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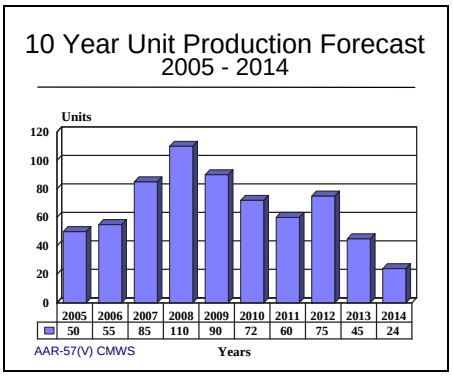
AAR-57(V) (CMWS) Archived 11/2006

Outlook

- CMWS first unit equipped 2Q FY04
- Army contracts for 484 ATIRCM/CMWS LRIP units
- Full Rate Production FY06



Orientation

Description. CMWS is the detection component of the ATIRCM/CMWS helicopter self-protection suite. It can also be used in a stand-alone configuration.

Sponsor

U.S. Army
Communications – Electronics Command
Fort Monmouth, New Jersey (NJ) 07703-5000
USA
Tel: + 1 (201) 532-2534
Web site: http://www.monmouth.army.mil

Status. Low-rate initial production.

Total Produced. Through 2004, an estimated 131 prototype and LRIP units had been produced.

Application. Design applications (ATIRCM/CMWS): MH-60K, MH/CH-47, AH-64D, UH/EH-60, CH-47F.

Other USSOCOM and tri-service applications are eventually possible.

Price Range. Based on initial estimates, unit cost for production systems has been put at $1.6 million for a CMWS B-Kit. This is based on DoD DOT&E figures. Individual acquisitions may vary, depending on program factors.

Contractors

BAE Systems North America - Information & Electronic Systems, Division HQ, http://www.iesi.na.baesystems.com, 65 Spit Brook Rd, Nashua, NH 03061-0868 United States, Tel: + 1 (603) 885-4321, Fax: + 1 (603) 885-2772, Email: randal.e.morger@baesystems.com, Prime

Technical Data

	Metric	U.S.
Dimensions		
Weight		
Sensors (6)	16.7 kg	32.7 lb
Electronic control unit	8.5 kg	16.5 lb
Size		
Sensor	10.8 x 8.52 cm	4.25 x 3.25 in

Electronic control unit	13.9 x 24.9 x 33	5.5 x 9.8 x 13 in

Characteristics

MTBF	650-3,000+ hr (depending on aircraft type)
MTTR	3-5 min
Maintenance	Built-in end-to-end testing Optical and electrical BIT Two- or three-level maintenance LRUs interchangeable between platforms

Design Features. The Advanced Threat Infrared Countermeasures (ATIRCM) system/Common Missile Warning System (CMWS) is a next-generation directable laser-based countermeasures system for protecting helicopters and some fixed-wing aircraft from heat-seeking missile threats. The program develops and produces a fit/function common missile warning system for the United States Army, Navy, and Air Force.

The suite combines AAR-57(V) CMWS missile warning and situational awareness system with preemptive and terminal countermeasures in the form of a directed laser that points at an attacking missile seeker head. The laser is mounted in a moveable turret, and energy from it will overload or disrupt a missile's seeker-head circuits.

The ATIRCM was designed to counter the anticipated missile threats out to the year 2020 and beyond. Both the ATIRCM and CMWS interface with the aircraft's avionics via the Mil-Std 1553 databus. The AAR-57(V) CMWS uses passive detection, staring focal plane arrays to detect the launch and approach of a missile. Up to six can be installed on an aircraft and either integrated with the ATIRCM directed energy system or operated as a stand-alone warning system integrating with jamming and dispenser systems. Four sensors provide 360-degree azimuth coverage, while a fifth can be added to provide coverage in the bottom quadrant (the "donut hole"). A sixth sensor ensures full spherical coverage.

Traditionally, IR-seeking missiles targeted a jet engine's exhaust using sensors in the 1- to 2-micron range. The sensor coverage was increased to 4 microns to counter new missiles that can seek cooler targets and attack from nearly any target-aspect angle. Because hot-flare decoys are ineffective in attracting these missiles, ATIRCM will aim a high-intensity, pulse-modulated beam of infrared energy at the missile to confuse and overload the seeker.

