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49TH ANNUAL TARGETS, UAVS & RANGE OPERATIONS SYMPOSIUM & EXHIBITION

"Budgets Impacts on Test and Training"

Fort Walton Beach, FL

October 25-27, 2011

Agenda

Wednesday, October 26, 2011

KEYNOTE ADDRESS

- Maj Gen David J. Eichhorn, USAF, Commander, Air Force Operational Test and Evaluation Center, Kirtland AFB

SESSION I: RANGES AND RANGE OPERATIONS

The Electronic Combat Range: The West Coast NAVAIR Electronic Warfare Range Complex

- Mr. Joseph Albert, Section Head, Electronic Combat Range Test Management, NAVAIR, China Lake

P5CTS: The Vector for Air Combat Training

- Mr. Randall King, Aerospace Engineer, AAC/EBYI, Eglin AFB

Outlaw ER

- Mr. Greg Chando, Aeronautical Engineer, Griffon Aerospace

Overview: Marine Corps Operational Test & Evaluation Activity (MCOTEA)

- Mr. Kenneth Lardie, Division Head, Expeditionary Test Division, Marine Corps Operational Test & Evaluation Activity

ATEC Re-organization and Support to the Test Ranges

- Mr. Allen Tyler, Threat Combat Developer and Senior Threat Coordinator, Test & Evaluation Directorate, U.S.Army Test & Evaluation Command (ATEC), Aberdeen Proving Ground

Joint Standard Target Control System Interface (JSTCSI)

- Mr. Dae Hong, Head, Target Systems Division, NAVAIR Weapons Division, Pt. Mugu

Range Encroachment Defense

- Mr. Steve Shegrud, Senior Manager, Range Resources, Analysis & Tools, Whitney, Bradley & Brown, Inc.

SESSION II: NEW TECHNOLOGY

Some Enabling Technologies

- Mr. Brad Westphal, Director of Business Development, Honeywell Aerospace - Defense & Space

Supersonic Aerial Target (SSAT) 167X

- Mr. Bret Torgerson, SSAT Program Manager, Composite Engineering, Inc.

Introduction to the Army Common Control System (ACCS)

- Mr. Barry Hatchett, Lead Project Director, PEO STRI Targets Management Office, Redstone Arsenal

K-MAX: Robotic Helicopter Operations

- Mr. Edward "Bud" Sauvageau, Senior Analyst, Lockheed Martin Corporation, Mission Systems and Sensors (MS2)

Tri-Service Directed Energy Update

- Mr. Doug Weatherford, Senior Advisor, PEO Simulations, Training and Instrumentation, PM Instrumentation, Targets and Threat Simulators, Instrumentation Management Office (PM ITTS-IMO)

Hubert D. Harris Scholarship Program Update

- Mr. Cort Proctor, Consultant, Micro Systems, Inc.; Chairman, Scholarship Program, NDIA Targets Division

Thursday, October 27, 2011

Keynote Address

- Mr. Dyke Weatherington, Deputy Director, Unmanned Warfare, Portfolio Systems Acquisition, Office of the Under Secretary of Defense (OUSD) for Acquisition, Technology and Logistics (AT&L) and the Office of the Assistant Secretary of Defense for Acquisition

SESSION III: CURRENT DEVELOPMENTS

QF-16 Developments

- Dr. Kevin Wise, Senior Technical Fellow, The Boeing Company

Common Range Integrated Instrumentation System (CRIIS) Update

- Mr. Christopher Hughes, Program Manager, CRIIS Program Office, AAC/EBYC, Eglin AFB

Land and Surface Target Scorer: Results From 2011 Proof of Concept Firing Trials

- Mr. Gary Kemp, Program Director, Missile Scoring, Cambridge Consultants

Target Support to Test Events in a Resource Constrained Environment: The Navy's Way Forward

- CAPT W.J. Jensen, USN, Navy Ranges and Targets Branch Head, OPNAV N433

Aerial Weapon Scoring System (AWSS) Future Integration: Radar Rocket Scoring and Data Capture

- Mr. Derek Foster, Program Director, Electronic Systems, Meggitt Defense Systems, Inc.

Spectrum Processes: What Does it Take to Radiate?

- Mr. Joe Giangrosso, RF Spectrum Engineer, 96 CS/SCXF, Eglin AFB

F-16 & F-4: From Boneyard to Drone

- Mr. Jeff Peterson, Director, Business Development, 309 AMARG, Davis-Monthan AFB

SESSION IV: MILITARY PROGRAMS AND REQUIREMENTS

U.S. Air Force

- Ms. Holly Reedy, Chief, Full-Scale Targets, Aerial Targets Program Office, Eglin AFB

U.S. Army

- Mr. Bruce Truog, Deputy Director, Targets Management Office, Redstone Arsenal

U.S. Navy

- CAPT Daniel McNamara, USN, Program Manager, Aerial Target and Decoy Systems, PMA-208, Patuxent River

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49th ANNUAL

TARGETS, UAVS & RANGE OPERATIONS SYMPOSIUM & EXHIBITION

"Budget Impacts on Test and Training"

OCTOBER 25-27, 2011

EMERALD COAST CONVENTION CENTER ▶ FORT WALTON BEACH, FL

WWW.NDIA.ORG/MEETINGS/2410

EVENT #2410

LODGING

Four Points by Sheraton
1325 Miracle Strip Parkway
Fort Walton Beach, FL 32548
(800) 874-8104

GOLF TOURNAMENT

Eglin AFB Eagle Golf Course
1527 Fairway Drive
Niceville, FL 32578-6901
(850) 678-8726

Please join us on Tuesday, October 25, 2011 for a fun-filled golf outing to raise funds for the Hubert D. Harris Scholarship Program. Tee times will begin at 12:00 PM at the Eglin AFB Eagle Golf Course. This is a great course, ranked #3 among all military golf courses. All skill levels are welcome and encouraged to participate in this fun-filled day!

A fee of $75 (includes green fees, cart, and lunch) is required to participate in the tournament. To rent clubs, please contact the golf course directly at: (850) 678-8726.

SYMPOSIUM THEME

The 49th Annual Symposium will bring together recognized experts from government, military, and industry to showcase the latest developments in Targets, UAVs and Range Operations. As threats and weapons systems evolve and robotics become ever more prominent in warfare, training and testing for these advanced scenarios becomes increasingly critical. Questions of threat replication and fidelity versus the realities of cost and funds availability make the planner's role in product selection difficult.

Join us to address these realities through presentations on cutting edge developments: standardizing interfaces of joint control systems, the role of micro robotic air vehicles, testing of new target technologies on U.S. and allied ranges, and the challenges of making these systems affordable for the end user.

WILLIS HOWARD AWARD

The Willis Howard Award is presented annually at the symposium to the person, either corporate or military, who in the view of the NDIA Targets Division Executive Board, has demonstrated both sustained superior service within the communities now represented by the NDIA Targets Division, as well as active service to the Division.

Named after Mr. Willis Howard, one of the founding owners of Cartwright Electronics (now a division of Meggitt Defense Systems, Inc.), it is the highest award presented within the Targets community. Willis was also one of the founding corporate members of the NDIA Targets Division, which was originally the Aerial Targets Division of the American Ordnance Association. He was an extremely active member of the Division who presented papers, chaired Sessions, and was Chairman of the Annual Symposium on two occasions.

Willis was killed in an auto accident while working with the USAF Weapons Evaluation Group at Tyndall Air Force Base. He was so well respected throughout the Targets community that the Division implemented an award in his honor.

HUBERT D. HARRIS SCHOLARSHIP PROGRAM & MEMORIAL GOLF TOURNAMENT

The Hubert D. Harris Scholarship Program was established in 1991 to memorialize Mr. Hugh Harris for his many contributions to the Targets community in both government and industry. The NDIA Targets Division has been joined by NDIA's Gulf Coast Chapter as a co-sponsor of the Scholarship Program.

Hugh was a longtime member and leader in various professional organizations including IEEE, AOC, and ADPA (forerunner of NDIA). He served two years as the National Chairman for the Aerial Targets and RPV Section, working closely with all three military services. Subsequent to his death on June 9, 1991, Hugh was the posthumous winner of the Division's Willis Howard Award for outstanding service.

The Scholarship is presented annually to a deserving high school senior who will be entering an accredited four-year university in pursuit of a math, engineering, or hard science degree. Profits from the Hubert D. Harris Memorial Golf Tournament supplement the $50,000 base scholarship fund.

TUESDAY, OCTOBER 25, 2011

11:00 AM - 6:30 PM **Registration Open**
Emerald Ballroom Foyer

12:00 PM - 5:00 PM **Hubert D. Harris Memorial Golf Tournament**
Eglin AFB Eagle Golf Course - Registration Required

5:30 PM - 6:30 PM **Welcome Reception (Hosted Beer and Wine)**
Emerald Ballroom I&II - Exhibit Hall

WEDNESDAY, OCTOBER 26, 2011

7:00 AM - 5:15 PM **Registration Open**
Emerald Ballroom Foyer

7:00 AM - 8:00 AM **Continental Breakfast**
Emerald Ballroom I&II - Exhibit Hall

8:00 AM - 8:10 AM **Welcome Remarks and Keynote Speaker Introduction by Symposium Co-Chairmen**
Emerald Ballroom III&IV
▶ Mr. Al Brown, Director, Targets Management Office, Redstone Arsenal; Symposium Co-Chairman, NDIA Targets Division
▶ Mr. Craig Tangedal, Vice President, 5-D Systems, Inc.; Symposium Co-Chairman, NDIA Targets Division

8:10 AM - 8:50 AM **Keynote Address**
Emerald Ballroom III&IV
▶ Maj Gen David J. Eichhorn, USAF, Commander, Air Force Operational Test and Evaluation Center, Kirtland AFB

SESSION I: RANGES AND RANGE OPERATIONS

8:50 AM - 9:00 AM **Introduction by Session Chair**
Emerald Ballroom III&IV
▶ Mr. Troy Bisbee, Director of Advanced Programs, Composite Engineering, Inc.

9:00 AM - 9:20 AM **The Electronic Combat Range: The West Coast NAVAIR Electronic Warfare Range Complex**
Emerald Ballroom III&IV
▶ Mr. Joseph Albert, Section Head, Electronic Combat Range Test Management, NAVAIR, China Lake

9:20 AM - 9:40 AM **P5CTS: The Vector for Air Combat Training**
Emerald Ballroom III&IV
▶ Mr. Randall King, Aerospace Engineer, AAC/EBYI, Eglin AFB

KEYNOTE ADDRESS

Major General David J. Eichhorn, USAF

LOCATION

Emerald Coast Convention Center
1250 Miracle Strip Parkway, SE
Fort Walton Beach, FL 32548
(850) 609-3800

REGISTRATION

Emerald Ballroom Foyer

GENERAL SESSION

Emerald Ballroom III&IV

EXHIBIT HALL

Emerald Ballroom I&II

ATTIRE

Appropriate dress for the symposium is business casual for civilians and Class B uniform or uniform of the day for military personnel.

ID BADGES

During symposium registration and check-in, each Attendee will be issued an identification badge. Please be prepared to present a valid picture ID. Badges must be worn at all symposium functions.

DONATION

In lieu of Speaker gifts, a donation will be made to the Hubert D. Harris Scholarship Program.

