CIRCM & ADIRCM & JATAS & Future Fast Jet DIRCM

Status: New Development
System Type: Airborne Directed IR Countermeasures (DIRCM) & Missile Warning System (MWS)

Program Briefing

TADIRCM (Tactical Aircraft Directed IR Counter Measures) was a US Navy development program for an IR missile countermeasures system for tactical aircraft (fast jets), originally planned for the F/A-18E/F, to be carried in a wing-mounted pod. Raytheon, Northrop Grumman, and BAE Systems all participated in TADIRCM development, but following an initial suitability assessment completed in 2006, the program was split (into Assault DIRCM and Strike DIRCM) and postponed.

In mid-2007, the Navy instead planned to fully fund a four-year development program for ***JATAS (Joint Allied Threat Awareness System)***, a next-generation IR-sensor missile warning system, beginning in 4QFY08. Although only JATAS MWS development was funded, the Navy still referred to the overall program as Assault DIRCM (the Navy planned to request funding for the DIRCM portion beginning in FY10). In September 2008, the Navy issued a draft RFP for JATAS, with technology development (TD) contracts awarded to ATK/BAE Systems and Lockheed Martin in September 2009, to be followed by a down-select to a single company for SDD in FY11. In July 2011, NAVAIR awarded Alliant Techsystems (ATK) and BAE a $109.2 million contract for JATAS EMD.

But by March 2014, the Navy planned to end the JATAS program in FY14 in accordance with an Acquisition Decision Memorandum (ADM). Remaining funds in FY15 would be realigned to the Army-led CIRCM instead. All JATAS tasks after FY14 were removed from the budget.

The Navy eventually wanted a full ***Assault DIRCM*** suite for almost 1,000 small and large helicopters and the MV-22. IOC for the full DIRCM system was originally planned for FY15, but then the Army took over as lead developer of a redesignated ***Common IRCM (CIRCM)*** program. CIRCM became essentially a next generation, smaller and lighter ATIRCM, since BAE Systems' Army ATIRCM never reached series production after two decades of continuing development problems (see report). CIRCM will utilize the platforms' existing MWS (the Army's AN/AAR-57(V) CMWS and the Navy's AN/AAR-47, both with older UV-sensors). In January 2012, the Army awarded 21-month CIRCM TD contracts to Northrop Grumman and BAE Systems. Milestone B was planned for 1QFY15, with an EMD award to be announced in 2QFY15.

In August 2015, Northrop Grumman finally won the CIRCM engineering and manufacturing development (EMD) and low-rate initial production (LRIP) contract, beating BAE Systems for this potentially huge program. BAE Systems had finally been shut out of the DIRCM market that they had essentially created when they (as Lockheed Sanders) won the Army development contract for ATIRCM in 1991.

In February 2016, the FY17 OCO budget funded initial production of 76 CIRCM B-kits for Army and Special Operations Forces, to be delivered beginning in November 2017, at a rate of 10 per month.

The overall Army Procurement Objective (APO) for CIRCM is 1,076 (B-Kits only), potentially worth more than $3 billion, and the Navy still wants nearly 1,000 DIRCM systems for helicopters and light aircraft as well.

Surprisingly, despite public dedication to the joint CIRCM program, the Navy continued to develop ***Assault DIRCM*** somewhat on the sly – or as the Navy budget reports, "PMA272 has funded this Future Naval Capability (FNC) since 2006 as a risk mitigator for both JATAS and the CIRCM system. By February 2016, an early production system was ready and funded in the FY17 OCO procurement budget with $27.5 million for 12 systems to be installed in 2017-18 on three different helicopter types – the USMC's AH-1Z and UH-1Y, and the Navy's MH-60S. The new system, now referred to as ***ADIRCM***, is being produced by DRS Technologies and Daylight Solutions (who also produce the lasers for CIRCM).

When TADIRCM was split by the Navy a decade ago, it envisioned both Assault DIRCM for helicopters and ***Strike DIRCM***, which would eventually use TADIRCM technology to develop a podded family of systems for fast jets. Strike DIRCM was seemingly unfunded for years, but plans were for Strike DIRCM to debut with a third generation MWS with four to six two-color staring sensors providing a full sphere of coverage. There would be one or two lasers and a compact pointer/tracker for the DIRCM itself.

To some degree coming full circle, in August 2016 the US Air Force awarded Northrop Grumman a $39.3 million, five-year contract for development efforts as part of the ***STRAFE (SHiELD [Self-protect High Energy Laser Demonstrator] Turret Research in Aero-Effects)*** Advanced Technology Demonstration (ATD) program, for a laser-based self-defense DIRCM system for pod-mounting on fast jets, now initially planned as the F-15 and F-16. The USAF expects to begin flight testing the integrated system by 2019.

With STRAFE currently just beginning a five-year ATD program, a major ***Future Fast Jet DIRCM*** production program is probably still at least a decade away, but we include speculative forecasts.

Executive

US Navy
Air Systems Command (NAVAIR)
47123 Buse Rd., Unit 2272
Patuxent, MD 20670-1547
tel: (301) 342-1487

United Kingdom
Ministry of Defense (MoD)
Main Building
Whitehall, London SW1A 2HB
tel: (+44 171) 218 90 00

US Army
Communications and Electronics Command (CECOM)
Ft. Monmouth, NJ

Manufacturers

Primes

Northrop Grumman Systems Corp.
Rolling Meadows, IL
(CIRCM)

DRS Technologies
(a Leonardo Company)
Dallas, TX
(ADIRCM co-prime)
(Leonardo was Finmeccanica)

Daylight Solutions
15378 Avenue of Science, Suite #200
San Diego, CA 92128
tel: (858) 432-7500
fax: (858) 432-5737
(ADIRCM co-prime)

Raytheon Technical Services
Indianapolis, IN
(TADIRCM EOA co-prime; pod)

Galaxy Scientific Corp.
Egg Harbor, ME
(TADIRCM EOA co-prime)

Subcontractors

- BAE Systems, Information & EW Systems (IEWS), Nashua, NH: TADIRCM EOA laser jammer
- Daylight Solutions, Inc., San Diego, CA: Lasers for CIRCM and ADIRCM (11/16)
- DRS Technologies, Dallas, TX: TADIRCM EOA 2-color IR MWS
- Johns Hopkins University, Columbia, MD: Studies & analysis ($0.6M, 4/05)
- Macauley Brown, Inc., Dayton, OH: Studies & analysis ($0.3M, 4/05)
- Selex ES, Edinburgh, Scotland: Teamed with Northrop Grumman for CIRCM (8/15)
- Tekla: Systems engineering ($2.6M, 9/05; $0.4M, 3/06)

Other Contractors

- BAE Systems, Pomona, CA: Fast Jet DIRCM (Program Manager is Bob Delaney, Ron Gidseg is Principle Systems Engineer, Phong Ha is Principle Software Engineer, Norm Wilcox is Section Manager)
- BAE Systems, Information & EW Systems (IEWS), Nashua, NH: Participant in TADIRCM development, with Agile Eye system
- Northrop Grumman Corp., Electronic Systems, Rolling Meadows, IL: Participant in TADIRCM development, with WANDA system

Functional Description

CIRCM Configuration (February 2016)

The ***Common Infrared Countermeasure (CIRCM)*** is an infrared (IR) countermeasure system that interfaces with a Missile Warning System (MWS) to provide near spherical protection of the host platform in order to defeat IR-guided threat missiles. The CIRCM will provide the sole acquisition of future laser-based IR countermeasure systems for all rotary-wing, tilt-rotor, and small fixed-wing aircraft across the Department of Defense.