Operational Characteristics. New missiles are mostly immune to being decoyed by flares and IRCM systems. Detecting the threat at longer range, avoiding false alarms due to clutter, and initiating countermeasures in a timely manner is vital to survival. Additionally, operation should be automated as much as possible.

The AAR-57(V) provides all-weather, all-altitude missile warning, and is capable of detecting and warning of multiple simultaneous engagements, even in dense clutter environments. It can track multiple sources and discriminate between lethal and non-lethal clutter, declaring a missile lethal to prompt cueing of directed IR countermeasures or countermeasures dispensers. It has been designed to be effective against all threat missiles. The quick, automatic reaction is particularly effective in protecting against shoulder-mounted heat-seeking missiles.

CMWS can cue a number of decoys and flare dispensers, and can be adapted to and integrated with the ALE-47(V) and M-130(V) chaff/flare dispensers so aircraft can be protected by both lasers flares.

The system interfaces with other protection systems. The ATIRCM/CMWS system exchanges messages with other sensors, including the ALQ-211(V) suite of radio frequency countermeasures. Outputs are also sent to cockpit displays to generate a unified, multispectrum, multithreat situational awareness.

Variants/Upgrades

There will be platform-specific adaptations to fit ATIRCM/CMWS to a variety of fixed- and rotary-wing aircraft.

AAR-57(V)

Source: BAE Systems

Program Review

Background. The U.S. Army issued a Request for Proposals (RFP) for an integrated infrared countermeasures system in spring 1991 for Special Operations Forces helicopters. The system would include an IR jammer, a missile approach warning system, and a decoy dispenser. Sanders (now BAE Systems) was awarded an initial three-year development contract that also included the (then) Loral Imaging Systems AAR-47(V) passive missile warning system to be integrated into the ATIRCM.

Seeking a single system that could be used by a variety of aircraft, the Pentagon shifted the ATIRCM to tri-service in late 1994. Under the newly aligned program, the CMWS was added to the development and would be designed either as part of the suite or as a stand-alone system. In FY95, demonstration and validation of ATIRCM/CMWS was completed, and the engineering and manufacturing development (EMD) phase of the program begun.

An EMD contract was awarded in September 1995, calling for the design and fabrication of six ATIRCM/CMWS systems for flight tests on the MH-60K helicopter, with options for an additional 25 systems. The contract provided for the delivery of 50 CMWSs, initial spare parts, support equipment, systems integration, and engineering support.

In June 1996, a Preliminary Design Review was completed. In November 1997, the Special Operations Acquisition Center (SOAC) published a solicitation for a series of special studies and analyses for the CV-22 Pre-Planned Product Improvement (P^3I) Program that included a requirement for an infrared countermeasures (IRCM) capability at Initial Operating Capability (IOC). The ALQ-212(V) ATIRCM and AAQ-24(V) DIRCM were leading candidates for installation on the tiltrotor. In August 2005, the AAQ-24(V)13 was selected.

U.S. Army CECOM awarded an 18-month contract in June 1997 to integrate the ATIRCM/CMWS with the AH-64D Longbow Apache helicopter. The effort would determine the optimum configuration and interface requirements for the helicopter. Designers would develop a MIL-STD-1553 electronic control unit emulator and optical coupler for use in integration.

In March 1999, the company delivered the first operational ATIRCM/CMWS System Integration Lab (SIL). Part of the EMD phase of the program, the SIL

would be used to analyze the performance of the AAR-57(V) CMWS on USAF F-16 aircraft. The system consists of two equipment racks that contain embedded processors, software, and an electronic control unit. It was delivered to Lockheed Martin Tactical Aircraft Systems, Fort Worth, Texas, and used to simulate missile threats and potential false alarm sources to evaluate the performance of the systems in detecting threats and rejecting false alarms. This would ensure that the CMWS was fully integrated with other aircraft avionics. Five more SIL systems were delivered during 1999.

In February 1999, the Air Force cut FY01 funding for CMWS by $38 million in Program Budget Decision No. 753. Small amounts ($2.6 million) would be added back into the budget in FY03, FY04, and FY05. Among the reasons cited for the cut was the fact that the program was running increasingly over budget. The contractor continued to work on the CMWS to meet the planned FY04 start of integration.

In early 1999, the DoD began to study the suitability of DIRCM as a replacement for ATIRCM. Schedule delays and cost growth in the ATIRCM/CMWS program prompted the study, which was to determine if the AAQ-24(V) DIRCM and its associated AAR-54(V) Missile Warning System could be a cost-effective alternative capable of meeting the requirements established for the ALQ-212(V) ATIRCM and its missile warner, the AAR-57(V) CMWS.