9:40 AM - 10:00 AM **Outlaw ER**
Emerald Ballroom III&IV
▶ Mr. Greg Chando, Aeronautical Engineer, Griffon Aerospace

10:00 AM - 10:45 AM **Networking Break**
Emerald Ballroom I&II - Exhibit Hall

10:45 AM - 11:05 AM **ATEC Re-organization and Support to the Test Ranges**
Emerald Ballroom III&IV
▶ Mr. Allen Tyler, Threat Combat Developer and Senior Threat Coordinator, Test & Evaluation Directorate, U.S. Army Test & Evaluation Command (ATEC), Aberdeen Proving Ground

11:05 AM - 11:25 AM **Joint Standard Target Control System Interface (JSTCSI)**
Emerald Ballroom III&IV
▶ Mr. Dae Hong, Head, Target Systems Division, NAVAIR Weapons Division, Pt. Mugu

11:25 AM - 11:45 AM **Range Encroachment Defense**
Emerald Ballroom III&IV
▶ Mr. Steve Shegrud, Senior Manager, Range Resources, Analysis & Tools, Whitney, Bradley & Brown, Inc.

11:45 AM - 12:00 PM **Willis Howard Award Presentation**
Emerald Ballroom III&IV
▶ Mr. David Miller, Business Development, Meggitt Defense Systems, Inc.; Chairman, NDIA Targets Division

12:00 PM - 1:30 PM **Networking Lunch**
Emerald Ballroom I&II - Exhibit Hall

SESSION II: NEW TECHNOLOGY

1:30 PM - 1:40 PM **Introduction by Session Chair**
Emerald Ballroom III&IV
▶ Mr. Steve Williams, Business Area Manager, Signal Instrumentation, RT Logic, Inc.

1:40 PM - 2:00 PM **Some Enabling Technologies**
Emerald Ballroom III&IV
▶ Mr. Brad Westphal, Director of Business Development, Honeywell Aerospace - Defense & Space

2:00 PM - 2:20 PM **Supersonic Aerial Target (SSAT) 167X**
Emerald Ballroom III&IV
▶ Mr. Bret Torgerson, SSAT Program Manager, Composite Engineering, Inc.

2:20 PM - 2:40 PM	**Introduction to the Army Common Control System (ACCS)** *Emerald Ballroom III&IV* ▶ Mr. Barry Hatchett, Lead Project Director, PEO STRI Targets Management Office, Redstone Arsenal
2:40 PM - 3:25 PM	**Networking Break** *Emerald Ballroom I&II - Exhibit Hall*
3:25 PM - 3:45 PM	**K-MAX: Robotic Helicopter Operations** *Emerald Ballroom III&IV* ▶ Mr. Edward "Bud" Sauvageau, Senior Analyst, Lockheed Martin Corporation, Mission Systems and Sensors (MS2)
3:45 PM - 4:05 PM	**Tri-Service Directed Energy Update** *Emerald Ballroom III&IV* ▶ Mr. Doug Weatherford, Senior Advisor, PEO Simulations, Training and Instrumentation, PM Instrumentation, Targets and Threat Simulators, Instrumentation Management Office (PM ITTS-IMO)
4:05 PM - 4:15 PM	**Hubert D. Harris Scholarship Program Update** *Emerald Ballroom III&IV* ▶ Mr. Cort Proctor, Consultant, Micro Systems, Inc.; Chairman, Scholarship Program, NDIA Targets Division
4:15 PM - 5:15 PM	**Networking Reception (Hosted Beer and Wine)** *Emerald Ballroom I&II - Exhibit Hall*

THURSDAY, OCTOBER 27, 2011

7:00 AM - 3:20 PM	**Registration Open** *Emerald Ballroom Foyer*
7:00 AM - 8:00 AM	**Continental Breakfast** *Emerald Ballroom I&II - Exhibit Hall*
8:00 AM - 8:10 AM	**Welcome Remarks and Keynote Speaker Introduction by Symposium Co-Chairmen** *Emerald Ballroom III&IV* ▶ Mr. Al Brown, Director, Targets Management Office, Redstone Arsenal; Symposium Co-Chairman, NDIA Targets Division ▶ Mr. Craig Tangedal, Vice President, 5-D Systems, Inc.; Symposium Co-Chairman, NDIA Targets Division
8:10 AM - 8:50 AM	**Keynote Address** *Emerald Ballroom III&IV* ▶ Mr. Dyke Weatherington, Deputy Director, Unmanned Warfare, Portfolio Systems Acquisition, Office of the Under Secretary of Defense (OUSD) for Acquisition, Technology and Logistics (AT&L) and the Office of the Assistant Secretary of Defense for Acquisition

KEYNOTE ADDRESS

Mr. Dyke Weatherington

NDIA EVENTS

Thank you for your interest in the Targets Symposium & Exhibition! We hope to see you at a future NDIA event. Please visit the NDIA website for a complete listing of the events we offer.

NDIA website:
http://www.ndia.org

Select:
Meetings & Events
Schedule of Events

ADVERTISING

Advertise in *National Defense* magazine and increase your organization's exposure. *National Defense* will be distributed to Attendees of this event, as well as other NDIA events. For more information, please contact Mr. Dino Pignotti, NDIA, at (703) 247-2541 or dpignotti@ndia.org.

SESSION III: CURRENT DEVELOPMENTS

8:50 AM - 9:00 AM — **Introduction by Session Chair**
Emerald Ballroom III&IV
▶ Mr. Josh Messner, T&E Resource Analyst, Office of the Secretary of Defense (OSD), DOT&E

9:00 AM - 9:20 AM — **QF-16 Developments**
Emerald Ballroom III&IV
▶ Dr. Kevin Wise, Senior Technical Fellow, The Boeing Company

9:20 AM - 9:40 AM — **Common Range Integrated Instrumentation System (CRIIS) Update**
Emerald Ballroom III&IV
▶ Mr. Christopher Hughes, Program Manager, CRIIS Program Office, AAC/EBYC, Eglin AFB

9:40 AM - 10:00 AM — **Land and Surface Target Scorer: Results From 2011 Proof of Concept Firing Trials**
Emerald Ballroom III&IV
▶ Mr. Gary Kemp, Program Director, Missile Scoring, Cambridge Consultants

10:00 AM - 10:45 AM — **Networking Break**
Emerald Ballroom I&II - Exhibit Hall

10:45 AM - 11:15 AM — **Target Support to Test Events in a Resource Constrained Environment: The Navy's Way Forward**
Emerald Ballroom III&IV
▶ CAPT W.J. Jensen, USN, Navy Ranges and Targets Branch Head, OPNAV N433

11:15 AM - 11:45 AM — **Aerial Weapon Scoring System (AWSS) Future Integration: Radar Rocket Scoring and Data Capture**
Emerald Ballroom III&IV
▶ Mr. Derek Foster, Program Director, Electronic Systems, Meggitt Defense Systems, Inc.

11:45 AM - 12:05 PM — **Spectrum Processes: What Does it Take to Radiate?**
Emerald Ballroom III&IV
▶ Mr. Joe Giangrosso, RF Spectrum Engineer, 96 CS/SCXF, Eglin AFB

12:05 PM - 12:25 PM — **F-16 & F-4: From Boneyard to Drone**
Emerald Ballroom III&IV
▶ Mr. Jeff Peterson, Director, Business Development, 309 AMARG, Davis-Monthan AFB

12:25 PM - 1:40 PM — **Networking Lunch (Last Chance to View Exhibits)**
Emerald Ballroom I&II - Exhibit Hall

SESSION IV: MILITARY PROGRAMS AND REQUIREMENTS

1:40 PM - 1:50 PM **Introduction by Session Chair**
Emerald Ballroom III&IV
▶ Mr. Ken Hislop, QF-16 Program Manager, AAC/EBYA, Eglin AFB

1:50 PM - 2:10 PM **U.S. Air Force**
Emerald Ballroom III&IV
▶ Ms. Holly Reedy, Chief, Full-Scale Targets, Aerial Targets Program Office, Eglin AFB

2:10 PM - 2:30 PM **U.S. Army**
Emerald Ballroom III&IV
▶ Mr. Bruce Truog, Deputy Director, Targets Management Office, Redstone Arsenal

2:30 PM - 2:50 PM **U.S. Navy**
Emerald Ballroom III&IV
▶ CAPT Daniel McNamara, USN, Program Manager, Aerial Target and Decoy Systems, PMA-208, Patuxent River

2:50 PM - 3:00 PM **Concluding Remarks by Symposium Co-Chairmen**
Emerald Ballroom III&IV
▶ Mr. Al Brown, Director, Targets Management Office, Redstone Arsenal; Symposium Co-Chairman, NDIA Targets Division
▶ Mr. Craig Tangedal, Vice President, 5-D Systems, Inc.; Symposium Co-Chairman, NDIA Targets Division

3:00 PM **Symposium Adjourned**

SYMPOSIUM CONTACT

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mgeary@ndia.org

EXHIBITS CONTACT

Mrs. Alden Davidson, CEM
Associate Director, Exhibits, NDIA
(703) 247-2582
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PROCEEDINGS

Proceedings will be available on the web through the Defense Technical Information Center (DTIC) two weeks after the symposium. All registered Attendees will receive an email notification once the proceedings are available.

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Aerial Weapon Scoring System (AWSS)

NDIA 49th Annual Targets, UAVs, and Range Operations Symposium

27 October 2011

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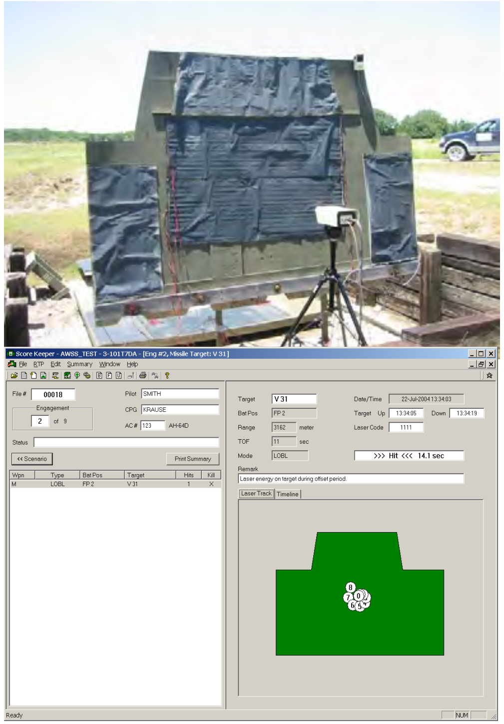
What is AWSS
Aerial Weapon Scoring System

- Scalable & portable system of computer controlled sensors used to score live-fire helicopter gunnery for evaluation of crew & weapons performance. This objective scoring system allows the commander to validate training standards, ensure training effectiveness, and substantiate training ammunition requirement levels.
- Consists of:
  - Acoustic sensors for 2.75” rocket impact location
  - Radar sensors for cannon/machine gun scoring
  - IR/Optical sensors for laser designator detection & tracking when used with the Hellfire Captive Training missile
- Seven fully portable systems delivered to the US Army for crew qualification gunnery training
- Only fielded system worldwide for Attack Helicopter live fire training

AWSS required operational capability

- AWSS is the standard objective scoring method for all US Army AH-64 & OH-58 crew qualification gunnery tables (6-8)
- Provide Commander with objective feedback of target effect for all Attack Helicopter weapons engagements
- Operate Day and Night with no degradation or limitation due to environmental conditions that would not preclude training
- Detect and score > 90% of all projectiles (rockets and bullets) in the target effect area (scored zone)
- Maintain > 95% equipment availability rate
- Sustain NO damage from environmental / EMI standard conditions for Army ranges & training devices



AWSS background

» Original Requirement	1984
» Prototype Operations (Ft Hood, TX)	1986-90
» Production Deliveries	1991
» ECPs Incorporated	1995-99
» Upgrades Funded	2000
» Production Start	2003
» Fielding	2004-07
» Continuous System Enhancements	2007-present

» Currently there are (4) Systems based at Ft. Hood, TX that are utilized for all US Army Attack Helicopter live-fire gunnery operations in North America. There is (1) System permanently based at Grafenwoehr, Germany, (1) System at Camp Casey, South Korea, and another (1) tailored system at Udairi, Kuwait.