Currently, plans are for CIRCM to utilize the platforms' existing MWS – the Army's AN/AAR-57(V) CMWS and the Navy's AN/AAR-47, both with older UV-sensors.

The Army's concept of CIRCM is part of the Suite of Integrated Infrared Countermeasures (SIIRCM). The core components of the SIIRCM concept are: a MWS, IR expendables countermeasures (flares), and a laser-based Infrared Countermeasure (IRCM). The SIIRCM detects, declares and initiates IRCM against IR-guided Surface-to-Air Missiles (SAM) or Air-to-Air Missiles

(AAM). The CIRCM is the next generation of the laser-based IRCM component and will interface with both the Army's Common Missile Warning System (CMWS) and future missile warning systems.

The A-Kit for CIRCM includes mounting hardware, wiring harnesses, and other components necessary to install and interface the mission kit on host aircraft. The A-Kit ensures the mission kit is functionally and physically operational with a specific host aircraft type.

The CIRCM B-Kit is the mission kit (laser, pointer tracker, and controller) required to achieve near spherical coverage for an aircraft.

The overall Army Procurement Objective (APO) for CIRCM is 1,076 (B-Kits only), potentially worth more than $3 billion.

ADIRCM Configuration (February 2016)

The ***Assault Direct Infrared Countermeasures (ADIRCM)*** is a lightweight Threat Warning System (TWS) and IRCM developed by the Navy Research Lab under an FY04 Office of Naval Research Future Naval Capability (FN04-03), Integrated E/O IR Self Protect Suite for Rotary Wing Aircraft. PMA272 has funded this Future Naval Capability (FNC) since 2006 as a risk mitigator for both the Joint and Allied Threat Awareness System (JATAS) and the Common Infrared Countermeasures (CIRCM) system.

The ADIRCM system offers significant savings in size, weight and power (SWaP) and cost avoidance. The system consists of a centralized processor and laser with high power fibers leading to two-color IR sensors. Each sensor incorporates a pointer tracker, which allows the laser energy to be focused on incoming threats. ADIRCM provides increased survivability against surface-to-air IR missiles, laser guided threats, small arms, anti-aircraft artillery (AAA), machine guns, and rocket propelled grenades for combat & assault rotary-wing and fixed wing aircraft.

The ADIRCM configuration on these aircraft will include one processor, one laser and four sensors. The US Navy's MH-60S is the lead platform with ADIRCM installation currently planned for 2017-18. The US Marine Corps' UH-1Y and AH-1Z are also scheduled for ADIRCM installation from 2017-18.

TADIRCM/Strike DIRCM Configuration

The following description applies to the original TADIRCM project, which was expected to lead to Strike DIRCM.

The ***TADIRCM (Tactical Aircraft Directed IR Counter Measures)*** will be optimized for fast combat jets. Two primary changes are needed to ATIRCM and DIRCM. Both ATIRCM and DIRCM rely on missile cueing from UV-type MWSs (AN/AAR-57(V) CMWS and AN/AAR-54 PMAWS), which detect UV radiation from a missile's rocket engine. TADIRCM specifies an IR-type staring (non-rotating) sensor, which has a longer range and better clutter rejection, and operates at different wavelengths to minimize false alarms. A disadvantage of IR-type systems is the need for cryogenic cooling, adding weight and expense.

The other change needed is a smaller jammer head, in this case exclusively for a laser jammer. Current designs feature a small gimbaled laser under a faceted dome. For aerodynamic reasons, this dome must be considerably smaller that the human-head-sized DIRCM and ATIRCM jammer heads.

TADIRCM originated as an advanced technology development (ATD) program, with most funding coming from BAE Systems and Northrop Grumman for in-house developments. BAE Systems's TADIRCM has about 60% commonality with ATIRCM, but with a miniaturized "Agile Eye" jam head. Northrop Grumman's TADIRCM is called "WANDA", with the Viper mid-infrared laser in a 5.5" dome.

The UK's Fast Jet Directed Infrared Countermeasures (DIRCM) system will acquire and track IR-guided missile threats and point a high-power laser jammer, to protect UK Tornados and possibly Eurofighters. BAE Systems will further develop its DART (Defensive Avionics Receiver Transmitter) for the program, integrated with a laser warner and the company's AN/AAR-57(V) Missile Warning System. BAE Systems' DART Program Manager, Robert Delaney, has referred to DART as a "next-generation TADIRCM", incorporating simplified optical paths and multiple electro-optical/infrared interfaces. It is also smaller than TADIRCM.

Platforms

TADIRCM was initially planned for tactical aircraft such as the F/A-18E/F, but would also offer advantages for fast transports such as the C-17.

Fast Jet DIRCM was intended for Panavia Tornados and perhaps Eurofighter and other platforms.

Initial ADIRCM production in 2017-18 is for the US Navy's MH-60S helicopter (the lead platform), as well as the US Marine Corps' UH-1Y and AH-1Z helicopters.

Variants/Related Systems

The initial version will probably be for the F/A-18E/F, but will be easily convertible to other platforms.

AN/AAQ-24(V) NEMESIS—NEMESIS is a Directed Infrared Countermeasures (DIRCM) system being developed by Northrop Grumman. NEMESIS lost to Sanders for the ATIRCM EMD contract, but was selected by the British Ministry of Defense. It will go into production before ATIRCM, in part because it uses a less advanced noncoherent source of IR energy rather than a laser countermeasure.

AN/ALQ-212 ATIRCM & AN/AAR-57 CMWS—Lockheed Martin Sanders' Advanced Threat Infrared Countermeasures/Common Missile Warning System lost to the comparable AN/AAQ-24 for the

UK/US SOCOM DIRCM requirement, but won the much more valuable ATIRCM competition. It uses a laser countermeasure beam, and will not enter service for at least two years after the AAQ-24. The CMWS is based on Loral's AN/AAR-47.

FLASH—DASA's Flying Laser Self-defense system against seeker-Head missiles (FLASH) is an IR countermeasures system which will use a high power laser, to burn out a missile's focal plane array, instead of simply misdirecting it. Ground testing is planned for early 2000, with flight testing around 2002.

Specifications

	TADIRCM EOA
Weight:	600 lbs.
Dimensions:	14" Diameter x 142" long
Flight Envelope:	Limited

Funding History

RDT&E ($ Millions)	FY09	FY10	FY11	FY12*	FY13	FY14*	FY15	FY16*	FY17**	FY18**
PE# 0604272N TADIRCM										
Proj. #3040 TADIRCM	35.3	49.1	—	—	—	—	—	—	—	—
Proj. #3166 CH-53 DIRCM TAP	3.9	—	—	—	—	—	—	—	—	—
Proj. #3302 JATAS	—	—	50.2	64.1	62.2	30.6	0.1**	—	—	—
Proj. #3304 CIRCM	—	—	—	—	4.0	3.3	5.7	19.0	72.9	38.0
PE# 0604270A Electronic Warfare Development										
Proj. #L20 ATIRCM/CMWS	20.9	132.3	187.7+	—	—	—	—	—	—	—
Proj. #VU7 CMWS	—	—	—	17.1	8.8	2.9	—	—	—	—
Proj. #VU8 CIRCM	—	—	—	0.2	39.5	110.9	—	—	—	—
PE# 0605035A Aircraft Survivability Development										
Proj. #EB4 CIRCM	—	—	—	—	—	—	101.3	101.6	107.9	106.7
Proj. #EE4 CMWS	—	—	—	—	—	—	53.6	—	—	—
PE# 0605051A Aircraft Survivability Development										
Proj. #ER8 CMWS CIRCM	—	—	—	—	—	—	—	16.7	61.6	n/a

Procurement ($ Millions)	FY09	FY10	FY11	FY12	FY13	FY14	FY15	FY16*	FY17**	FY18**
Navy Procurement										
JATAS	—	—	—	—	—	17.6**	—	—	—	—
ADIRCM	—	—	—	—	—	—	—	—	27.5	—
Army Procurement										
CIRCM	—	—	—	—	—	—	—	—	108.7	6.3

**Appropriation*
***Request*
+Primarily funding for CIRCM, CMWS, HFDS

Costs

Earlier, the Navy's ***Assault DIRCM*** unit cost was likely to approximate ATIRCM and DIRCM costs, probably being a bit more expensive, or about $2.2 million, including missile warning sensors, installation and other costs.