The AAR-57(V) CMWS was designed for tactical attack and rotary-wing aircraft, while the AAR-54(V) was designed primarily for rotary-wing and large, slow aircraft. The study had to evaluate whether the DIRCM and associated equipment could be reasonably converted to meet ATIRCM's more stringent specifications. It was decided that the two needs could not be met by one system, and reducing the number of DIRCM providers to one was considered unwise.

In late 1999, the Air Force opted out of the CMWS program because of budget limits and other priorities. Planners would continue EMD (USAF is the lead) but would not procure any AAR-57(V)s. The service would seek other systems to meet its stand-alone CMWS needs.

The FY00 Defense Authorization markup from the Senate Armed Services Committee recommended increasing the budget by $8.1 million. This increase would complete non-recurring engineering on the system to perfect the CMWS for installation in the Apache Longbow, so A-Kits could begin to be installed in Lot 7 aircraft. A $6.6 million increase was recommended to begin B-Kit installation with Lot 7. The Senate also recommended an $8.6 million increase in R&D funding for ATIRCM development.

In March 2000, designers demonstrated a multiband laser unit that could be added to the ATIRCM system. It operated in the most common seeker bands and generated good efficiency levels. Two technologies – a unit photon decrement diode pumped solid-state laser, and the crystal growth and exploitation of zinc germanium phosphide (a non-linear material that generates Band II and IV radiation at higher power) – made it possible to overcome efficiency limitations that had plagued development in the past. This unit was designed to be attached directly to the ATIRCM system.

Army live-fire tests were completed in April 2000 at the White Sands Missile Test Range, New Mexico. During the tests, live missiles were fired at an infrared source located near an ATIRCM/CMWS sensor mounted on a cable car simulating an airborne helicopter. Ten test flights included single and multiple missile launches at various distances. This test was a critical requirement for an LRIP decision.

Captive seeker testing on an EH-60 helicopter was completed on August 3, 2000, at test facilities in Merrimack, New Hampshire. Tests demonstrated an ability to defeat five key missile seekers. They also provided data to be used in reducing potential false alarms. This effort led to testing on the sled at Holloman AFB.

In late August 2000, contractor sled testing was concluded. During the test, missiles were strapped to and launched on a rail system simulating live missile firings. ATIRCM/CMWS was installed on an EH-60, identifying, tracking, and jamming the missile threats at distances from 1.5 to 4 kilometers. Thirteen test flights were conducted at different altitudes and airspeeds, from a stationary hover to 120 knots, accelerating and decelerating, and flying varied angles of approach. Scenarios involved both single missiles and missiles launched simultaneously.

Reports said that the system successfully detected, tracked, and placed laser energy on the target in every test. Following this testing, electromagnetic vulnerability testing was to be conducted at Dahlgren Naval Air Station, Virginia**.**

In the October 31, 2000 issue of *Commerce Business Daily*, Army CECOM officials sought sources and information for an ATIRCM/CMWS (ALQ-212(V)) production program. The missile warning component of the system, the AAR-57(V), would have to be designed to meet the flight and environmental requirements of the DoD's Tactical Aircraft (the F-16, F-15, AV-8B, F-18, and A/AO-10).

While the Army continued to address the problems with the new jammer, advanced flares performed well in testing, fielded with an existing programmable

dispenser (DoD's joint-service ALE-47(V) dispenser) and missile warning system (the AAR-47(V) on Special Operations helicopters).

The Army Special Operations Command took this action to reduce the vulnerability of its helicopters while waiting for new self-protection. A programmable dispenser is capable of ejecting a combination of flares in certain sequences at specific time intervals and the advanced flares are more effective than the Army's current flares because their signature, 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.

In April 2001, the ATIRCM/CMWS system successfully passed 10 live-fire engagements during tests at the White Sands Missile Range. The scenarios involved both single and multiple missile engagements at various distances. An ATIRCM/CMWS sensor mounted on a cable car simulated an airborne helicopter.

The CMWS system demonstrated the ability to defend a platform during live-fire tests against a QF-4 drone at White Sands. The tests took place in March 2002. The system was configured as it would be on an F-16 fighter and flown against a total of eight man-portable air defense (MANPAD) missiles. Reports declared the tests 100 percent successful.