© Meggitt Defense Systems Inc.

System packaging for portability

© Meggitt Defense Systems Inc.

AWSS benefits

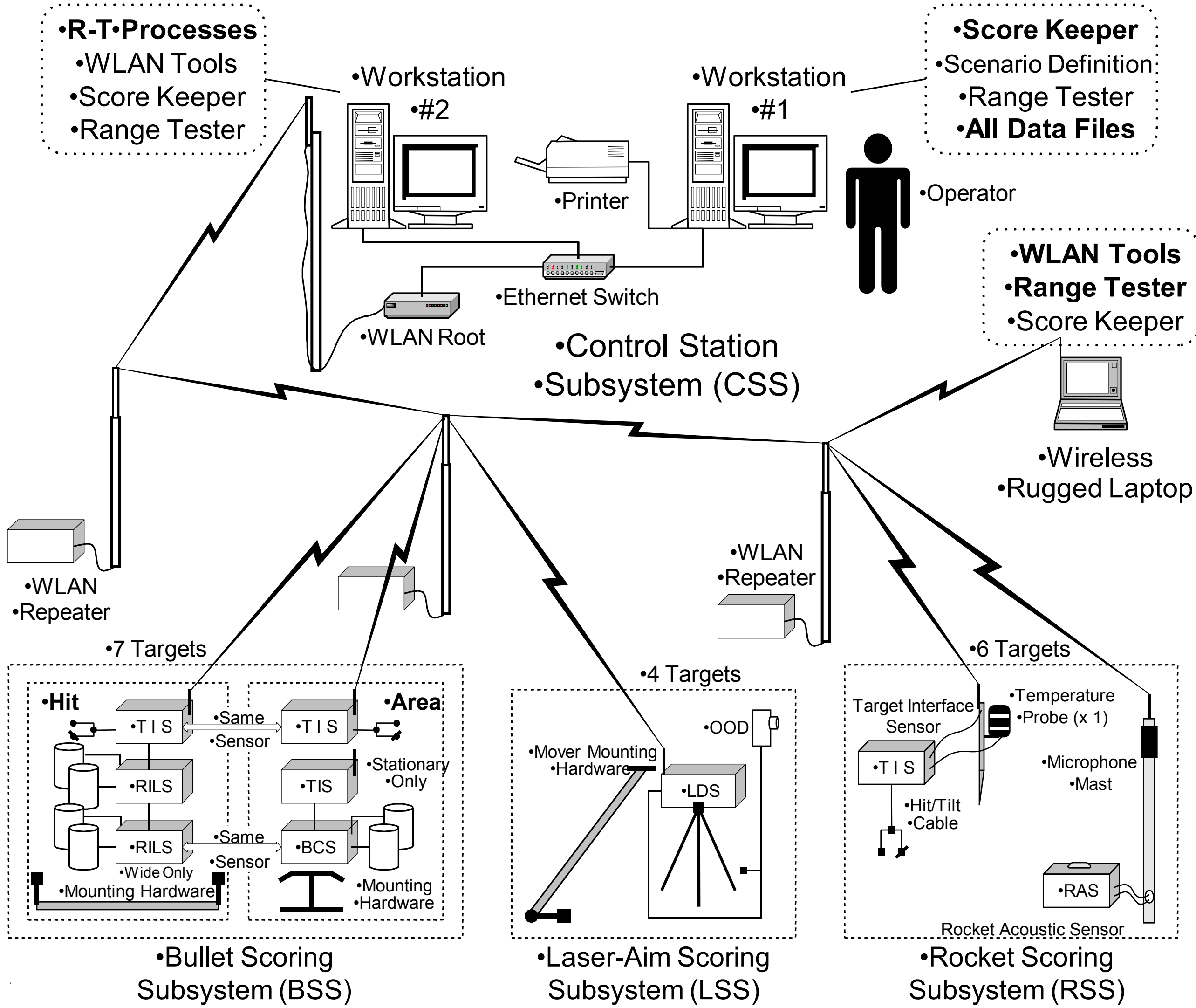
- Every Weapon Engagement is scored to same standard
- Target Effect of every Weapon Engagement is provided in near REAL-TIME
- Every Weapon Engagement is documented
- TTPs can be validated and standardized
- Crew Performance Improves Dramatically
- Training Resource Utilization is captured
- Performance can be tracked
- Crew Errors are separated from Bias Errors
  - Both can be identified and tracked
  - Weapons maintenance / bore sight accuracy improved
- OBJECTIVE MEASUREMENT OF COMBAT READINESS!

AWSS subsystems

» Control Station Subsystem (CSS)
  – (CSS) Computers, Printer, WLAN Data Link, System Software
» Bullet Scoring Subsystem (BSS)
  – 7.62mm, .50 cal, 20mm, 30mm, 40mm
  – Real-Time Hit Scoring (98% Detection/Location On-Target)
  – Area Scoring (98% Detection within 50X20 meters area)
» Laser-Aim Scoring Subsystem (LSS)
  – LOAL and LOBL Missile Launch Modes
  – Real-Time Hit Indication
» Rocket Scoring Subsystem (RSS)
  – PD (M274) and MPSM (M267) Rockets (90% Detection/Location within the TEA)
  – Real-Time Scoring with Target Effect (90% Detection/Location within the TEA)

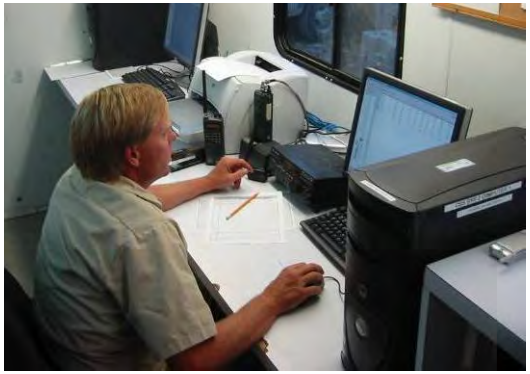
 © Meggitt Defense Systems Inc.

Subsystems and components



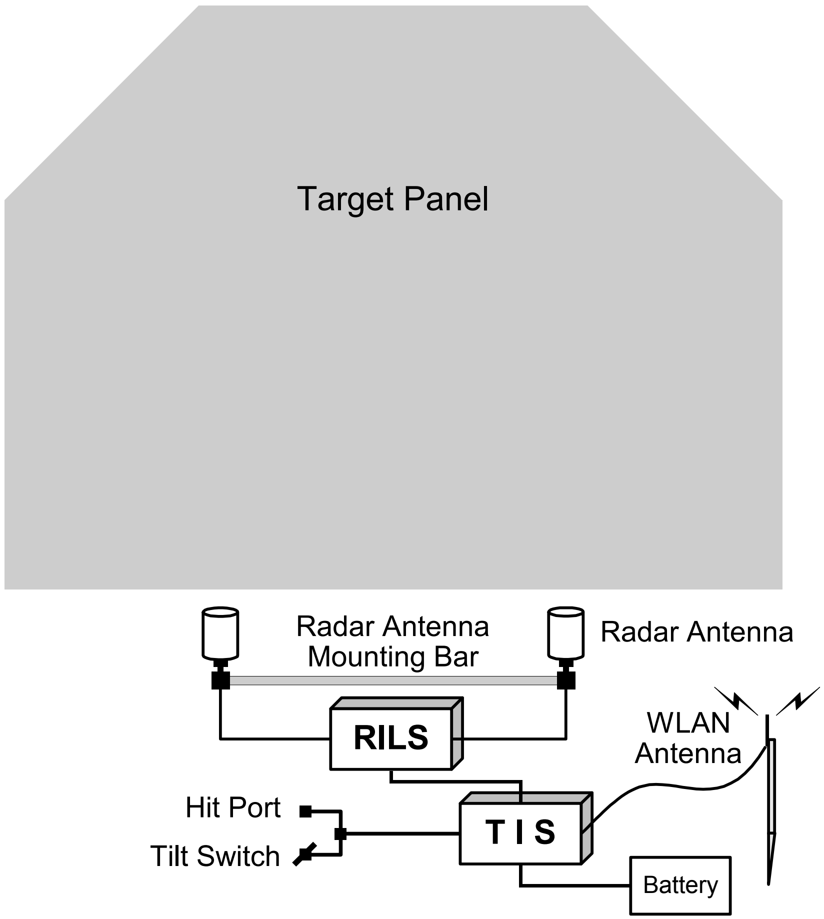
Control Station Subsystem (CSS)

- Workstation #1
  - Primary Control Station for scoring engagements
  - Holds all shared data including score files
  - Only station requiring data back up
- Workstation #2
  - Runs Real-Time Processes automatically
  - Performs sensor communication and rocket scoring
  - Secondary scoring station (backup)
- Rugged Laptop
  - Supports downrange operations (setup/BIT)
  - Remote scoring station
  - May be used to observe engagement results in real time at remote location (tower)



Bullet hit scoring stationary target

Round Identification Location System (RILS)



Round Identification & Location System (RILS)

Target Interface Sensor (TIS)

