



DEPARTMENT OF THE AIR FORCE
WASHINGTON, DC

12 April 2006

HAF/ICIOD (FOIA)
1000 Air Force Pentagon
Washington, DC 20330-1000

Federation of American Scientists
Matthew Schroeder
1717 K Street NW #209
Washington, DC 20036

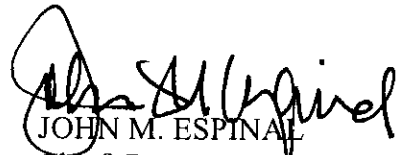
Dear Mr. Schroeder

This is in response to your November 8, 2005, Freedom of Information Act request for information regarding "MANPADS: The Worldwide Threat to Aviation Conference".

The attached documents have been reviewed and determined to be releasable.

Please direct your questions to LaSundra Bridgewater at (703) 696-7263 and refer to case number #06-0122.

Sincerely


JOHN M. ESPINAL
Chief, Documentation Information
& Services Section

Attachments:
Responsive documents

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USAF Aircraft Survivability Equipment (ASE)

Major Scott "G-9" Guilbeault

AF/XORE

4 Nov 04

This Briefing is Classified SECRET

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Purpose

- **USAF Aircraft Survivability Programs**
 - **Exposure**
 - **Infrared Countermeasures**
 - **Expendables**
 - **Missile Warning Systems**
 - **MAJCOM Assessments**
 - **AFRL Efforts**

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Exposure

- Exposure Is a Measure to Determine the Opportunity for Attack

Actual Sortie Data - 2003	C-5	C-17	C-130*	Total
Total Sorties	20,042	35,387	95,991	151,420
Sorties into Arabian Peninsula	2,815	6,879	49,444	59,138
Sorties into Iraq and Afghanistan	508	3,472	16,667	20,647
Total number of tails used in Iraq and Afghanistan	55	98	390	543
*Not inclusive of all theater generated sorties				

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IR Countermeasure Techniques

- **Suppression**
 - Reduce aircraft IR signature Below the IR background generating track denial
 - Make active CM easier
 - Not applicable to large transport aircraft
- **Decoys**
 - Seduce the missile tracker away from the aircraft with a more intense / desirable source
 - Reactive and pre-emptive approaches possible
- **Jammers**
 - Add a modulation to aircraft signature to confuse missile track processing

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DIRECTED INFRARED COUNTERMEASURES