PE0604270A, L20 ATIRCM/CMWS. This U.S. Army program develops, tests, and integrates defensive infrared (IR) countermeasures into existing, current generation host platforms for more effective protection against a greater number of IR-guided missile threats than afforded by currently fielded IR countermeasures. The Operational Requirements Concept for IR countermeasure systems is known as the Suite of Integrated Infrared Countermeasures (SIIRCM).

The A-Kit is the modification hardware, wiring harness, cable, etc., necessary to install and interface the ATIRCM/CMWS Mission Kit to each platform. The A-Kit ensures the Mission Kit is functionally and physically operational with the host platform.

The Mission Kit consists of the ATIRCM/CMWS, which performs the missile detection, false alarm rejection, and missile declaration functions of the system. The Electronic Control Unit (ECU) of the CMWS sends a missile alert signal to on-board avionics and other Aircraft Survivability Equipment (ASE) such as expendable flare dispensers. Threat missiles detected by the CMWS are handed over to the ATIRCM.

FY06-FY07 funding supports continued incremental improvements for jam head miniaturization and countermeasures against Tier 2 and Tier 3 threats.

Product development was funded at $6.888 million in FY04. Test and Evaluation made up the FY05 through FY07 budget. The annual funding line was put at $6.807 million in FY05, $3.293 million in FY06, and $3.126 million in FY07.

Acquisition Strategy. The Engineering Manufacturing Development (EMD) contract was competitively awarded in FY95. The Army Acquisition Executive (AAE) approved the Limited Procurement Urgent (LPU) for acquisition of the CMWS for Special Operations Force (SOF) aircraft in March 2002. An Army Systems Acquisition Review Council (ASARC) resulted in a Milestone C Low Rate Initial Production (LRIP) decision in November 2003, approving the program's entry into LRIP.

The LRIP procurement acquisition strategy is sole-source, fixed-price procurement. Funding supports an acquisition strategy of buying CMWS separately from ATIRCM, while installing A-kits on all modernized aircraft. The ATIRCM Full Rate Production (FRP) decision is scheduled to follow the Initial Operational Test and Evaluation (IOTE) with production continuing through FY17. The current production contract is a sole-source, fixed-priced, five-year, Indefinite Delivery, Indefinite Quantity (IDIQ) contract to BAE Systems.

ATIRCM/CMWS was not included in the FY2004 DOT&E Annual Report.

In March 2005, The Government Accountability Office published a report: *DEFENSE ACQUISITIONS: Assessment of Selected Major Weapon Programs* at the request of Congress. GAO-05-301 carried the following on the ATIRCM/CMWS program:

This report estimated the procurement quantity would be 2,583, with the last procurement in 2023. The 2003 Program Unit Cost was put at $1.075 million, an increase of 13.5% from 1996 figures.

The report addressed the program in general with the following:

"The ATIRCM/CMWS program entered production in November 2003 with technologies mature and designs stable. Currently, the program's production processes are at various levels of control. The CMWS portion of the program entered limited production in February 2002 to meet urgent deployment requirements. However, full-rate production for both components was delayed because of reliability problems. Over the past several years, the program has had to overcome cost and schedule problems brought on by shortfalls in knowledge: key technologies were demonstrated late in development and only a small number of design drawings were completed by design review. At the low-rate production decision point, the Army developed a new cost estimate reducing program procurement cost substantially.

Technology Maturity. The ATIRCM/CMWS's five critical technologies are mature. However, they did not mature until after the design review in February 1997. Most of the early technology development effort was focused on the application to rotary wing aircraft. When system development began in 1995, the requirements were expanded to include Navy and Air Force fixed wing aircraft. This change caused problems that largely contributed to cost increases of more than 150 percent to the development contract. The Navy and the Air Force subsequently dropped out of the program, rendering the extra effort needless, but the Navy and the Army are currently pursuing future joint production planning.

Design Stability. The basic design of the system is complete with 100 percent of the drawings released to manufacturing. The design was not stable at the time of the design review, with only 22 percent of the drawings complete. This was primarily due to the expanded requirements. It was not until 2 years after the design review that 90 percent of the drawings were released and the design was considered stable. This resulted in inefficient manufacturing, rework, additional testing, and a 3-year schedule delay. The system design was successfully demonstrated through engineering and manufacturing development and transitioned to production.