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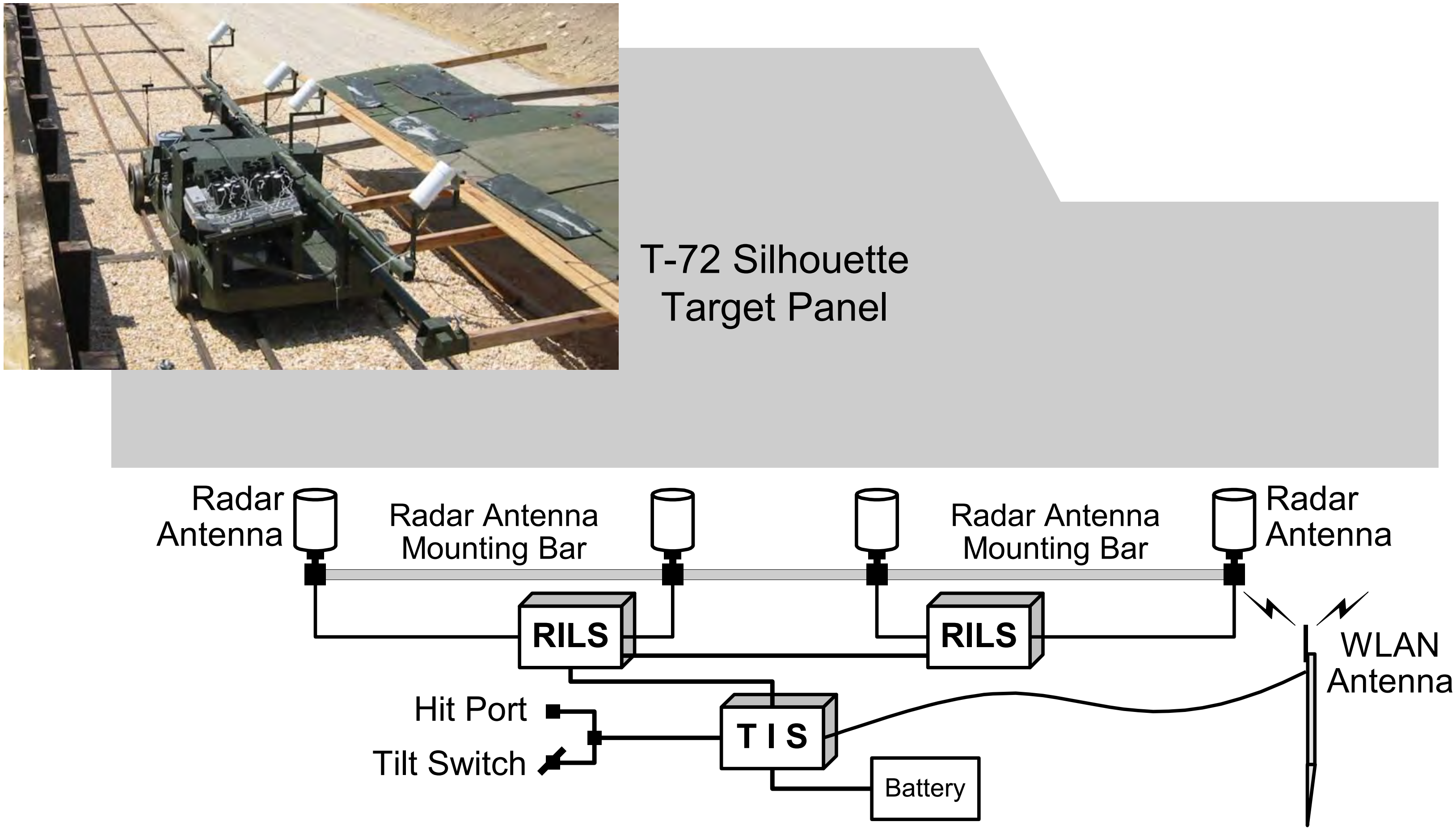
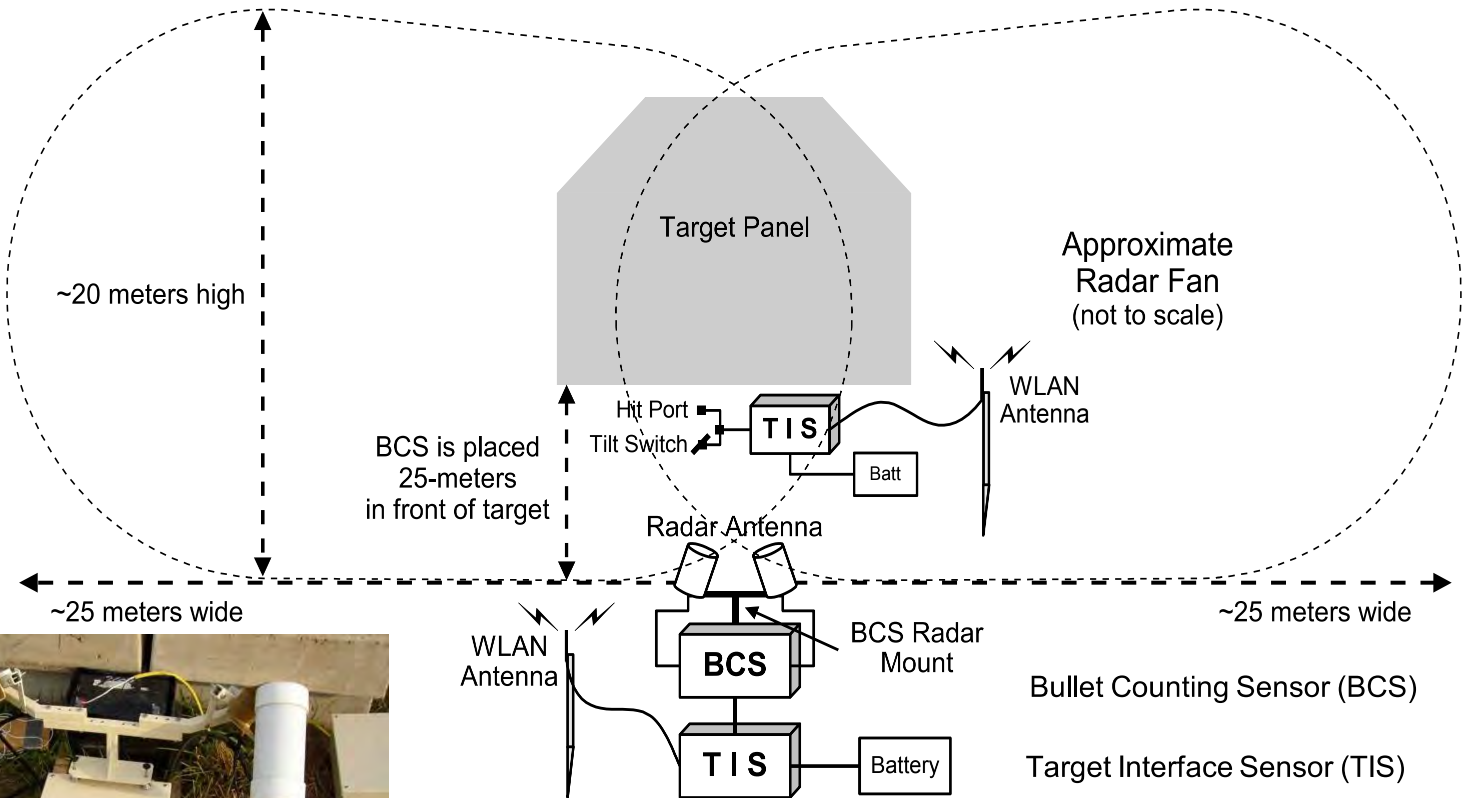
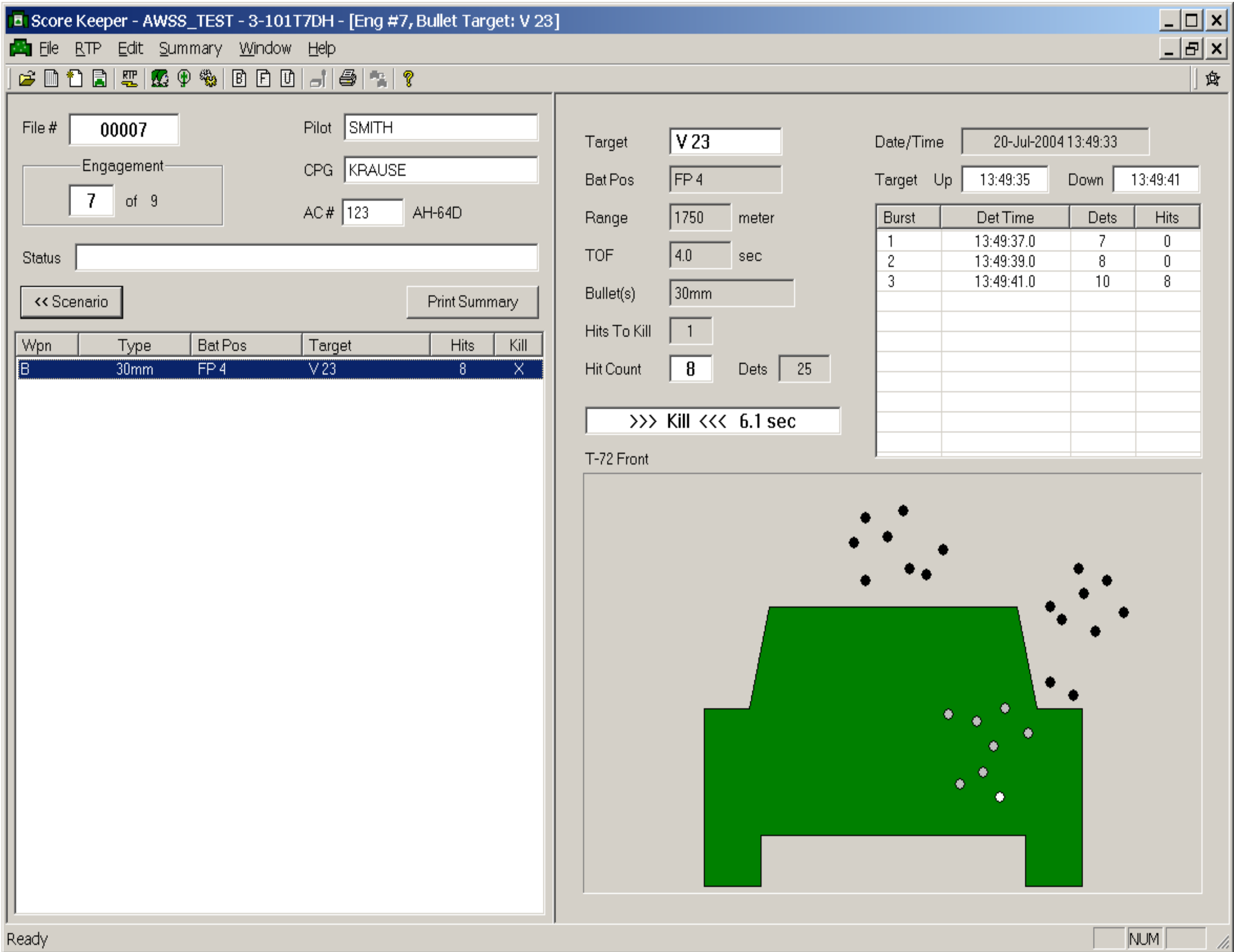
Bullet hit scoring moving target



