatile, deployable and lethal. IEWCS was to combine TACJAM-A, TRAILBLAZER, TEAMMATE, and TEAMPACK capabilities, and help the Army achieve its goal of meeting its 21st century tactical needs with less equipment. The award of the IEWCS build-to-model acquisition contract moved the entire effort But testing became an ongoing problem.

TACJAM-A was to contribute operational and logistical improvements and replace up to six different types of hardware with one common system that is more effective than anything possible today. The design of MSR-3 TACJAM-A took advantage of new technology and incorporates human interface engineering to increase the effectiveness of operators. Automation would make it possible for operators to concentrate on operational concepts rather than getting bogged down in mechanical details of running the equipment. The display is a major improvement in commanders' situational awareness of the electronic order of battle.

Electronic warfare is critical on the battlefield. Commanders must have information on the enemy's electronic order of battle, and the capability to disrupt his command and control communications. New systems are needed to keep up with technology on both sides of the forward line of troops (FLOT). Budget cutbacks have decreased the size and operating tempo of the Army, impacting overall production and the long-term levels of spares procurement and repair activities needed to support many systems, including the TACJAM-A MSR-3.

The GAO report reflects what is probably the result of an overly aggressive approach to developing the new EW systems for the battlefield. It is not uncommon for the GAO to criticize EW development because of testing/production scheduling. In this case, however, it was partly on target. The Army had already slipped the development, and needed to evaluate its efforts.

IEWCS was an intelligent, but overly ambitious, approach to EW. Although the standardization of hardware is important to improving the overall system, software development is a challenge. Cutting back from the large number of different systems used on the front line to a single system of systems was a logical approach; but planners ended up trying to do too much with one system. The desired performance and reliability could not be achieved, testing was not working out, and a Milestone III production decision was deferred.

The Army wisely decided to call an "all-halt" and step back to re-evaluate where it was, where it needed to be, and how to get there. By essentially stopping IEWCS and beginning a new effort, the Army is allowing itself to look at its plans with a fresh eye unencumbered by established programmatics.

Nearly two-thirds of IEWCS technology could be migrated to the new system. The Army hopes to take what worked during testing and eliminate what did not. Prophet Air will be the key to the system, with the ground components providing early entry self-protection. Future plant call for moving the airborne components to a UAV.

Prophet plans and funding are a work in progress. By issuing the *Commerce Business Daily* notices, the Army hopes to get solid information on technology and architectures which make success more likely and on which plans can be based. The Army is following the example of the other services in using commercially available equipment where possible to meet force needs. This hopefully will give units an electronic attack system that can be fielded quickly and affordably. The goal is a simple system that will not incur significant development costs, while at the same time giving field commanders most, if not all, of the electronic combat capability they need.

Ten-Year Outlook

Production plans will be changed based on the new Prophet program.

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