In February 2016, the FY17 OCO budget funded 12 ***ADIRCM*** systems for three US Navy/USMC helicopter types, at a unit cost of about $2.0 million, plus another $350,000 per helicopter in support costs.

Earlier, we estimated that if the Army's ***CIRCM*** materialized as a sub-120 lb. system for smaller helicopters, it could cost less, perhaps $1.6-1.8 million per platform, also including missile warning sensors, installation and other costs.

In February 2016, the FY17 OCO budget funded initial production of 76 CIRCM B-kits, at a unit cost of $1.2 million, or $1.5 million when including initial installation and support

costs. But note that this is only B-kit cost, which is somewhat misleading – total cost for adding CIRCM to each aircraft will be much higher than $1.5 million. When adding the A-kit – basically everything that needs to be added *to the aircraft* to make the sensors and lasers work – actual unit cost might jump to $2.5 million or more. And this additional $1+ million A-kit unit cost is currently being hidden in platform or other funding lines. It is not broken out in DoD budget documents, meaning the true CIRCM cost is not obvious.

The CIRCM B-Kit is the mission kit (laser, pointer tracker, and controller). The A-Kit includes mounting hardware, wiring harnesses, and other components necessary to install and interface the mission kit on host aircraft. The A-Kit ensures the mission kit is functionally and physically operational with a specific host aircraft type.

Within CIRCM, the JATAS MWS system might compose about $300,000 of CIRCM B-kit unit cost.

Earlier, ***Strike DIRCM*** unit cost in full-rate production would likely have been greater than $3 million (including missile warning sensors), more than ATIRCM and DIRCM, but perhaps less than LAIRCM.

Program Overview

History

UK's Fast Jet Program

The UK's MoD has been conducting a similar program for tactical aircraft, the "Fast Jet" program, and has already tested MWSs.

Lockheed Martin Sanders Programs

Sanders's TADIRCM has about 60% commonality with ATIRCM. A major development has been the "Agile Eye" miniaturized jam head, which has already undergone flight tests aboard a P-3. TADIRCM is in the evaluation phase.

Northrop Grumman Programs

Northrop Grumman has been developing the MIMS-2000, a missile warning system with two-color staring IR sensors. It has already been tested for the UK's "Fast Jet" program.

Northrop Grumman's IRCM system is called WANDA, with a "Viper" solid-state laser in a 5.5" dome. WANDA is in the demonstration phase.

Raytheon Programs

Although Raytheon does not have the background of ATIRCM or DIRCM to build upon, they are developing an IR-type missile warning system which could be offered for at least part of TADIRCM. Raytheon's Santa Barbara Research Center has developed a stacked mercury-cadmium telluride sensor which operates simultaneously in the mid- and far-IR bands.

TADIRCM Testing

In November 2001, a US Navy QF-4 drone equipped with BAE Systems' Agile Eye TADIRCM laser jammer successfully defeated a shoulder-fired SAM missile, completing the TADIRCM Advanced Technology Development (ATD) program.

BAE Systems Chosen for UK Fast Jet DIRCM Development

In January 2002, the UK Ministry of Defense (MoD) awarded BAE Systems, Pomona, CA a 3.9 million pound ($5.6 million) technology demonstration contract for the Fast Jet Directed Infrared Countermeasures (DIRCM) program. The Fast Jet system will acquire and track IR-guided missile threats and point a high-power laser jammer, to protect UK Tornados and possibly Eurofighters. BAE Systems will further develop its DART (Defensive Avionics Receiver Transmitter) for the program, integrated with a laser warner and the company's AN/AAR-57(V) Missile Warning System. BAE Systems' DART Program Manager, Robert Delaney, has referred to DART as a "next-generation TADIRCM", incorporating simplified optical paths and multiple electro-optical/infrared interfaces. It is also smaller than TADIRCM. Laboratory and field trials over the next two years will demonstrate the system's compatibility with several laser systems. Flight trials could follow. Much work will be conducted at the Pomona, CA facility.

Fast Jet DIRCM DART Delivered

In August 2004, BAE Systems completed hardware delivery for Fast Jet DIRCM, including DART. DART was to begin range and flight demonstrations in the UK and US in early 2005, as the final phase of the Technology Demonstration Program (TDP).

Assault DIRCM RFI

In November 2005, the Advanced Tactical Aircraft Protection (PMA-272) Program Office of NAVAIR, Patuxent River, MD, announced the Navy is seeking information from industrial sources with the capability to develop, test, produce, and support a DIRCM for Navy/Marine Corps helicopters.

This information will be used to determine the viability and makeup of a Navy Assault DIRCM acquisition program. A detailed request for information (RFI) has been posted at the NAVAIR Homepage. The NAVAIR Homepage is located at http://www.navair.navy.mil/. The Assault DIRCM RFI will be found under solicitation number N0001906P1PQ009. SOL is N00019-06-P1-PQ009.

TADIRCM EOA Completion

The management and acquisition strategy for TADIRCM has entailed a competitive phased approach to reduce risk to cost and schedule through viable competition. The Early Operational Assessment (EOA) project awarded two contracts for pointer/tracker/laser development , one contract for pod development, and one contract for missile warning sensors, with the Naval Research Lab serving as technical lead in integration of these systems. The Navy then selected one contractor in FY05 for the pointer/tracker/laser, at the fabrication point, to ensure the project did not exceed budget and can be executed on schedule.

Assault DIRCM Status

The Navy's Assault DIRCM program for helicopters is now anticipated to be a spiral upgrade to the Army's ATIRCM, but the lead contractor has yet to be determined (meaning BAE Systems does not have it locked up yet, especially if ATIRCM problems continue). The Army and Navy will pursue a common solution on a joint set of requirements.

However, in mid-2006 Assault DIRCM was under review by the Navy, meaning further delays and an increased likelihood of a simple buy in to ATIRCM at some point. An Analysis of Alternatives (AoA) was planned for 3QFY06.

In mid-2006, Navy requirements called for 400 systems.

Strike DIRCM Status

The Strike DIRCM program will maximize use of TADIRCM technology developed under the EOA, to develop a podded family of systems for fast jets. The program will redesign/repackage components to survive the tactical aircraft environment, and will conduct tests to verify system performance meets the tactical environment.

In mid-2006, Navy requirements called for 100 systems.

CH-53E DIRCM TAP

In 2006, The US Navy/Marine Corps CH-53E DIRCM Technology Assessment Program (TAP) was contracted to Northrop Grumman, funded in PE# 0604272N . It will assist in evaluating the most applicable IRCM system to protect the CH-53E helicopter fleet from the threat of shoulder fired infrared (IR) missiles. The TAP will evaluate the performance of five different variations of currently available IRCM systems/capabilities, with test and evaluation methodology also applicable to other Navy/Marine Corps helicopters, including the MH-60S/R, MV-22, UH-1 and AH-1.