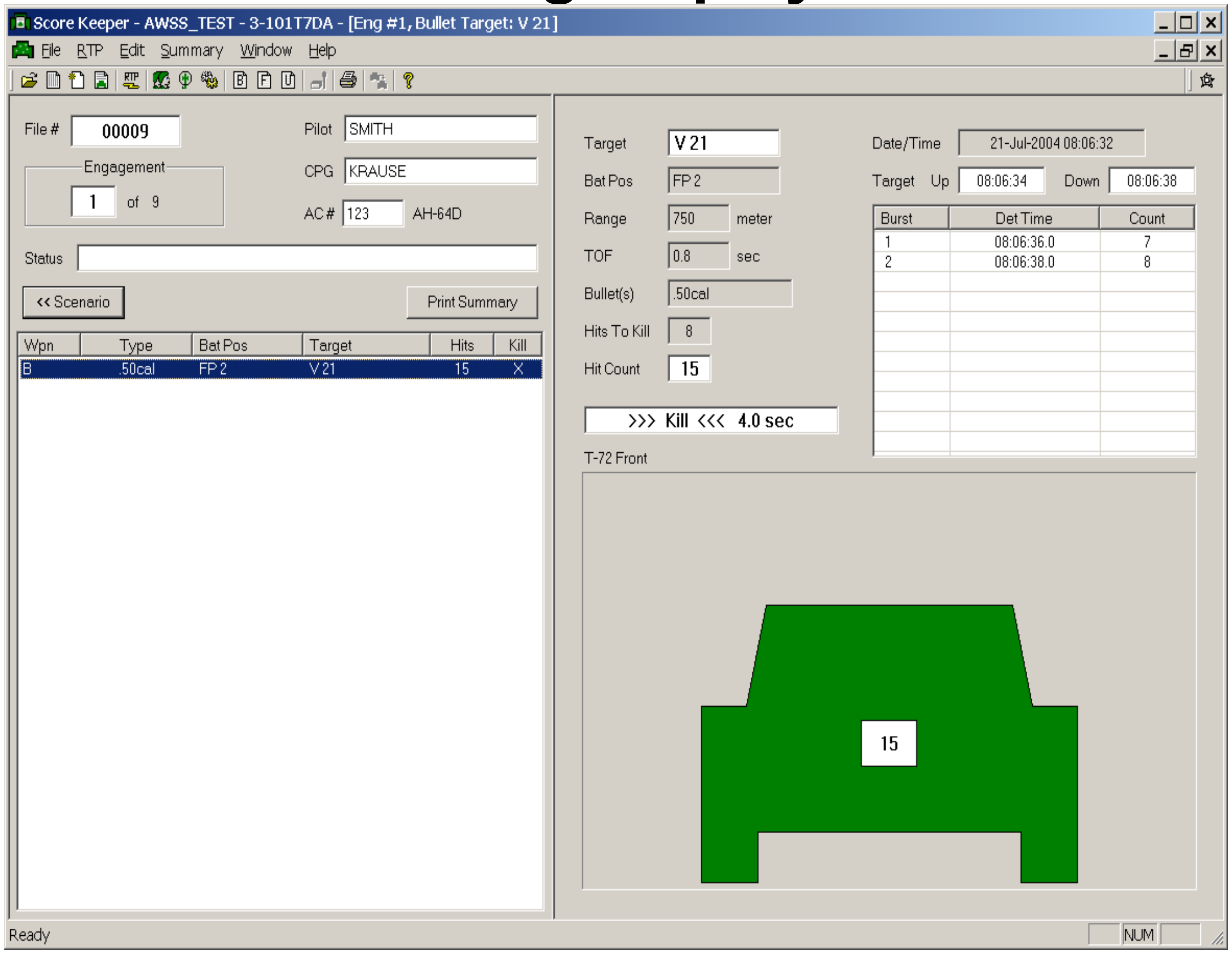
Bullet area scoring



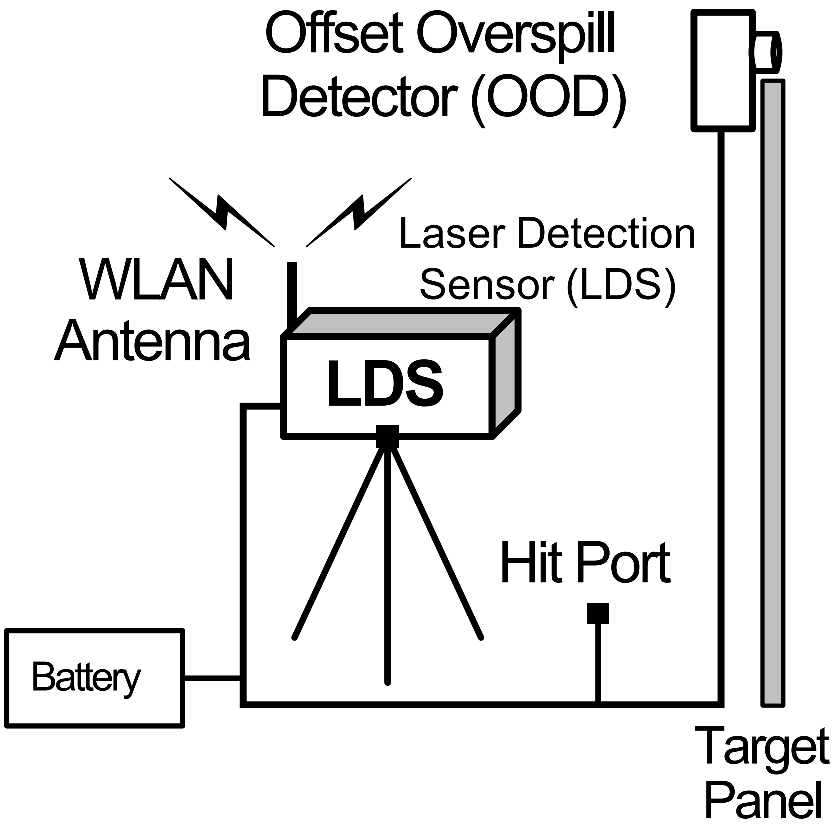
Bullet hit scoring display



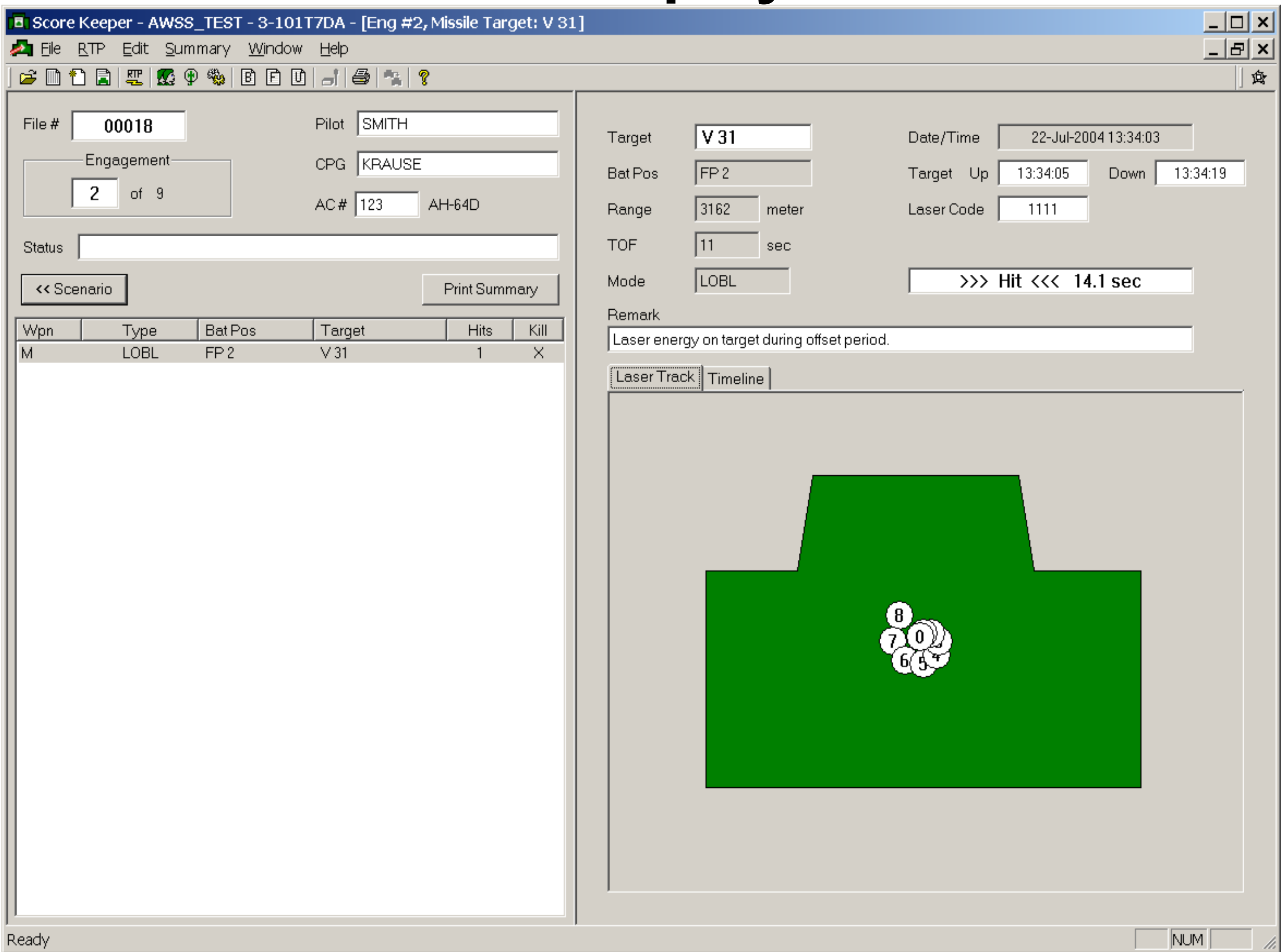
Bullet area scoring display



Laser Scoring Subsystem (LSS)