AFSOC - DIRCM

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AN/AAQ-24 Overview

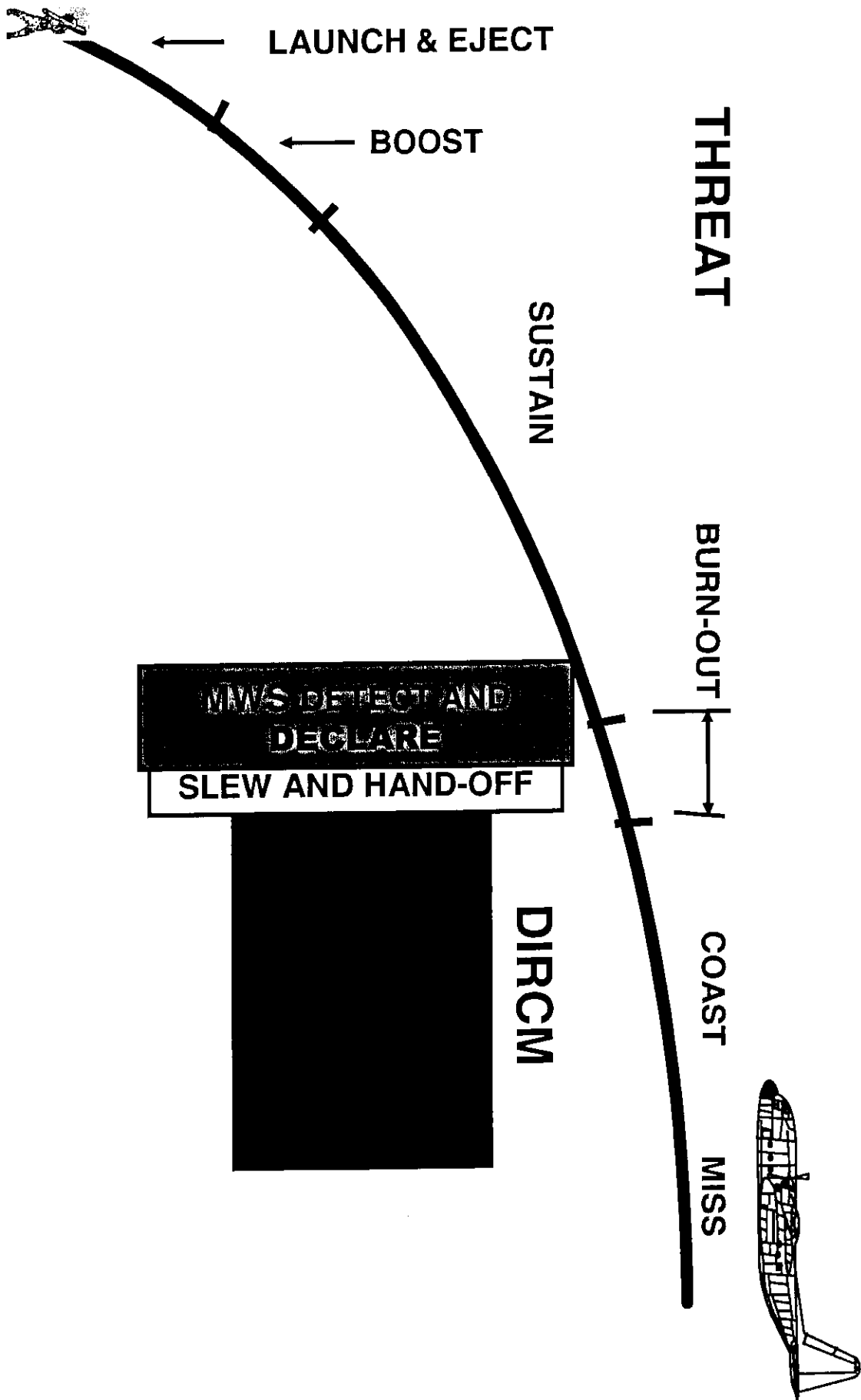
- Directional InfraRed CounterMeasures (DIRCM)
 - AN/AAQ-24(V)6
- Defeats IR MANPADS (SA-X)
- Replacement for the QRC 84-02A Pods



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Sequence of Events



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LARGE AIRCRAFT INFRARED COUNTERMEASURES

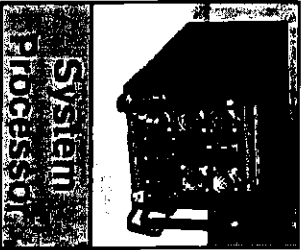
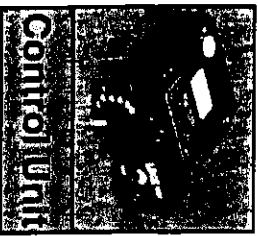
AMC - LAIRCM

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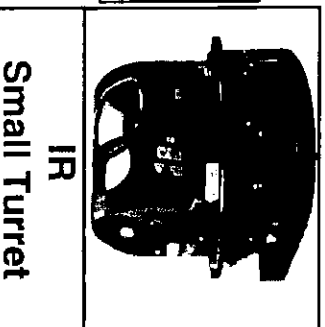
The LAIRCM Solution