The baseline system will be Northrop's AAQ-24 DIRCM, with two GLTA jamheads. The 5 variations of IRCM systems to be evaluated include: 1) Navy baseline ASE for these helicopter, non-imaging ultraviolet (UV) missile warning sensors (MWS) cueing flares, 2) imaging UV MWS cueing flares (allowing for faster timelines, and angle of arrival specific flare dispensing), 3) imaging IR MWS cueing flares (allowing for even faster timelines, and angle of arrival specific flare dispensing), 4) imaging UV MWS cueing a directional infrared countermeasures (DIRCM), and 5) imaging IR MWS cueing a DIRCM.

Flight tests were conducted in the summer of 2006, with TAP assessment planned for September 2006.

ITT Tests the Water

In July 2007, ITT Electronic Systems (Clifton, NJ) successfully demonstrated a new integrated laser pointer/tracker on a UH-60 helicopter. Clearly ITT hopes to be able to capture at least a part of the huge new DIRCM market, much as Raytheon began DIRCM developments a year ago.

JATAS MWS to Precede Assault DIRCM

In mid-2007, the Navy planned to fully fund a four-year development program for JATAS (Joint Allied Threat Awareness System), a next-generation IR-sensor missile warning system, beginning in 4QFY08. Although only JATAS MWS development is funded, the Navy is still referring to the overall program as Assault DIRCM. The Navy plans to request funding for the DIRCM portion beginning in FY10.

The Navy eventually wants Assault DIRCM for almost 1,000 small and large helicopters, and the MV-22. IOC for the full DIRCM system is tentatively planned for FY15 (many shoot-downs in the future; one wonders why the Navy will keep buying impervious F/A-18E/Fs and bloated and unnecessary DDG-1000s, instead of funding defenses for servicemen who are actually being shot and killed; I hope pork politicians *don't* sleep easy…).

An Assault DIRCM/JATAS SDD contract is expected to be awarded in the summer of 2008. Likely bidders include Northrop Grumman and BAE Systems, and now Raytheon and ITT Electronic Systems.

Strike DIRCM Further Out

Strike DIRCM is also unfunded, with the Analysis of Alternatives study now complete. Though the alternatives will certainly change by the time it is ready, the plans are for Strike DIRCM to debut with a third generation MWS with four to six two-color staring sensors providing a full sphere of coverage. There will be one or two lasers and a compact pointer/tracker for the DIRCM itself.

Earlier in 2007, the Navy tested 11-inch diameter DIRCM pod (presumably the TADIRCM pod) on a Super Hornet wing station with good results.

Hostile Fire Indicator for Assault DIRCM JATAS

In September 2007, NAVAIR announced it was soliciting information from industry concerning a Hostile Fire Indicator (HFI) capability for Marine Corps and Navy rotary wing and tilt rotor aircraft. The purpose of this RFI is to determine the maturity of the technology required to implement a HFI capability. NAVAIR intends to use this data to aid in defining

an acquisition strategy and assessing risks involved with implementing a HFI capability on USMC and USN aircraft.

The HFI capability should detect ballistic threats such as small arms, RPGs, and AAA directed at the aircraft. Once hostile fire is detected and declared, the HFI should provide the aircrew with a warning of the presence of hostile fire and provide a bearing to the HF. Specific threats to be detected are identified in a classified specification (please contact Don Harwood (Assault DIRCM Engineer), tel: (301) 757-7909). The HFI technology may be integrated with the Joint and Allied Threat Awareness System (JATAS) for control and display or as an integral part of the JATAS. The HFI technology should have enough growth potential to include new threats as they emerge. Aircraft targeted to have the HFI capability are the MV-22, CH-53K, AH-1Z, UH-1N, MH-60R and MH-60S, and potentially KC-130.

Proposed technology should be capable of being deployed on these USMC and USN aircraft beginning in 2014. Written responses to the RFI shall be no greater than 30 pages in length. Multiple RFI responses may be submitted for different technology solutions to the HFI requirement. SOL is N00019-06-P1-PQ009, due October 11, 2007. POC is Lorraine Rardin, tel: (301) 757-7074, fax: (301) 757-7054, email: lorraine.rardin@navy.mil.

Navy IRCM Solicitation

In October 2007, the Office of Naval Research (ONR), Naval Research Laboratory (NRL), Washington, DC, had a requirement for the research and development of new technologies for IRCM systems that exploit the optical spectrum from infrared through ultraviolet to support military aircraft and ship systems. The areas of technical investigation will be broad, but with emphasis on electro-optical and infrared (EO/IR) systems and techniques for countering infrared guided missile threats to tactical aircraft. NRL anticipates an award of a CPFF type contract. Personnel proposed to work on the resultant contract shall have a Secret clearance or shall be eligible for the aforementioned clearance prior to contract commencement. The contractor shall have at least a Secret facilities clearance and Secret storage capabilities prior to contract commencement. Period of Performance will be one (1) year with three (3) one-year options. SOL is N00173-08-R-LS01, POC is Lisa Fleming, tel: (202) 767-3739, fax: (202) 767-6197, email: lisa.fleming@nrl.navy.mil. POP is 4555 Overlook Ave., SW Washington, DC 20375.

JATAS Draft RFP

In September 2008, the Navy issued a draft RFP for JATAS, with a two-company technology development period planned for late FY09, to be followed by a down-select to a single company for SDD in FY11, following a Milestone B decision.

In July 2008, Alliant Techsystems (ATK) announced it would partner with BAE Systems (with ATK as prime) to bid for JATAS.

Northrop Wins USAF NexGen MWS

In October 2008, Northrop Grumman's two-color infrared sensor technology won the USAF's NexGen MWS competition, beating Lockheed Martin's one-color seeker (based on the F-22's AN/AAR-56). The Navy awarded Northrop a $5.5 million contract to begin production. Northrop will deliver an initial 18 LRIP units, to be followed by full-rate production after further testing. The C-17 will likely get the first upgrades.

A different version of Northrop's system is also being developed for the Navy's JATAS program, another version (MIMS) is in production for US Marine Corps CH-46 and CH-53D/E helicopters.

ATK/BAE and Lockheed Martin for JATAS

In September 2009, the US Navy awarded contracts worth a combined $65 million to Alliant Techsystems (ATK) (teamed with BAE Systems) and Lockheed Martin to design and develop JATAS prototypes by January 2011. The Navy rejected a competing bid from Northrop Grumman.

CIRCM Ideas

In late 2009, the US Army was developing ideas for CIRCM (Common Infrared Countermeasures), but had not yet established funding or selected contractors. An EMD contractor or contractors could be selected in mid-2010, with a June 2010 Milestone B decision and a 21-month EMD contract. The total installed CIRCM system should weigh less than 120 lbs. The Army's CIRCM point of contact is Darrell Quarles, tel: (256) 955-0304, email: Darrell.quarles@us.army.mil.

Thought to be interested in CIRCM are ITT, Northrop Grumman/Selex, and Raytheon/BAE Systems, all with laser jam-head systems, and possibly Alliant Techsystems/DRS Technologies with a distributed aperture system.

Assault DIRCM Becomes (Army) CIRCM; (Navy) JATAS Goes Ahead; Strike DIRCM Delayed

In the FY11 budget (February 2010), the schedule for Navy TADIRCM programs changed due to new guidance from OPNAV. An earlier Analysis of Alternatives (AoA) was conducted by OPNAV to assess the need for an advanced IRCM capability for assault aircraft (rotary wing/tilt rotor) and strike aircraft (fighters) against surface-to-air threats.