Missile laser track display



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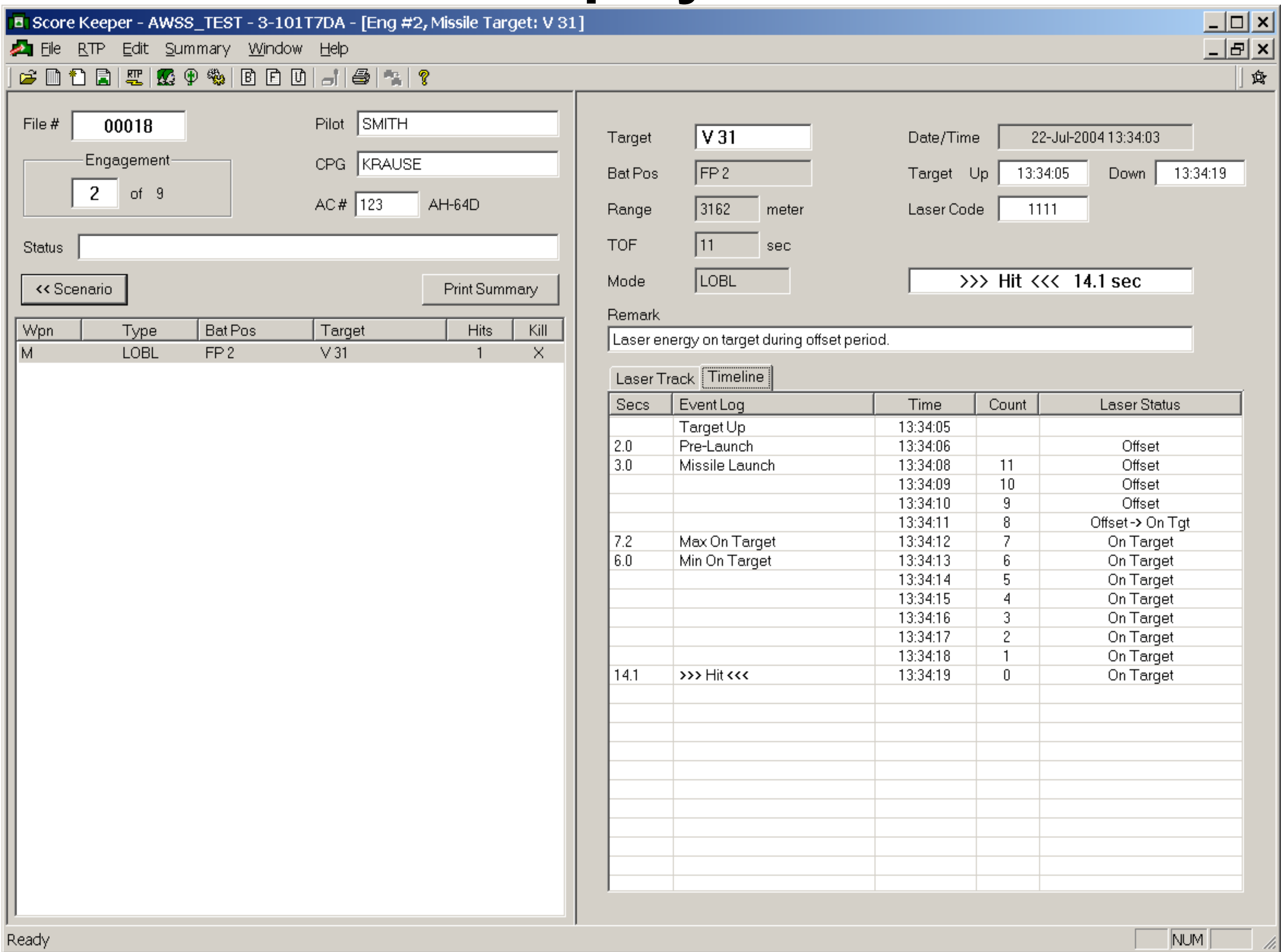
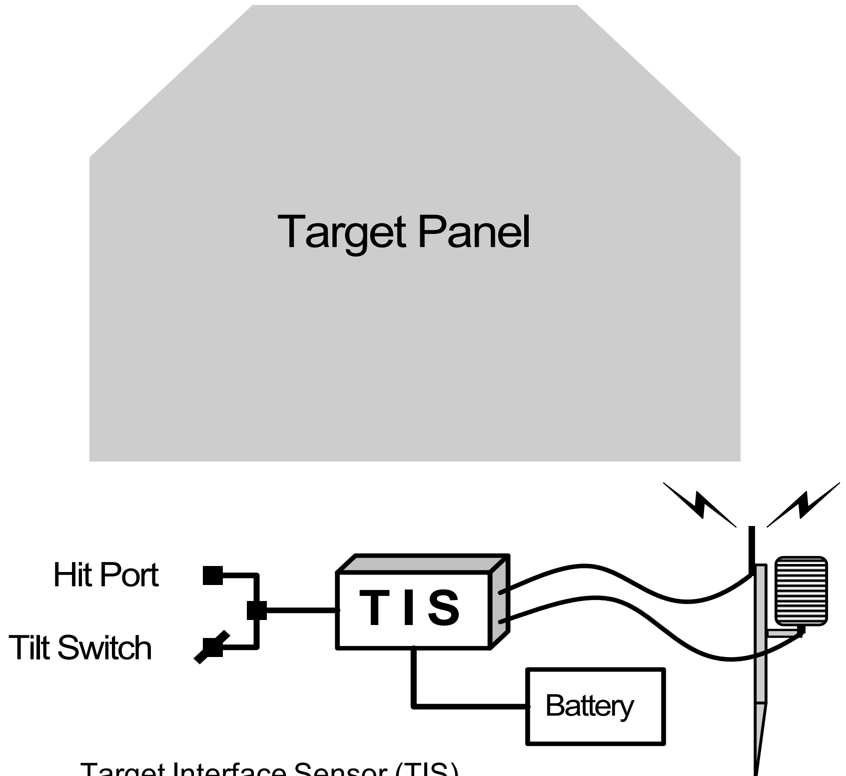
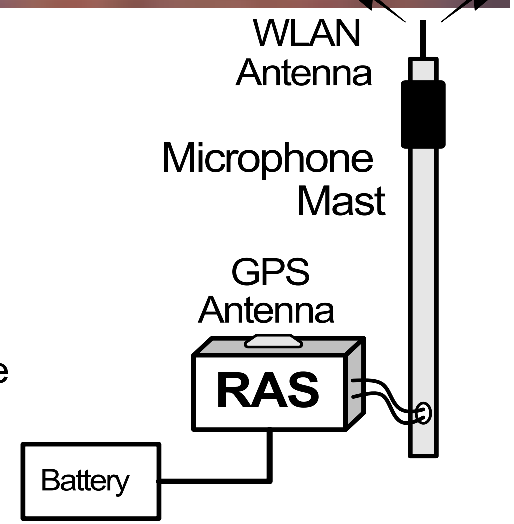
Missile timeline display



Rocket scoring subsystem



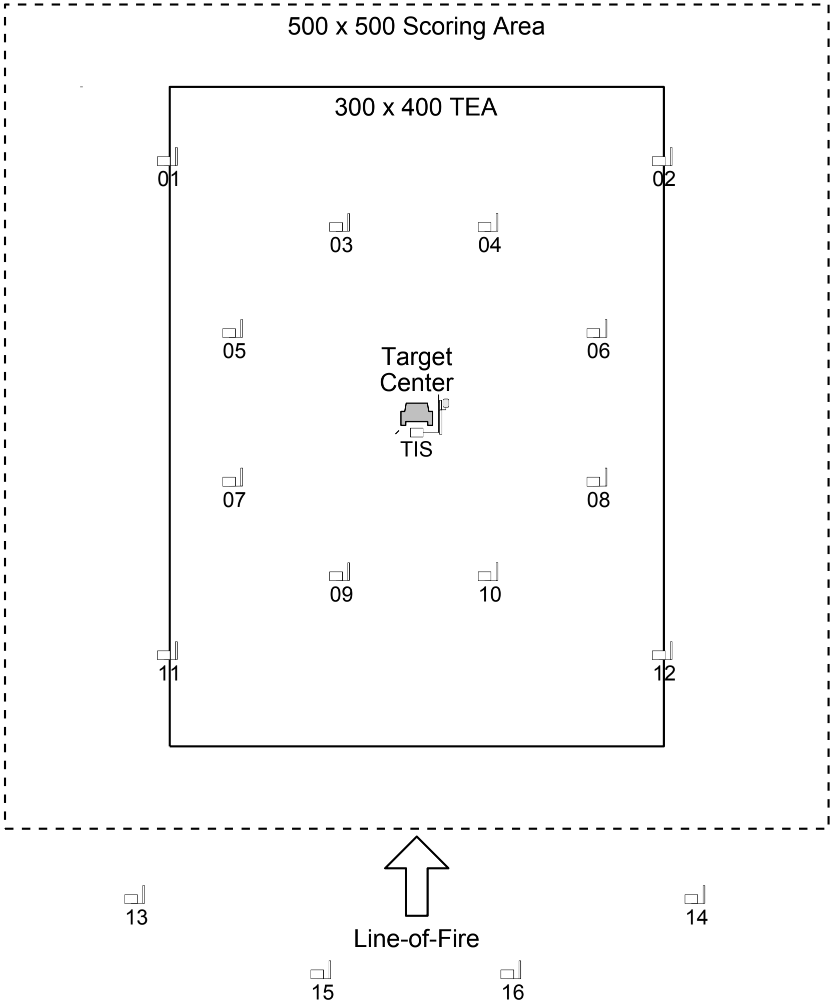
Target Interface Sensor (TIS)



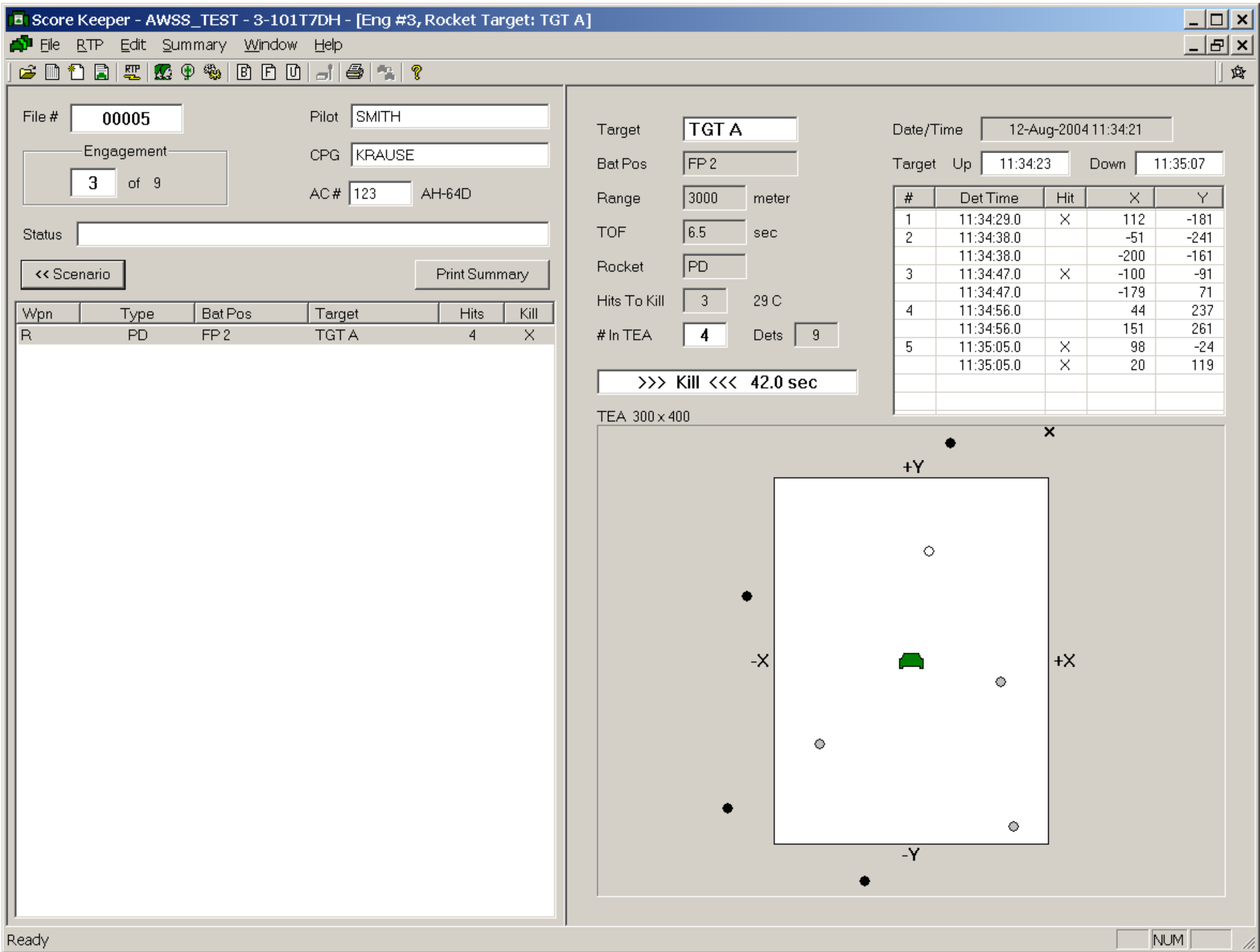
Rocket Acoustic Sensor (RAS)

Rocket scoring area

- Impacts are accurately located within 500m X 500m zone.
- Impacts within user defined Target Effect Area (TEA) area are indicated as target hits.
- All impacts detected and resolved are indicated on score sheet for each target.