Production Maturity. The production maturity could not be assessed based on the information provided by the program office. According to program officials, the ATIRCM/ CMWS program has 16 key manufacturing processes in various phases of control. They stated that ATIRCM statistical process controls are in development, control plans are being enhanced and as the program continues in production and data are gathered, lessons learned will be included in the processes. The Army entered limited CMWS production in February 2002 to meet an urgent need of the U.S. Special Operations Command. Subsequently, full-rate production was delayed for both components due to reliability testing failures. The program implemented reliability fixes to six production representative subsystems that will be used for initial operational test and evaluation.

These systems were delivered in March 2004. The full-rate production decision for the complete system is now scheduled for 2006.

Other Program Issues. The Army procured an initial 32 systems in Fiscal Year 2002 for use on the U.S. Special Operations Command's CH-47 helicopters. The Army plans to procure a total of 99 systems to outfit special operations aircraft between fiscal year 2003 and 2009. Currently, program officials are working to integrate CMWS on 16 additional platform types and models, which will result in an increase in quantity and funding. The CMWS low-rate initial production quantity increased by 141 systems to a total of 200. The Army procured all 200 of these systems, and deliveries are on schedule.

At the low-rate production decision point, the Army developed a new cost estimate for the program that featured a variety of different program assumptions. For example, program officials deleted 17 years of Contractors Logistics Support, reducing potential duplication, and deleted 29 training systems. As a result, program officials report that procurement cost was reduced by 17 percent.

Agency Comments. The Army concurred with this assessment and provided technical comments, which were incorporated where appropriate. Additionally, the Army commented that in January 2004, it directed the acceleration of CMWS for deployment on Operation Iraqi Freedom aircraft. Initial operational tests and evaluation will be completed during fiscal year 2005 for CMWS and in fiscal year 2006 for ATIRCM."

Funding

U.S. FUNDING

	FY04 QTY	FY04 AMT	FY05 QTY	FY05 AMT	FY06 (Req) QTY	FY06 (Req) AMT	FY07 (Req) QTY	FY07 (Req) AMT
RDT&E (U.S. Army)								
PE#0604270A								
L20 ATIRCM/CMWS	-	0.0	-	7.2	-	7.1	-	10.8
Procurement (U.S. Army)								
ASE IRCM	-	112.8	-	271.1	-	211.2	-	266.2

	FY08 (Req) QTY	FY08 (Req) AMT	FY09 (Req) QTY	FY09 (Req) AMT	FY10 (Req) QTY	FY10) (Req) AMT	FY11 (Req) QTY	FY11 (Req) AMT
RDT&E (U.S. Army)								
PE#0604270A								
L20	-	14.6	-	11.0	-	12.2	-	13.2
Other Funding (U.S. Army)								
ASE IRCM	-	343.2	-	420.7	-	317.8	-	243.5

All US$ are in millions.

Recent Contracts

(Contracts over $5 million)

Contractor	Award ($ millions)	Date/Description
BAE Systems	125.0	Jan 2002 – Time-and-material contract with cumulative total of $125,000,000 for technical support services of the ATIRCM/CMWS. Services include, but are not limited to, engineering support associated with the development of new jamming codes to counter emerging threats, contractor logistics support, system installation into other aircraft to support DoD and FMS sales requirements, software support, and integration of product improvements. To be completed January 2007. (DAAB07-02-D-B201)
BAE Systems	6.9	Nov 2003 – Mod to FFP contract for five Common Missile Warning Systems and mission spares. Complete December 2004. (DAAB07-02-C-B213)
BAE Systems	25.3	Apr 2004 – Mod to an FFP contract for 13 ATIRCM/CMWS systems and 40 CMWS systems. Complete March 2004. (W15P7T-04-C-J404)
BAE Systems	484.0	Sep 2004 – Ceiling value ID/IQ five-year contract for 484 ATIRCM/CMWS systems. Consists of LRIP, spares, test equipment, and support. The first order for 50 CMWS system on September 10, 2004 was valued at $27.8 million. (W15P7T04RJ032)

Timetable

Month	Year	Major Development
	1991	First RFP issued
	1994	Program switched to a tri-service effort, demonstration/evaluation
Jan	1995	ATIRCM merged with AF/Navy AMWS program
Apr	1996	Test & Evaluation Master Plan approved
4Q	1995	EMD contract awarded for ATIRCM/CMWS
Jun	1996	PDR completed
	1997	Laboratory evaluations begin
Jun	1997	Contract for AH-64D integration, baseline schedule changes approved
	1998	Demonstration test and evaluation started
Jan	1998	CMWS selected for U.K. WAH-64 Longbow Apache Attack Helicopters
Jun	1998	Successful demonstration of ATIRCM/CMWS integration
1Q-4Q	FY99-00	ATIRCM/CMWS operational testing
Mar-Sep	2001	MS III objective/threshold