Conclusions from the AoA determined there was an immediate need for an advanced IRCM capability for assault aircraft, however, additional analysis was needed to evaluate strike aircraft IRCM requirements – hence, Strike DIRCM plans have been out on hold.

The AoA conclusion was that advanced missile warning technology was sufficiently mature to proceed into an Engineering and Manufacturing Development (EMD) program –

hence continued Joint and Allied Threat Awareness System (JATAS) funding under Navy leadership. In September 2009, competitive Technology Development (TD) phase contracts were awarded to two contractors, to conduct competitive prototyping prior to EMD. The EMD contract award is planned for FY11 with an Initial Operational Capability (IOC) date of FY14 planned.

The AoA determined that Assault DIRCM technology for small to medium USN/USMC rotary wing aircraft required further maturity of several technologies prior to EMD. Hence, the Navy has designated the Army as the lead service for developing a DIRCM capability for assault aircraft. Assault DIRCM, which has now been designated by the Army as the Common Infrared Countermeasures (CIRCM) program, has a planned Milestone B of FY11.

ATK Wins JATAS EMD

In July 2011, NAVAIR awarded Alliant Techsystems (ATK), Clearwater, FL a $109.2 million contract for engineering and manufacturing development of JATAS, after beating off a team of Lockheed Martin Missiles and Fire Control, Orlando, FL; DRS Infrared Technologies, Dallas, TX; and Goodrich ISR Systems, Danbury, CT. ATK is teamed with BAE Systems Electronic Solutions, Nashua, NH, which could perform about 40% of the development work.

CIRCM Delays

By late 2011, CIRCM program delays had grown to at least a year, despite all bidders claiming their systems were at or beyond technology readiness level (TRL) 6, required for development. These delays (and the eventual planned dates by early 2013) raised the continuing spectre of ATIRCM – the Army has just not been able to get its crucial requirement for IRCM up and running. In September 2011, the Senate Appropriations Committee (SAC) recommended cutting $67 million from CIRCM in FY12 – zeroing RDT&E. With EW's traditional vulnerability in times of budget cuts, in July 2011 Chris Carlson, director of business development for ITT Electronic Systems, said, "We're going to have to bring a lot more to the table in the long run for [CIRCM] to stay sold."

CIRCM for UAVs?

One spur to CIRCM development might be use on large unmanned aerial vehicles (UAVs), pitched by Raytheon in October 2011. "Raytheon is developing a family of directed infrared countermeasure solutions that can protect cargo aircraft and combat helicopters; unmanned is the next logical step", according to Mike Booen, vice president of Advanced Security and Directed Energy Systems for Raytheon Missile Systems. "Raytheon's DIRCM solutions are lighter [15 lbs. lighter than the Army CIRCM requirement], more reliable and draw significantly less power than other systems on the market today," said Booen.

CIRCM Equipment Offerings

As of late 2011, the five major CIRCM offerings (now down to two for TD) included "incumbent" BAE Systems' Boldstroke, with more than 80% computing and subassembly commonality with ATIRCM. Northrop Grumman is developing its CIRCM from AAQ-24 LAIRCM helicopter variants. ITT and Raytheon Missile Systems had both been developing low cost DIRCM systems for several years, with Raytheon's Scorpion/Quiet Eyes pointer-tracker incorporating the proven IR seeker from Raytheon's AIM-9X missile. The final bidder was a Lockheed Martin Missiles and Fire Control-led team. ITT, Raytheon, and Lockheed all planned to link their laser generator to multiple jam heads with fiber-optics, to save weight and improve capability, though there have been reliability issues in the harsh rotary-wing environment.

CIRCM Down-Select to Northrop and BAE Systems

In January 2012, the Army awarded 21-month Technology Development (TD) contracts to Northrop Grumman, Rolling Meadows, IL, and BAE Systems, Nashua, NH.

Milestone B is now planned for 1QFY15, with an EMD award to be announced in 2QFY15.

Exelis Protests CIRCM Loss, Unsuccessfully

From February through May 2012, Technology Development (TD-phase) work by Northrop Grumman and BAE Systems on CIRCM was halted as a protest by losing bidder Exelis was resolved, delaying the program by 4 months. Exelis' protest was eventually denied by the GAO.

Preliminary Design Review is now scheduled for July 2013, with delivery of prototype hardware for testing in September 2013.

CIRCM FUE Planned for… 3QFY19

In late 2012, CIRCM plans were for a LRIP decision in 3QFY17 and First Unit Equipped (FUE) in 3QFY19. Hardly the immediate needs program originally intended.

The total procurement objective for the US Army is still 1,076 systems.

HFI for JATAS

JATAS is planned to include hostile fire indication (HFI) threat detection capabilities, to provide accurate and timely warning of small arms, rocket-propelled grenades, and other ground fire in all flight regimes, ambient light conditions, clutter backgrounds, and weather conditions. So far, schedules and plans for HFI incorporation into JATAS are not definite, but it appears ATK – already contracted for an HFI software upgrade for the AAR-47 – may take over HFI development and incorporate it into the baseline JATAS. No word yet whether this will delay JATAS readiness, and ATK has a good record with its on-schedule AAR-47 upgrades, but Teal Group is wary that full base-

line HFI incorporation could result in capabilities creep reminiscent of the ATIRCM nightmare.

Army CIRCM EMD Funding: FY15

CIRCM has been undergoing TD-phase development and pre-MS B activities, with MS B approval anticipated in 1QFY15, followed by award of the EMD contract to one vendor in 2QFY15.

In the FY15 budget released in March 2014, planned FY15 RDT&E funding of $128.3 million will support CIRCM EMD, to include platform integration as well as integration with other Aircraft Survivability Equipment (ASE) systems.

The EMD contract will include priced options for Low Rate Initial Production (LRIP) 1 and 2, Engineering Support, A-Kit development for other aircraft, a Technical Data Package (TDP) (which will enable competition for Full Rate Production [FRP]), and Defense Exportability Features (DEF).

Upon CIRCM MS C approval in the second quarter of FY17, the LRIP and Engineering Support options may be exercised and the program may immediately enter the Production & Deployment phase. In March 2014, the Product Manager (PdM) Countermeasures intended to pursue competition for the award of a fixed price contract for CIRCM FRP if the option is exercised to procure the TDP.

Army CIRCM Testing Delays

Test schedule delays in March 2014 included A-Kit qualifications for CIRCM H-1 IOT&E changed from 3QFY17-1QFY18 to 3QFY18-1QFY19. B-Kit qualifications for CIRCM H-1 IOT&E changed from 2QFY18-4QFY18 to 2QFY18-4QFY19. All other tasks are on schedule and to be completed by the Army.

Navy CIRCM EMD Plans

CIRCM is a New Start for the Navy. CIRCM development is being led by the Army, but is ultimately intended for Army, Navy, and Marine Corps assault aircraft, and the Navy has RDT&E funding lines in place.

505AD LVL 3 = Navy JATAS Folded into CIRCM

In FY13, there was a successful demonstration of CIRCM-JATAS Initial Capabilities Document Interoperability in Lab Environment. FY14 was planned to see Critical Design Reviews and Technical Readiness Reviews. Eight (8) JATAS test articles were developed for various test events in FY13.

In March 2014, Navy plans were to end the JATAS program in FY14 in accordance with the Acquisition Decision Memorandum (ADM). Remaining funds in FY15 will be realigned to CIRCM (PU 3304). All tasks after FY14 were removed from the schedule profile.