Rocket scoring display



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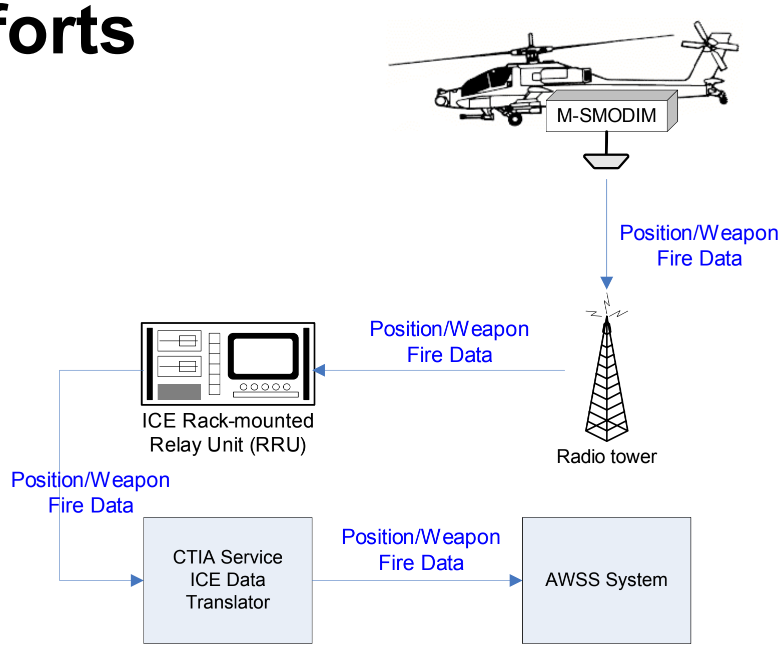
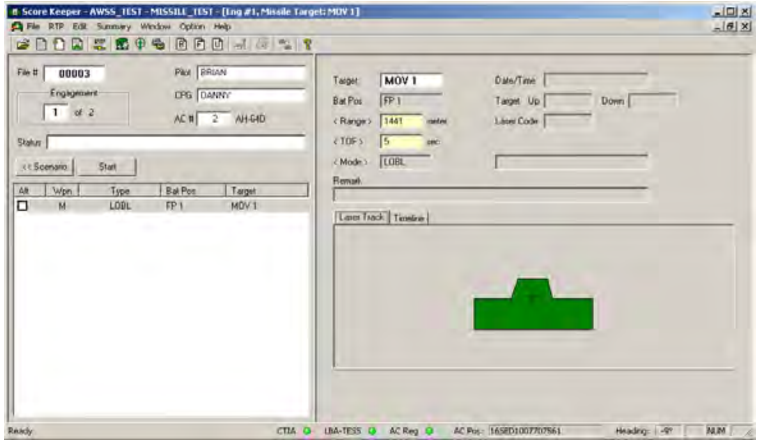
Current system upgrade efforts
Aviation data capture

- Integration of AWSS Control Station Subsystem with Aviation Tactical Engagement Simulation System (TESS)
  - Pulls A/C status & weapons data from the 1553 bus into the AWSS Control Station for improved scoring via the TESS, Smart Onboard Data Interface Module (SMODIM)
  - Automates the scoring process for the Hellfire Missile Engagements (using the Captive Training Missile) & eliminates the need for Pilot shot call
  - Provides a common GPS time base to sync the A/C weapon firing events to the AWSS score reporting

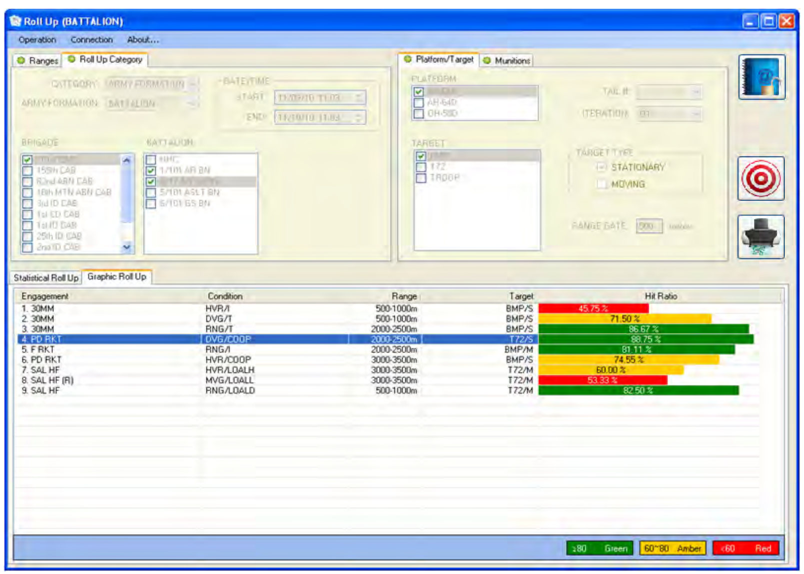




Current system upgrade efforts cont.

Unit gunnery summary report

» Modified the AWSS CSS S/W to add a new database that allows for USAACE Gunnery Branch to perform unit level and Army-wide rollup to justify ammunition levels and track unit readiness



Sample Graphic Roll Up (Battalion)

Engagement	Condition	Range	Target	Hit ratio
1. 30MM	HVR / IHADSS	600	TROOP / S	[illegible]
2. PD RKT	DVG / COOP	2000	BMP / S	[illegible]
3. SAL HF	HVR / LOAL H	4800	T72 / S	79%
4. SAL HF	RNG / LOAL D	4000	T72 / M	[illegible]
5. 30MM	RNG / TADS	1200	TECH/S	[illegible]
6. SAL HF (R)	MVG / LOAL L	2300	T72/S	[illegible]
7. 30MM	DVG / TADS	1300	BMP / M	[illegible]
8. F RKT	RNG / IHADSS	1200	BMP / M	75%
9. PD RKT	HVR / COOP	3200	TRUCK/S	[illegible]
10. 30MM	DVG / IHADSS	900	TECH/S	[illegible]
11. PD RKT	RNG / IHADSS	2000	TROOPS/S	[illegible]
12. SAL HF	HVR / LOAL D	2300	T72	[illegible]

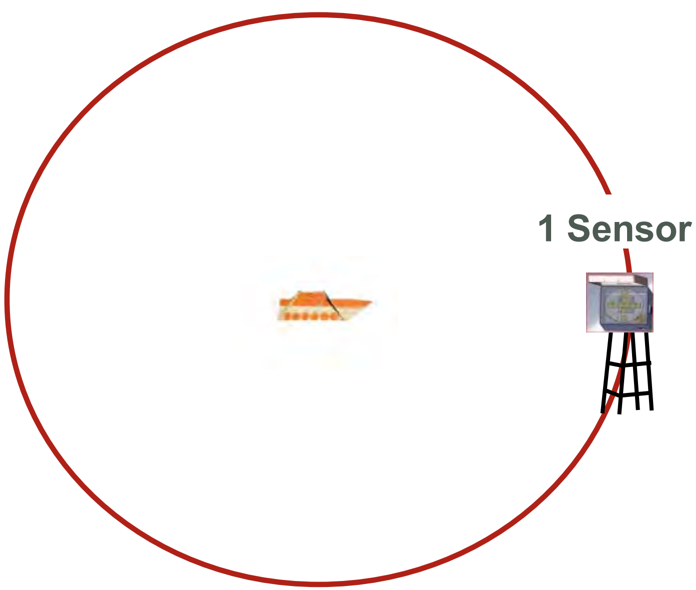
≥ 80% - Green
60-80% - Amber
< 60% - Red

Roll Up (Table 7DN and 8DN / Engagement 1 – 30MM IHADSS)

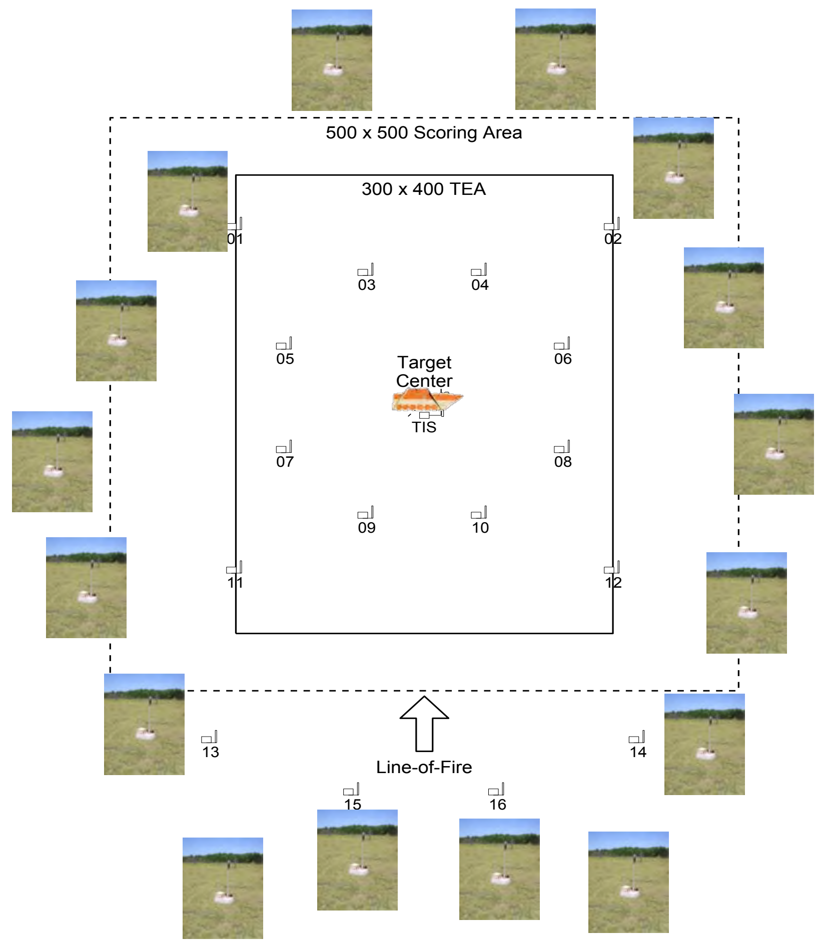
Bullet Size	Battle Position	Target Mnemonic	Total Hits	Total Rounds
30MM	FP1A	A-7	1601	2040

Current system upgrade efforts cont.

Radar vs. Acoustic Rocket Scoring



Enables diving fire:
Rapid rocket scoring
Paired rocket scoring

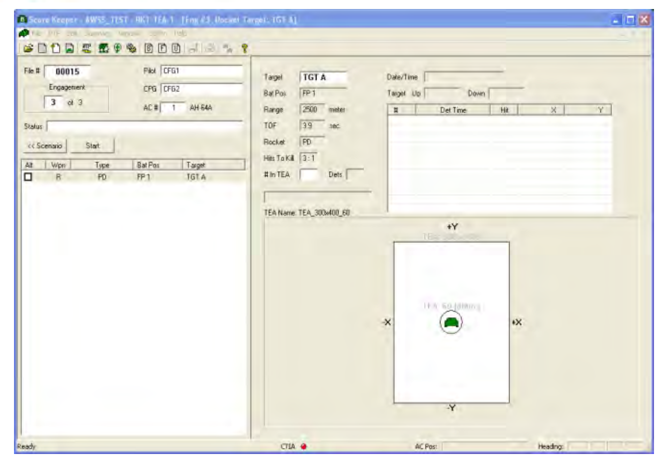


October 2011 | © Meggitt Defense Systems Inc.

Current system upgrade efforts cont.