Common Infrared Countermeasure Solution
for Multiple Aircraft Platforms



EJECT

BOOST
SUSTAIN



JAM

MISS



1. ALWAYS DETECT & DEGRADABLE

2. HAND-OFF & SLEW

3. TRACK & JAM

Effectiveness = P_{detect} \times P_{handoff} \times P_{track} \times P_{miss}

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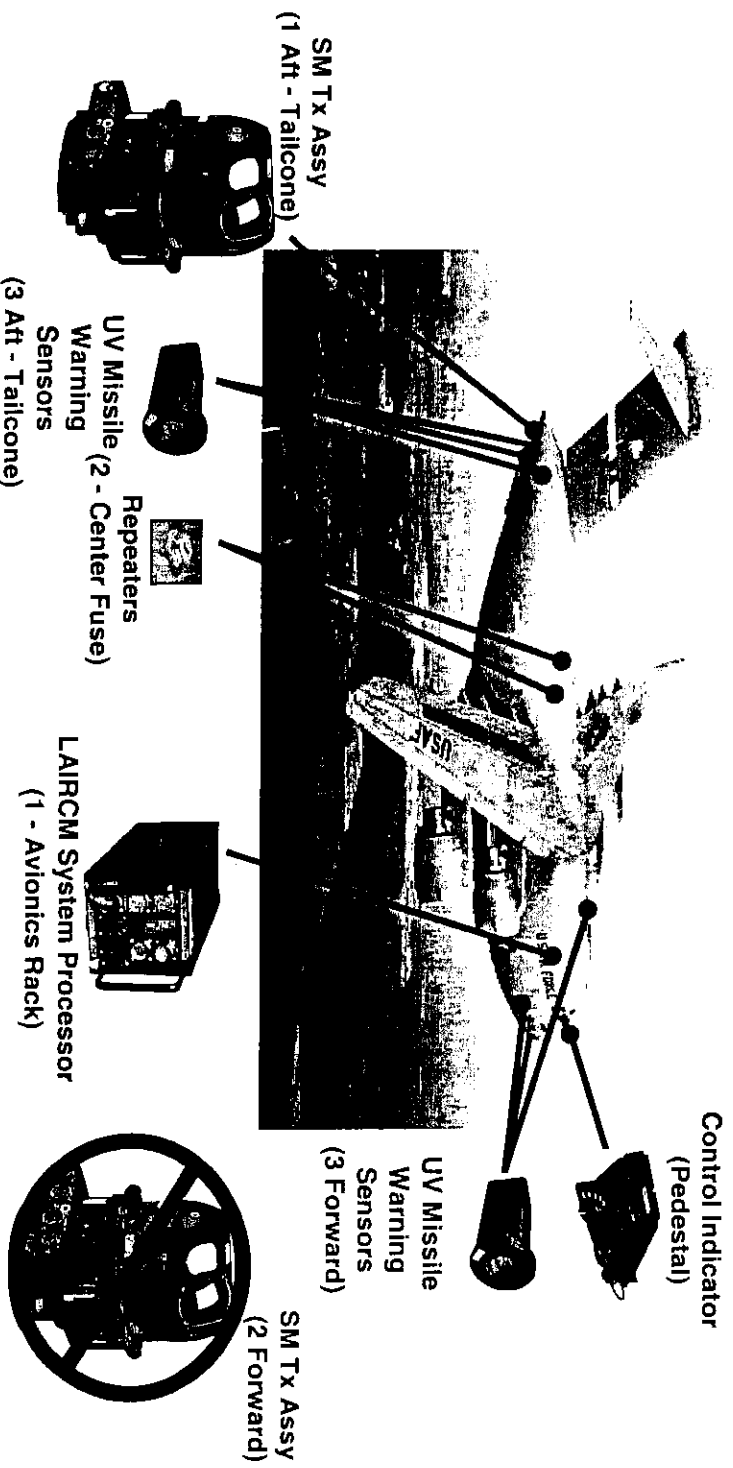
LAIRCM