CIRCM TD Development Add-Ons

In August 2014, the Army awarded Northrop Grumman and BAE Systems $10 million and $8 million contract add-ons, respectively, for limited-scope services for CIRCM RDT&E, with work to be completed by March 2015. The new contracts are for additional development and testing requirements for the technology demonstrators, including services for continued software development and design, as well as Guided Weapons Evaluation Facility testing, Laser Integration Test and Evaluation Lab testing, developmental testing, accelerated life test, pallet testing, and reliability characterization testing. The modifications also support engineering support for development of the AH-64E Apache kit and the development of a final Anti-Tamper plan.

Current Developments

Northrop Grumman Wins CIRCM EMD/LRIP

In August 2015, the Army Contracting Command, Redstone Arsenal, AL, awarded Northrop Grumman Systems Corp., Rolling Meadows, IL, a $35.4 million CPFF, fixed-price incentive, FFP hybrid contract with options for engineering and manufacturing development and low-rate initial production of CIRCM. Work will be performed in Rolling Meadows, IL, with an estimated completion date of October 2017. Bids were solicited via the Internet with two received (the other was undoubtedly BAE Systems). The full contract amount was obligated at the time of the award, as FY15 RDT&E funding (W58RGZ-15-C-0067).

Congressional Adds and OCO CIRCM RDT&E Funding

In February 2016, the FY17 Army budget for PE# 0605051A Aircraft Survivability Development shows FY16 Congressional Add funding of $16.7 million and FY17 OCO RDT&E funding of $61.6 million for integration efforts to support the Advanced Threat Warner and CIRCM Quick Reaction Capability (ATW & CIRCM QRC) solution in support of Joint Urgent Operational Needs Statement (JUONS) SO-0010 for the OIR theater of operations. The intent of the ATW & CIRCM QRC program is to reduce the SWaP that require operational tradeoffs that are associated with the Phase 2a solution.

FY16 development will begin ATW & CIRCM QRC development and qualification of the new Army ATW processor and the ATW transfer alignment function. Funding will also begin software integration with the current ATW processor. Efforts will also begin on A-Kit development/Integration. Efforts will also include Army systems engineering and program management efforts.

FY17 development will continue development and qualification of the new Army ATW processor and the ATW transfer alignment function; complete software integration with

the current ATW processor and begin the software integration with the new Army ATW processor; and continue QRC A-Kit development/Integration efforts for UH-60M, UH-60L, HH-60M, CH-47F, AH-64E, MH-47G and MH-60M. Funding will also support the modification of the JUONS SO-0010 Phase 2a A-Kit to accommodate the new Army ATW processor and CIRCM on all aircraft.

CIRCM Procurement Begins

In February 2016, the US Army budget provided FY17 OCO funding of $108.7 million to procure CIRCM B-kits for Army and Special Operations Forces.

The overall Army Procurement Objective (APO) for CIRCM is 1,076 (B-Kits only).

The Common Infrared Countermeasure (CIRCM) is an infrared (IR) countermeasure system that interfaces with a Missile Warning System (MWS) to provide near spherical protection of the host platform in order to defeat IR-guided threat missiles. The CIRCM will provide the sole acquisition of future laser-based IR countermeasure systems for all rotary-wing, tilt-rotor, and small fixed-wing aircraft across the Department of Defense.

The Army's concept of CIRCM is part of the Suite of Integrated Infrared Countermeasures (SIIRCM). The core components of the SIIRCM concept are: a MWS, IR expendables countermeasures (flares), and a laser-based Infrared Countermeasure (IRCM). The SIIRCM detects, declares and initiates IRCM against IR-guided Surface-to-Air Missiles (SAM) or Air-to-Air Missiles (AAM). The CIRCM is the next generation of the laser-based IRCM component and will interface with both the Army's Common Missile Warning System (CMWS) and future missile warning systems.

The A-Kit for CIRCM includes mounting hardware, wiring harnesses, and other components necessary to install and interface the mission kit on host aircraft. The A-Kit ensures the mission kit is functionally and physically operational with a specific host aircraft type.

The CIRCM B-Kit is the mission kit (laser, pointer tracker, and controller) required to achieve near spherical coverage for an aircraft.

Initial CIRCM Deliveries in 2017

In February 2016, the FY17 OCO budget funded initial production of 76 CIRCM B-kits, at a unit cost of $1.2 million, or $1.5 million when including initial installation and support costs.

These 76 systems are to be delivered beginning in November 2017, at a rate of 10 per month.

Note that this is only B-kit cost, which is somewhat misleading – total cost for adding CIRCM to each aircraft will be much higher than $1.5 million. When adding the A-kit, basically everything that needs to be added to the aircraft to make the sensors and everything else work, actual unit cost might jump to $2.5 million or more.

US Navy/USMC ADIRCM Procurement

In February 2016, the US Navy FY17 procurement budget outlined the current status of the Assault Direct Infrared Countermeasures (ADIRCM) program – previously a program very much under the radar. But by 2016, early production systems were ready and funded in the FY17 OCO procurement budget with $27.5 million for 12 systems to be installed in 2017-18 on three different helicopter types – the AH-1Z, UH-1Y, and MH-60S. The new system, now referred to as ADIRCM, is being produced by DRS Technologies and Daylight Solutions (who also produce the lasers for CIRCM).

ADIRCM is a lightweight Threat Warning System (TWS) and IRCM developed by the Navy Research Lab under an FY04 Office of Naval Research Future Naval Capability (FN04-03), Integrated E/O IR Self Protect Suite for Rotary Wing Aircraft. PMA272 has funded this Future Naval Capability (FNC) since 2006 as a risk mitigator for both the Joint and Allied Threat Awareness System (JATAS) and the Common Infrared Countermeasures (CIRCM) system. The ADIRCM system offers significant savings in size, weight and power (SWaP) and cost avoidance. The system consists of a centralized processor and laser with high power fibers leading to two-color IR sensors. Each sensor incorporates a pointer tracker, which allows the laser energy to be focused on incoming threats. ADIRCM provides increased survivability against surface-to-air IR missiles, laser guided threats, small arms, anti-aircraft artillery (AAA), machine guns, and rocket propelled grenades for combat, assault rotary-wing and fixed wing aircraft in theater.

The scope of the Joint Urgent Operational Needs Statement (JUONS) phase includes the non-recurring engineering (NRE) required to develop, integrate, and test all hardware, software, and firmware to field ADIRCM. Efforts will also include the manufacturing of ADIRCM test articles, test bench fixtures, fleet representative hardware, and system training. Two prime contractors, DRS Technologies and Daylight Solutions, will be awarded sole source contracts for the ADIRCM WRAs. During the JUONS phase, the ADIRCM system will be installed on the following USN/USMC aircraft identified in JUONS SO-0010: AH-1Z, UH-1Y, and MH-60S.

The ADIRCM configuration on these aircraft will include one processor, one laser and four sensors. The US Navy's MH-60S is the lead platform with ADIRCM installation currently planned for 2017-18. The US Marine Corps' UH-1Y and AH-1Z are also scheduled for ADIRCM installation from 2017-18.

Fast Jet Laser DIRCM Returns: USAF STRAFE/SHiELD Contract to Northrop

In August 2016, the USAF Air Force Research Laboratory (AFRL) awarded Northrop Grumman a $39.3 million, five-year CPFF contract for

development efforts as part of the STRAFE (SHiELD Turret Research in Aero-Effects) (SHiELD is Self-Protect High Energy Laser Demonstrator) Advanced Technology Demonstration (ATD) program, for a laser-based self-defense IRCM system for pod-mounting on fast jets.