Month	Year	Major Development
2Q	FY02	LRIP
Mar	2002	Contract for 26 units for SOF Enduring Freedom
Early	2002	Operational Assessment
Feb	2002	100th CMWS delivered
4Q	FY02	Complete ATIRCM/CMWS EMD contract
Sep	2003	SOF Enduring Freedom installations completed
1Q	FY04	ATIRCM Milestone C Decision
2Q	FY04	LRIP contract award, First Unit Equipped – CMWS
1Q	FY05	Integration Testing Aerial Cable Range 2
2Q-3Q	FY06	IOT&E ATIRCM/CMWS
2Q-4Q	FY06-09	Incremental Improvements (including jam head miniaturization)
3Q	FY06	First Unit Equipped - ATIRCM
4Q	FY06	ATIRCM Full-Rate Production Decision
	2023	Last projected procurement (GAO)

Worldwide Distribution

The **United Kingdom** is installing the system on its WAH-64 attack helicopter as part of the Helicopter Integrated Defensive System.

The **United States** will be installing the AAR-57(V) as part of the ATIRCM/CMWS system and in several stand-alone versions.

The **Australian** Defence Organization Project 5406 six-year collaborative Research, Development, and Engineering program with the U.S. included collaborative technology and technique development, modeling and simulation, laboratory demonstration of integration concepts, and field demonstrations. The ALQ-212(V) SIIRCM is one of the programs involved. The aim of Project 5406 was to develop local capabilities and processes that provide self-reliant support for the Australian Defense Force's present and future aircraft ASE programs. Other programs involved are the ALQ-211(V) SIRFC and AVR-1(V) Laser Detection System.

Forecast Rationale

Today's seeker heads make older IRCM equipment nearly unable to decoy a missile attack. Early missiles targeted hot spots, principally the tailpipe of an aircraft, because of energy wavelength limits to seeker heads. Flares and arc-lamp sources could generate alternate hot spots or induce guidance errors to decoy a missile away from the protected aircraft.

Sensor technology makes it possible for seekers to operate at longer wavelengths so they can detect and home in on engine exhaust, hot engine parts, and other heat sources on an aircraft. The warmth of an aircraft's skin against a cold sky background is enough thermal contrast for targeting.

Third-generation focal plane arrays are now commonplace, so more discriminating guidance circuits can reject all but the most sophisticated flares. Staring focal plane arrays in seeker heads are less susceptible to the modulated decoy energy generated by current IRCM systems, so missiles are relatively immune to today's countermeasures.

The advances that made the new seekers possible also made better protection feasible. Staring arrays and sophisticated controls can be combined with efficient laser generators to produce a find-point-shoot countermeasures capability for helicopters, slow-moving transports, and Special Mission aircraft.

An important feature of the ATIRCM/CMWS program is its dual nature. Aircraft could receive an ALQ-212(V) combined suite or just the AAR-57(V) CMWS, making more applications possible. Directable countermeasures may not be adaptable to all fast-moving attack and fighter aircraft, but a missile warning sensor is. This takes advantage of economies of scale in both R&D and production.

The Pentagon will procure DIRCM and ATIRCM/CMWS, with increased pressure to correct CMWS's problems. This has the advantage of keeping two DIRCM suppliers in the industrial base.

The Air Force and Navy decisions to not procure the AAR-57(V) impacted their CMWS-only installations, not protection suites. They are more invested in the AAQ-24(V) DIRCM.

On the other hand, Special Operations decided to procure CMWS units on a rush basis to support helicopters taking part in Operation Enduring Freedom. AAR-57(V) units have been produced at a steady rate and will continue to be so for the near term, supporting both ATIRCM/CMWS requirements and a stand-alone requirement.

Ten-Year Outlook

ESTIMATED CALENDAR YEAR PRODUCTION

			High Confidence Level				Good Confidence Level				Speculative			
Designation	**Application**	**Thru 04**	**05**	**06**	**07**	**08**	**09**	**10**	**11**	**12**	**13**	**14**	**Total 05-14**
AAR-57(V) CMWS	VARIOUS (VARIOUS)	131	50	55	85	110	90	72	60	75	45	24	666