- **Laser based DIRCM systems (LAIRCM) provide highest degree of protection available**
 - **Laser energy available in all MANPAD threat bands**
 - **Jammer effectiveness greater than 95% for all threats tested**
 - **System effectiveness limited primarily by missile warning effectiveness (currently UV based AAR-54)**
- **Limited number of systems fielded**
 - **(12 C-17s and 4 C-130s outfitted)**
- **Costly system – difficult to rapidly outfit large fleet of aircraft**

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LAIRCM "Lite"

- Spreads Laser Turrets Over More Aircraft in Near-Term
- First Fielded May 04, 12 LAIRCM Lite C-17s Fielded Today



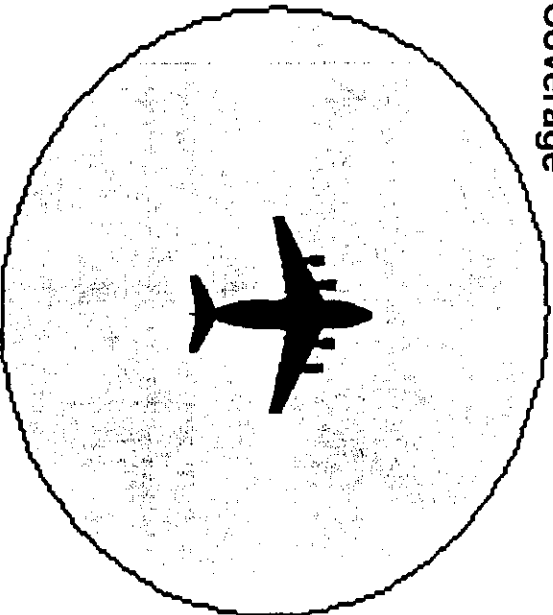
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Coverage & Effectiveness

LAIRCM

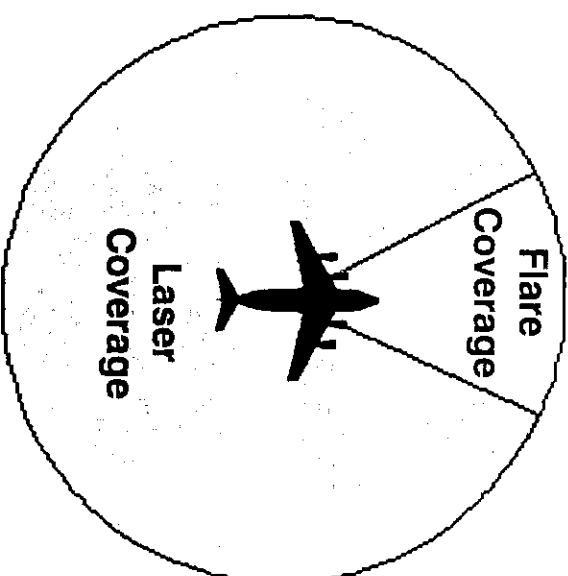
Laser
Coverage



**> 90% Effectiveness
for 8 key threats**

LAIRCM "Lite"

Flare
Coverage
Laser
Coverage



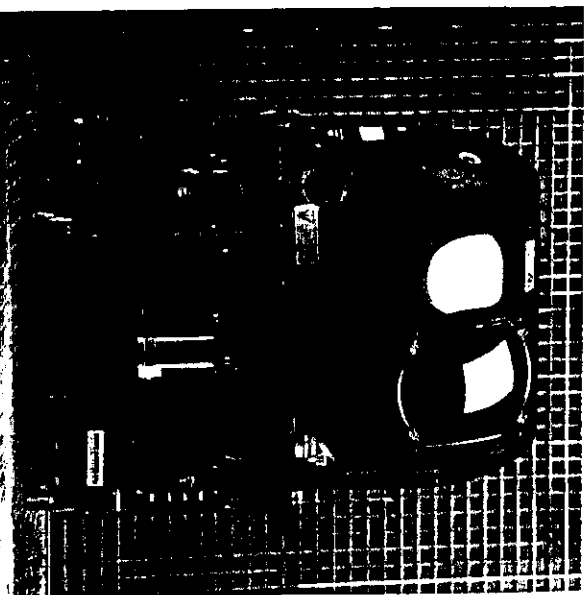
**> 70% Effectiveness
for 8 key threats**