Northrop will develop and deliver an advanced beam control system for integration as part of a larger program for a complete laser weapons system for USAF fighter aircraft – primarily the F-15 and F-16 (the pod would negate the stealth characteristics of the F-22 and F-35 JSF). The system will be tested on a tactical aircraft flying at speeds up to supersonic. The AFRL expects to begin flight testing the integrated system by 2019.

According to W. Mark Skinner, vice president, directed energy, Northrop Grumman Aerospace Systems, "Our Northrop Grumman-led team is integrating an innovative beam director with proven beam control technologies to help the Air Force define and successfully demonstrate a laser weapon capability for current and next generation aircraft…. The beam control system characterizes the flight environment for atmospheric disturbances that could distort the laser beam, acquires and tracks incoming targets, determines an aim point for the laser, then 'shapes' and focuses the outgoing beam on the target."

Northrop Grumman is developing the SHiELD beam control system under the segment of the ATD program known as STRAFE. The AFRL will integrate the STRAFE beam control system with a laser source, and power and cooling systems developed for the SHiELD ATD. Work will be performed at Redondo Beach, CA and Kirtland Air Force Base, NM, and is expected to be complete by August 2021. This award is the result of a competitive acquisition with three offers received (FA9451-16-C-0007).

According to some sources, the SHiELD laser would "destroy" incoming missiles, as opposed to diverting IR-guided missiles with flares – today's fighter defense. Northrop Grumman's website even shows an artist's illustration of just this happening (but it also shows a stealthy future UCAV carrying the laser, and pods are unstealthy…). However, as with Northrop's very successful LAIRCM countermeasures system for large and slow aircraft, airborne laser countermeasures systems typically do not have enough power to destroy missiles (certainly not enough to "blow them up" in picturesque fireballs), but instead lasers distract or disable the missile guidance systems. The Air Force does claim future pods will increase laser power output for greater effect/range, but again, missile destruction is unnecessary if the guidance system is disabled or destroyed, and missile diversion at long ranges will always be preferable to blowing up missiles at close ranges (this will also save on flight suit laundry needs…).

According to the Department of Defense (DoD), the STRAFE project will also increase knowledge and understanding of aero-optic disturbances in a supersonic environment by collecting data during engagement scenarios.

Teal Group Evaluation

CIRCM: The New ATIRCM, Delays and All?

In mid-2010, following a draft RFP in May, the US Army was expected to award at least two 21-month ***Common IRCM (CIRCM)*** technology development (TD) contracts in early 2011, with flight tests beginning in 2012. Plans called for CIRCM First Unit Equipped in 2017 and set a procurement objective of 1,076 systems for Army Apache, Black Hawk, upgraded Kiowa Warrior, and other helicopters, potentially worth more than $3 billion.

By February 2011, delays had slipped the planned TD contract award to the third quarter of 2011, with a two-year sole-source EMD contract planned for late 2013.

In January 2012, the Army finally awarded 21-month TD contracts to Northrop Grumman, Rolling Meadows, IL, and BAE Systems, Nashua, NH, with Milestone B planned for a not-right-around-the-corner 1QFY15 and an EMD award to be announced in 2QFY15. In late 2012, CIRCM plans were for a LRIP decision in 3QFY17 and First Unit Equipped (FUE) in 3QFY19. CIRCM was thus hardly the immediate needs program originally intended.

However, by March 2014, more than $100 million in annual CIRCM RDT&E funding was scheduled beginning in FY14, and the dates for Milestone B and EMD contract award had not slipped at all – still planned for 1Q and 2QFY15. Procurement funding was also in the FY15 budget, planned to begin in FY17.

In August 2015, the Army awarded Northrop Grumman the CIRCM engineering and manufacturing development (EMD) contract, with options for low-rate initial production (LRIP).

In February 2016, the FY17 OCO budget funded initial production of 76 CIRCM B-kits, to be delivered beginning in November 2017, at a rate of 10 per month.

By late 2014, ATIRCM – the current generation's planned "common" IRCM – was finally definitely dead, at least in the non-classified budgets. And, as of early 2014, the US Navy's ***JATAS (Joint Allied Threat Awareness System)*** missile warning system (MWS) had been folded into CIRCM, transferring future JATAS funding to CIRCM. CIRCM will initially utilize the platforms' existing MWS – the Army's AN/AAR-57(V) CMWS and the Navy's AN/AAR-47, both with older UV-sensors.

Thus, overall, the US seems to be serious about CIRCM, just not in as big a rush as previously claimed (the initial CIRCM B-kits to be delivered in 2017 can't be final configuration

versions, in part because procurement funding shrinks to only $6.3 million in FY18). On the other hand, this "serious but not immediate" need was also the case throughout 20+ years of ATIRCM development, so Teal Group believes CIRCM funding will stay strong, but actual production may continue to be delayed.

In terms of CIRCM production numbers, it is also the same ATIRCM promise all over again. In July 2010 the Defense Acquisition Executive (DAE) directed that CIRCM provide the *sole acquisitionhich* of future laser based infrared countermeasure systems for all rotary-wing, tilt-rotor, and small fixed wing aircraft across the Department of Defense. But in late 2016 we have still not seen any production systems, and ATIRCM itself was only procured for fewer than 100 US Army CH-47 helicopters.

Thus, it should not be surprising that despite public dedication to the joint CIRCM program, the Navy continued to develop ***Assault DIRCM*** somewhat on the sly – or as the Navy budget reports, "PMA272 has funded this Future Naval Capability (FNC) since 2006 as a risk mitigator for both JATAS and the CIRCM system. By February 2016, an early production system was ready and funded in the FY17 OCO procurement budget with $27.5 million for 12 systems to be installed in 2017-18 on three different helicopter types – the USMC's AH-1Z and UH-1Y, and the Navy's MH-60S. The new system, now referred to as ***ADIRCM***, is being produced by DRS Technologies and Daylight Solutions (who also produce the lasers for CIRCM).

CIRCM: The Need and Our Forecast

The Navy and Air Force have collaborated with the Army in determining requirements, but according to Lt. Col. Pickering, "[CIRCM] is not a joint program, but it is kind of a multi-service-interest program." The Navy urgently needs a system lighter than LAIRCM for CH-53E, AH-1Z SuperCobra, and hundreds of other helicopters.

Northrop's CH-53E LAIRCM with two laser jam heads weighs 193 lbs. and BAE's Chinook ATIRCM weighs 160 lbs., with all-up weights of around 350 lbs. including cabling and A-kit aircraft mods. CIRCM's planned weight is 85 lbs. with two jammer turrets, with a maximum weight including A-kit of only 120 lbs. for smaller helicopters such as Apaches and Black Hawks, and 155 lbs. for the Chinook and V-22.

CIRCM will utilize a modular open system approach (MOSA) to integrate jammers, MWSs, and missile trackers. Today's LAIRCM and ATIRCM are federated systems, with single-purpose sensors and countermeasures linked through proprietary interfaces.

Though Teal Group sees the possibility of continuing ATIRCM-like delays, future CIRCM production should still be huge. Eventually, thousands of next-generation DIRCMs will be acquired, though possibly of more than one design and from more than one manufacturer. A good quantitative market comparison is with the current US IRCM for small and mid-sized helicopters – more than 6,000 of BAE Systems' AN/ALQ-144 have been produced. Mitigating against massive LAIRCM-like funding will be the possible return of EW budget cuts, as well as the goal of CIRCM as an inexpensive system, with a $1-2 million B-kit unit cost, much less than LAIRCM.