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Acquisition Strategy

- Phase II: spiral developments to improve affordability & effectiveness for rest of 2-SSC
 - Block 1: Miniature Turrets IOC: FY07
 - Block 2: NexGen MWS IOC: FY08
 - Block 3: Closed Loop IRCM Unfunded

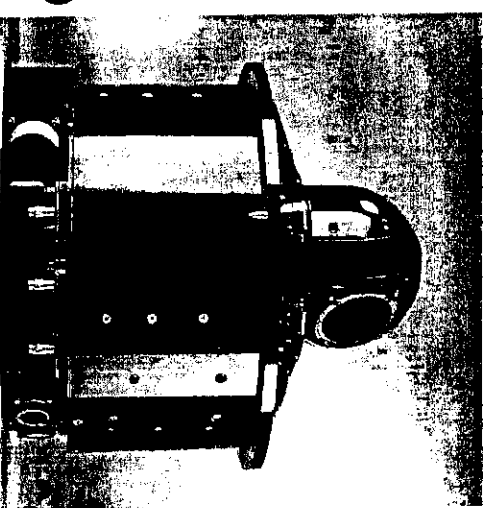
SLTA



Guardian Development

- Form Fit Replacement
- 50% Cost Reduction
- 25% Weight Reduction
- 2.5 / 1 Drag Reduction
- 100% Reliability Improvement
- 25% Increase in Tx aperture
- Full Temp Range Qual (-55C to +71C)
- Fully Backward Compatible
- CLIRCM Ready

GPTA



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LAIRCM “Bottom Line”

- Original requirement for 137 LAIRCM-equipped aircraft (JCS 2 Small Scale Contingency force); FY05 PB funded 116 aircraft
- Recent OEF/OIF operational experiences resulted in AMC increasing requirement to 444 aircraft
- Priority = Airlift Aircraft
- Pursuing acceleration of fielding 59 additional C-17s with LAIRCM by end FY06
- 12 C-17 LAIRCM equipped A/C fielded (11 LAIRCM “Lite”, 1 Full LAIRCM)
- 6 C-130 LAIRCM aircraft fielded
 - 4 Active Duty
 - 2 Guard

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FLARES

Pyrophoric and Pyrotechnic Options

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Flare Characteristics

- Flare Families
 - Pyrophoric – M-211, MJU-50, MJU-51
 - Pyrotechnic – M-206, MJU-53, MJU-62, MJU-10, MJU-7
 - Cocktails – Use Combination of Pyrophoric and Pyrotechnic Flare Countermeasures
 - Provides Improved Countermeasure Performance Versus Advanced MANPADS*
- Flare Programs
 - Reactive – Require Auto/manual Initiation
 - Preemptive – Run for a Predetermined Amount of Time
 - Cost and Logistics Limit Use of Preemptive Options for MAF*
 - Hybrid (Evade) – Uses Reactive in Conjunction With Preemptive Programs

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MISSILE WARNING SYSTEMS

AAR-47 / AAR-54

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MAJCOM ASSESSMENT

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CAF IRCM Plan

	<u>MWS</u>	<u>CMDS</u>
A-10 	None	ALE-40
B-1 	ALQ-161 TWF	ALE-49
B-52 	ALQ-153	ALE-20
F-15C 	None	ALE-45 ALE-58 FY07-10
F-15E 	None	ALE-45
F-16 	None	ALE-40/47
EC-130 	AAR-54 Winter 04	ALE-47 Winter 04

 - Current  - Future  - Change

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CAF Way Ahead

Short Term Options:

- EC-130 (Compass Call)
 - First aircraft installs of AAR-54 and ALE-47 in Winter 2004

Countermeasure Employment:

- A-10 Extended Duration Covert IRCM
 - #44 on CAF FY06 Unfunded Requirements (UFR) List
 - Provided by either approximately 30 minutes of continuous dispensing of covert special material IRCM or a missile warning system with laser-based countermeasures
- BOL Countermeasures Dispenser
 - F-15E BOL is #85 on ACC UFR
 - F-16 BOX is #87 on ACC UFR

IRCM:

- TADIRCM
 - Navy Program

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MAF IRCM Plan

	<u>MWS</u>	<u>CMDS</u>	<u>LAIRCM</u>	<u>Notes</u>
C-17	AAR-47 AAR-54 w/LAIRCM	ALE-47	FY09 43 C-17s	Does not account for TRANSCOM assets
C-130	AAR-47 AAR-54 w/LAIRCM	ALE-47	FY09 24 C-130s	
C-5	AAR-47	ALE-47	None	61 C-5As have nothing
KC-135	None	None	FY09 12 KC-135s	
KC-10	None	None	None	

 - Current
  - Future

MAF Way Ahead

Short Term Options:

- Preemptive ALE-47 – Stockpile of covert flare cocktails requires time
 - Aug '02 Test for C-130 Flare Cocktail
- Accelerate AAR-47 (Navy) Upgrade Install – Improves Reactive ALE-47

System Status:

- LAIRCM
 - Need for 444 aircraft – 18 currently operational
 - Recommend expanding LAIRCM “Lite” for 59 additional C-17s (71 total)
 - Pursue program for LAIRCM on more C-17s, C-130s, C-5Bs in 06 POM

Flare Employment w/ALE-47:

- Coordinating Large Aircraft Defensive System CONOPS (AMC)
- Need to Develop/Procure/Field improved Advanced MWS (2-Color)

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SOF IIRCM Plan

	<u>MWS</u>	<u>CMDS</u>	<u>IR Jammer</u>
	AAR-44, AAR-47 AAR-54 w/DIRCM	ALE-40 ALE-47 by CY05	DIRCM
AC-130	AAR-44, AAR-47 AAR-54 w/DIRCM	ALE-40 ALE-47 by CY05	DIRCM
MC-130	AAR-44, AAR-47 AAR-54 w/DIRCM	ALE-40 ALE-47 by CY05	DIRCM
MC-130P	AAR-44, AAR-47 AAR-54 w/DIRCM	ALE-40 ALE-47 by CY05	None
MH-53	AAR-47 AAR-54 w/DIRCM	ALE-40 ALE-47 by CY05	Complete on 15 acft
HC-130	None	ALE-47	None DIRCM
HH-60	AAR-47	ALE-47	None
CV-22	AAR-47 & 54 AVR-2A (LWS)	ALE-47	DIRCM

 - Current  - Future

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SOF Way Ahead

- **Short Term Options:**
 - **Reactive ALE-47 – Stockpile covert flare cocktails within 1 year**
- **System Status**
 - **DIRCM: On all AC-130H/U, MC-130E/H and MH-53J/M by Dec 2004**
- **Flare Employment w/ALE-47**
 - **Reactive ALE-47 Flares**
 - **Need to field improved flare cocktail**
 - **Need to Develop/Procure/Field improved Advanced MWS (2-Color)**
- **Preemptive ALE-47 Flares not an option due to ALE-40**
 - **ALE-47 on all aircraft by CY05**

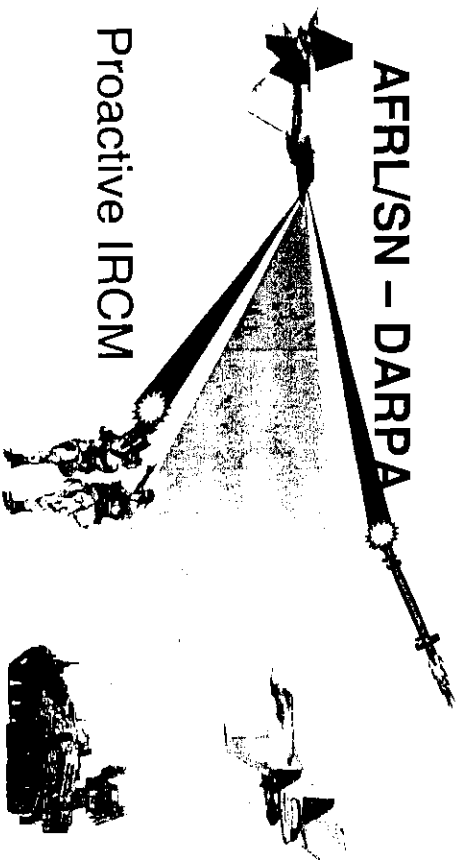
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Air Force Research Lab (AFRL) Efforts

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Multi-function Electro-Optics for Defense of US Aircraft (MEDUSA)



Proactive IRCM

- Active & Passive EO Capability**
- Missile warning & situational awareness
 - Threat ID
 - Countermeasures
 - Targeting data for kill chain

Milestone Schedule

FY	02	03	04	05	06	07
In-H Measurements	████████████████████					
Component Tech Dev	████████████████████					
System Development	████████████████████					
Breadboard/Lab Demo	████████████████████					
Brassboard/Flight Demo	████████████████████					

DARPA FUNDING (\$M) - 6.3 (PE 63762E)

	02	03	04	05	06	07
In-H Measurements	3.7	4.7	2.9	1.7	1.6	
Component Tech Dev	3.5	6.8	0.6	0.6	0.5	
System Development	1.3	6.4	16.2	15.8	14.3	

Description	Benefits to the Warfighter
<ul style="list-style-type: none"> • <i>Preemptively</i> detect, ID, locate, target and defeat EO/IR sensors and seekers <i>prior to launch</i> • Proof of concept – field & flight demonstrations • Supports ongoing and future CE and ATDs 	<ul style="list-style-type: none"> • Detect threat before enemy can engage • Regain initiative and exercise options <ul style="list-style-type: none"> - Avoid lethal envelope - Deny launch by disrupting/disabling sensors - Missile defeat • Allow aircraft to accomplish its assigned mission
<p style="text-align: center;">Technology</p> <ul style="list-style-type: none"> • Search/jam lasers • IR fibers • Conformal apertures and beam steering • Damage lasers • Advanced detectors 	<p style="text-align: center;">Operational Issues</p> <ul style="list-style-type: none"> • DF Accuracy of Cueing System/Sensors • Testing of New Tactics, Techniques and Procedures • False Alarm Management/Mitigation • System Field of View and Reaction Distance/Time
	<ul style="list-style-type: none"> • Fly places we will not fly now • Put more bombs on target

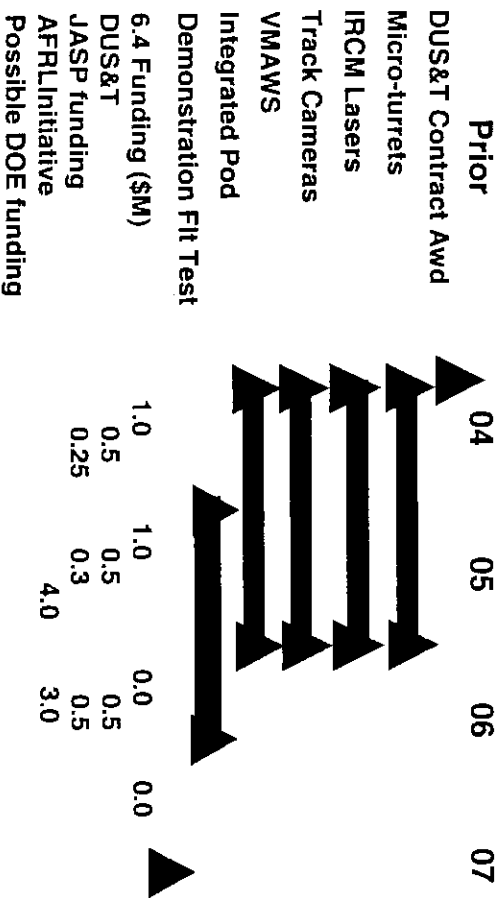
UNCLAS Affordable Laser IRCM Survivability