And, as we discuss in our speculative ***Future Low-Cost DIRCM & MWS Systems*** forecast (see report), if any competitor comes up with a $1 million DIRCM system – as long sought – CIRCM could see production numbers shrink, or even an ATIRCM-like collapse of the entire program. But, this time, the Army and Navy both seem willing to buy a $2.5 million "low-cost" system, and both CIRCM and the Navy's new DRS Technologies-developed ADIRCM seem to possibly have this unit cost on track.

Our CIRCM forecasts follow planned Army schedules fairly closely for now, as Northrop Grumman has been producing LAIRCM at high rates for a decade and the Army no longer seems to expect a $1 million CIRCM. But ATIRCM-like delays could certainly occur.

The Navy: CIRCM or ADIRCM?

Considering that the US Navy has been funding a CIRCM-alternative all along, despite the Defense Acquisition Executive (DAE) directive that CIRCM provide the *sole acquisition* of future laser based infrared countermeasure systems for all rotary-wing, tilt-rotor, and small fixed wing aircraft across the Department of Defense... well, we don't know what to say. Clearly, our hesitation to guarantee that any follow-on to ATIRCM would go smoothly was taken to heart by the Navy as well.

So… our forecast is highly speculative, as we had thought the Navy would wait for CIRCM to prove itself somewhat with the Army before initiating a major procurement. Now, we guess they could begin their own ADIRCM buy somewhat earlier, at least for a limited number of helicopters, and then choose between ADIRCM and CIRCM (or split production between both, for different platforms) in a few years.

We have moved our ADIRCM funding forecasts forward somewhat, considering we now know much more RDT&E spending has been ongoing than has been in public budgets, but we do not see major production ramping up as soon as is likely for the Army.

JATAS: Delayed or Cancelled?

The most important future US missile warning system (MWS) was to be the US Navy's ***JATAS (Joint Allied Threat Awareness System)***, which was planned to grow the MWS market by the end of this decade, prior to contributing to IRCM market growth next decade. JATAS has developed a

next-generation two-color imaging IR-sensor to offer faster and longer-range missile detection than the ultraviolet (UV) sensors in most current MWSs, including BAE Systems' AN/AAR-57 CMWS (primarily US Army, originally developed for ATIRCM), Northrop Grumman's AN/AAR-54 (with LAIRCM and AAQ-24), and Alliant Techsystems' (ATK) AN/AAR-47 (the ubiquitous legacy Navy/Marine/Air Force MWS).

The Navy originally planned to develop its own "***Assault DIRCM"*** suite for almost 1,000 small and large helicopters and the MV-22. IOC for the full Assault DIRCM system – including JATAS – was originally planned for FY15, but then the Army took over as developer of the DIRCM portion with its ***CIRCM*** program. At that time, plans called for JATAS buys for all Army and Navy CIRCM systems, as well as hundreds or thousands of independent JATAS suites, which could result in a massive future procurement, possibly even greater than CMWS production.

In September 2008, the Navy issued a draft RFP for JATAS, with technology development contracts awarded in September 2009 to an ATK/BAE Systems team and Lockheed Martin.

In July 2011, the Navy awarded ATK a $109.2 million contract for JATAS EMD, after beating off the Lockheed Martin team. BAE Systems will contribute heavily, possibly with as much as 40% of the development work. The EMD contract included options for LRIP and full-rate production, potentially worth $1.1 billion, with LRIP deliveries beginning in 1QFY15 and IOC planned for FY15. The EMD award date slipped from 1QFY11 to 3QFY11, but since its origins in 2007, JATAS has held relatively steady to schedule.

JATAS was planned to initially replace the AAR-47 on the MV-22B Osprey, followed by MH-60R, MH-60S, and UH-1Y utility helicopters, the CH-53K heavy-lift helicopter, and AH-1Z SuperCobra attack helicopters.

But by March 2014, the Navy planned to end the JATAS program in FY14 "in accordance with the Acquisition Decision Memorandum (ADM)". Without further explanation, "remaining funds in FY15 will be realigned to CIRCM. All JATAS tasks after FY14 have been removed from the schedule profile".

We have thus removed our JATAS forecasts.

Fast Jet DIRCM: The LAIRCM of Next Decade?

When TADIRCM was split by the Navy a decade ago, it envisioned both Assault DIRCM (ADIRCM) for helicopters and ***Strike DIRCM***, which would eventually use TADIRCM technology to develop a podded family of systems for fast jets. Strike DIRCM was seemingly unfunded for years, but plans were for Strike DIRCM to debut with a third generation MWS with four to six two-color staring sensors providing a full sphere of coverage. There would be one or two lasers and a compact pointer/tracker for the DIRCM itself.

To some degree coming full circle, in August 2016 the US Air Force awarded Northrop Grumman a $39.3 million, five-year contract for development efforts as part of the ***STRAFE (SHiELD [Self-protect High Energy Laser Demonstrator] Turret Research in Aero-Effects)*** Advanced Technology Demonstration (ATD) program, for a laser-based self-defense DIRCM system for pod-mounting on fast jets, now initially planned as the F-15 and F-16. The USAF expects to begin flight testing the integrated system by 2019.

With STRAFE currently just beginning a five-year ATD program, a major ***Future Fast Jet DIRCM*** production program is probably still at least a decade away, but we include speculative forecasts.

Perhaps – it's a long shot and not yet in our forecast, but maybe – beginning some time next decade, a major Fast Jet DIRCM procurement for US and international 4th generation fighters (F-15s, F-16s, F/A-18s) could become a multi-billion ongoing program the way Northrop Grumman's LAIRCM was for large aircraft for the past decade.

Funding Forecast

RDT&E (FY17$ Millions)	FY17	FY18	FY19	FY20	FY21	FY22	FY23	FY24	FY25	FY26
All RDT&E										
CIRCM (Army)	168.0	106.0	64.0	72.0	42.0	44.0	42.0	36.0	32.0	34.0
ADIRCM & CIRCM (Navy)	72.0	48.0	42.0	34.0	32.0	28.0	36.0	36.0	28.0	30.0
Total RDT&E	**240.0**	**154.0**	**106.0**	**106.0**	**74.0**	**72.0**	**78.0**	**72.0**	**60.0**	**64.0**

Procurement (FY17$ Millions)	FY17	FY18	FY19	FY20	FY21	FY22	FY23	FY24	FY25	FY26
All Production										
CIRCM (Army)	108.0	12.0	56.0	110.0	116.0	120.0	132.0	140.0	144.0	148.0
ADIRCM & CIRCM (Navy)	28.0	—	22.0	36.0	42.0	80.0	92.0	98.0	124.0	140.0
All Upgrade & Support										
CIRCM (Army)	4.0	26.0	24.0	18.0	22.0	32.0	36.0	34.0	28.0	32.0
ADIRCM & CIRCM (Navy)	—	10.0	6.0	12.0	16.0	18.0	26.0	20.0	30.0	30.0
Total Procurement	**140.0**	**48.0**	**108.0**	**176.0**	**196.0**	**250.0**	**286.0**	**292.0**	**326.0**	**350.0**

RDT&E+Proc (FY17$ Millions)	FY17	FY18	FY19	FY20	FY21	FY22	FY23	FY24	FY25	FY26
All RDT&E and Production and Upgrade & Support										
Future Fast Jet DIRCM (USAF & US Navy)	20.0	22.0	44.0	52.0	60.0	68.0	72.0	68.0	86.0	104.0

April 2017