System (ALISS)

AFRL/SN



Technology Investment Schedule (FY)



Description	Benefits to the Warfighter
<ul style="list-style-type: none"> Technology to make laser IRCM affordable for multi-aircraft application Pushes component, subsystem & integrated designs to meet low cost goals 	<ul style="list-style-type: none"> Aims at low cost laser IRCM systems technology for military and commercial use Stresses pod and blister installation approaches allowing low cost integration over many platforms Drives to lower cost of Laser IRCM systems below \$1M in production of 100 units or more Use USAF DUS&T vehicle requiring 50% cost share with industry Initiative funds needed to complete demonstration
Technology	Operational Issues
<ul style="list-style-type: none"> Micro-turret with single optical path Pulse synchronized agile track camera Semi-conductor and fiber IRCM lasers Visible band missile warning sensors Tech transition into TADIRCM 	<ul style="list-style-type: none"> DF Accuracy of Cueing System/Sensors Testing of New Tactics, Techniques and Procedures False Alarm Management/Mitigation System Field of View and Reaction Distance/Time

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Project Romulus

- A MANPADS Working Group to provide CSAF a “Quick Look” at the MANPADS threat and USAF capabilities to mitigate the threat
- Briefing to CSAF was pre-empted by start of Operation Iraqi Freedom
 - CSAF signed-off on briefing read-ahead
- Recommendations:
 - Develop CONOPS for protective zone around bases to mitigate MANPADS (Status: CONOPS drafted)
 - Develop TTPs to mitigate MANPADS (Status: AMC standardized approach and departure tactics, created “Evade” flare settings)
 - Follow direction of MAJCOM EW Roadmaps, continue to evaluate investment strategy (Status: LAIRCM-Lite acceleration included in FY05 AF Unfunded Priority List)

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Counter-MANPADS Interagency Task Force

- Resulted from 27 Nov 02 Mombasa, Kenya incident
 - Directed by the Homeland Security and National Security Advisors
- Organized into four working groups:
 - MANPADS Proliferation Control and Threat Reduction
 - Tactical Measures and Recovery
 - Technical Countermeasures
 - Informational/Public Affairs Strategy
- ASD/HD is the primary DoD representative to the Task Force
 - A key DoD contribution to the Task Force was the DoD MANPADS Study

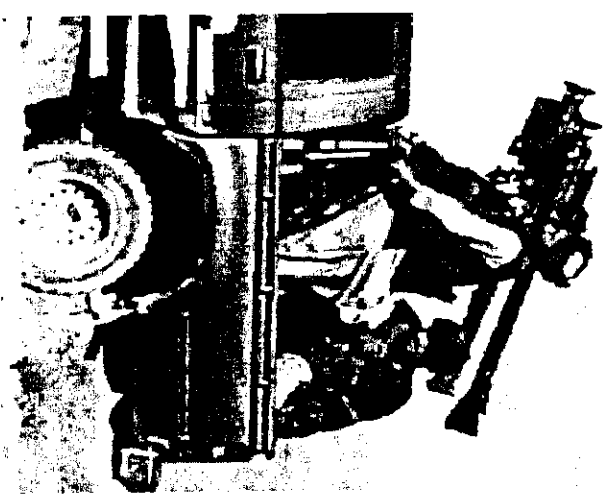
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Summary

- **USAF Aircraft Survivability Programs**
 - **Threat**
 - **Infrared Countermeasures**
 - **Expendables**
 - **Missile Warning Systems**
 - **MAJCOM Assessments**
 - **AFRL Efforts**



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