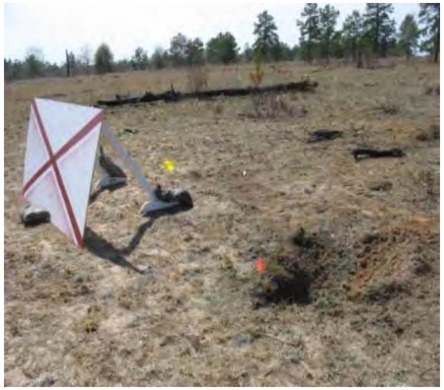
Radar rocket scoring

» Evaluation of Radar for Short range, Rapid Fire Rocket Scoring
  - NAWC/WD Targets System Division, Point Mugu/Port Hueneme entered a loan agreement with the US Army (PM ITTS, TMO) to conduct evaluations of the Surface Target Vector Scorer (STVS) for data collection and proof of concept
    - NAWC/WD Targets System Division
    - POC: Mr. Dae Hong 805-989-5996 dae.hong@navy.mil
  - STVS was recently developed for the US Navy for enhanced fleet training capabilities during gun weapon system & missile firing
  - Goal was to enable the AWSS to provide accurate scoring of single, pairs & ripple fire M274 Point Detonation 2.75" Training Rockets when fired at range to target of less than 1500 meters



Current system upgrade efforts cont.
Radar rocket scoring

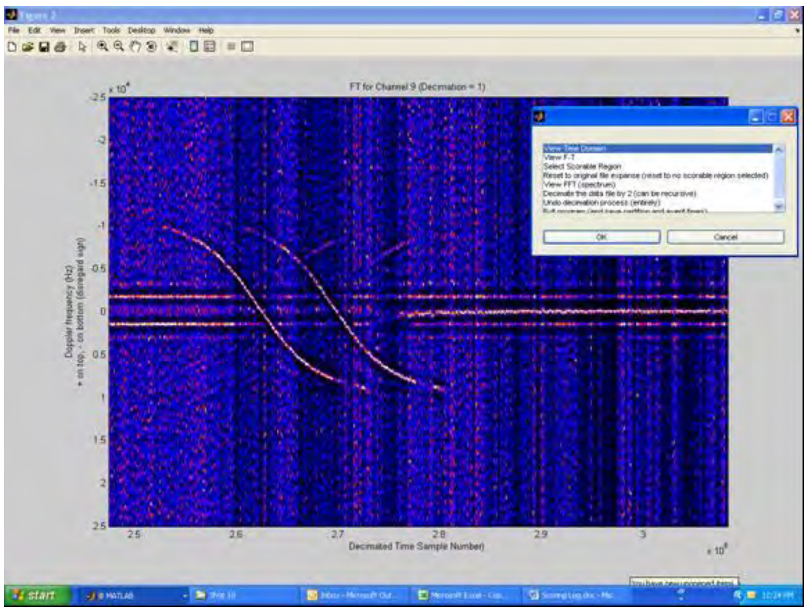
- Evaluation of Radar for Short range, Rapid Fire Rocket Scoring
- Work performed
  - MDSI received the transfer of STVS hardware from USN (NAWC/WD Targets System Division)
  - Prototype Antenna design was completed
  - Initial algorithms were refined and all hardware was tested
  - Successful live-fire data collection was carried out 4-16 March 2010
  - Processed all data for shots within the designated TEA (100 Meter Circle)

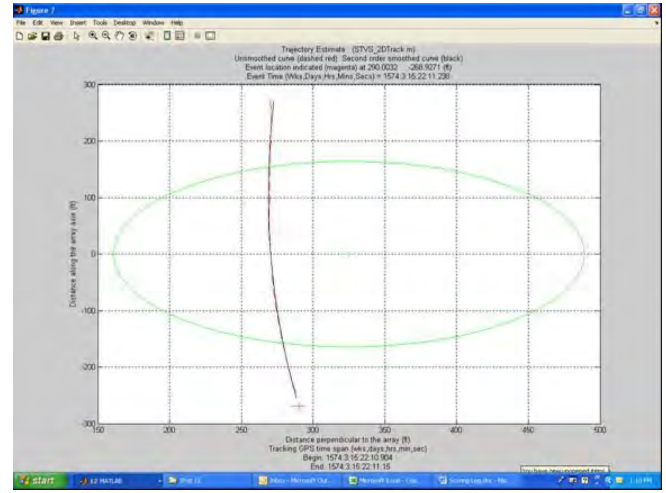


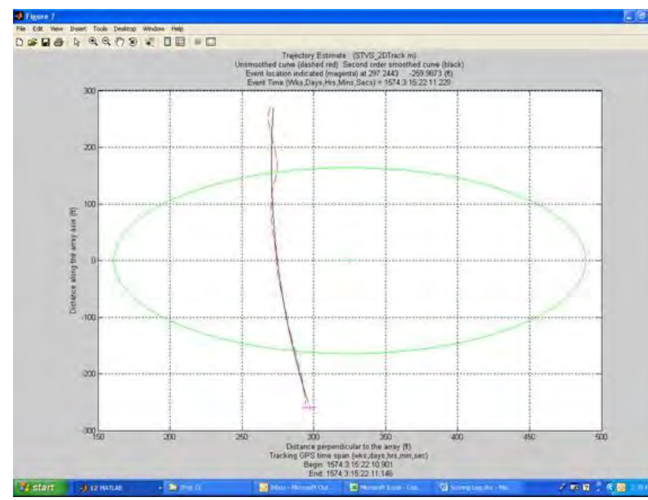
Current system upgrade efforts cont.

Radar rocket scoring

- Data shows two individual rockets fired as a pair in a color frequency vs. time display
- Each rocket was tracked separately to process the impact points

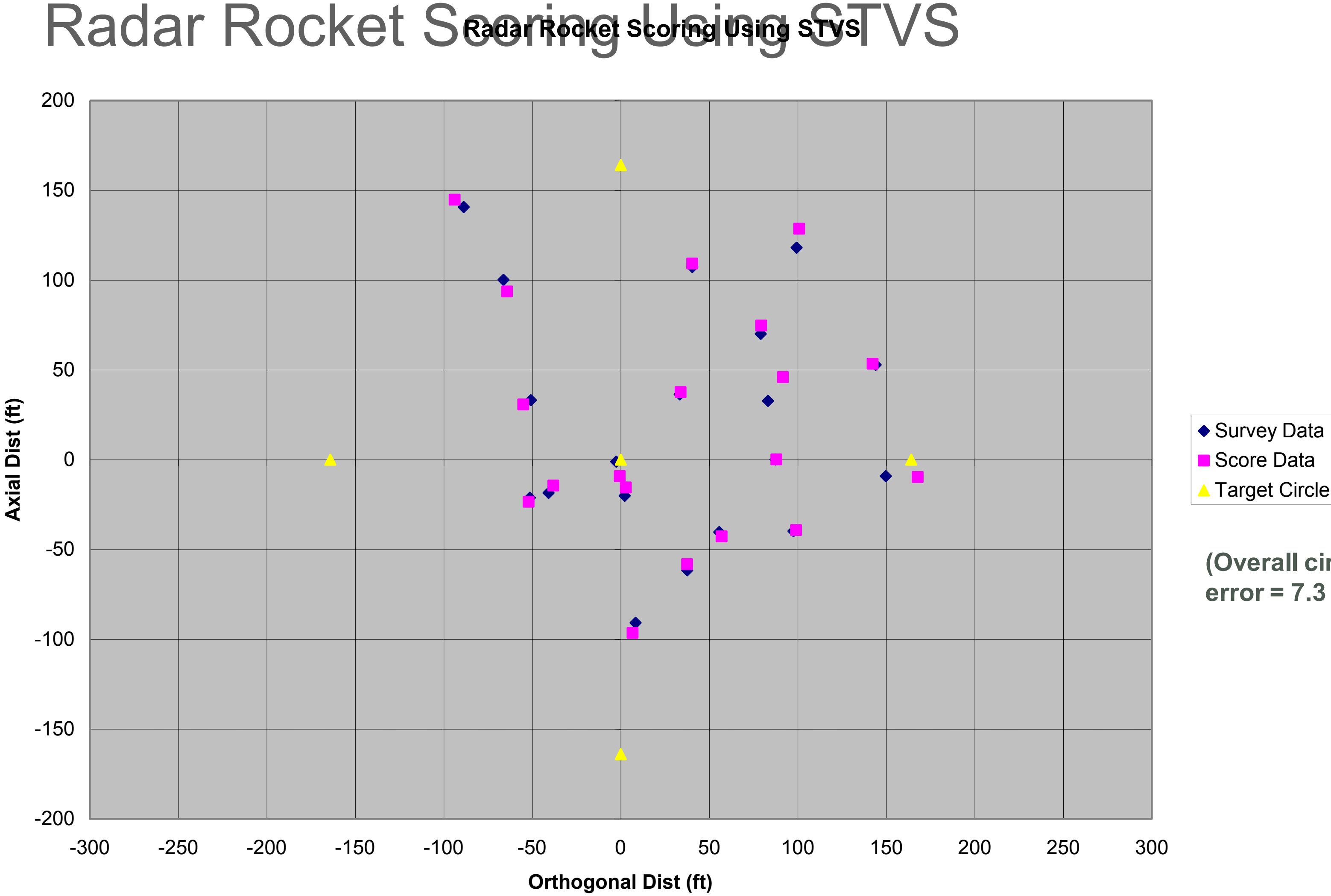






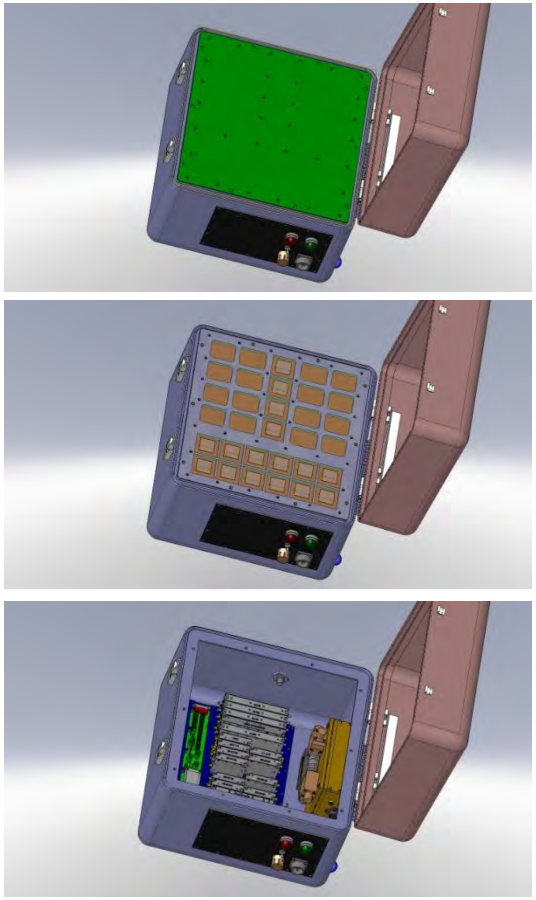
Summary of rocket impacts vs. processed

Radar Rocket Scoring Using STVS



(Overall circular RMS error = 7.3 feet/2.2 meters)

Conceptual radar design



Government & service contractor POC's

- Training Requirements/Doctrine:
  - CW5 Robert S. Jackson – USAACE, Gunnery Branch, Ft. Rucker
    - 334-255-2691, Robert.S.Jackson2@us.army.mil
  - Mr. Ron Moring – Army Aviation Training Specialist - ATSC, TCM-Live, LTD
    757-878-2320, ron.moring@us.army.mil
- Engineering/Development/Production:
  - Mr. Barry Hatchett – AWSS PD, PEO-STRI, PM-ITTS, Targets Management Office
  - 256-842-6797, barry.hatchett@us.army.mil
- Operations:
  - Mr. Todd Pesicek, PEO STRI, PM Field Ops
    407-384-5524, Todd.Pesicek@us.army.mil
  - Mr. Troy Stevens – AWSS Operations Manager – Warrior Training Alliance, CSC
    254-702-3400, Troy_L_Stevens@raytheon.com

Questions / comments ?

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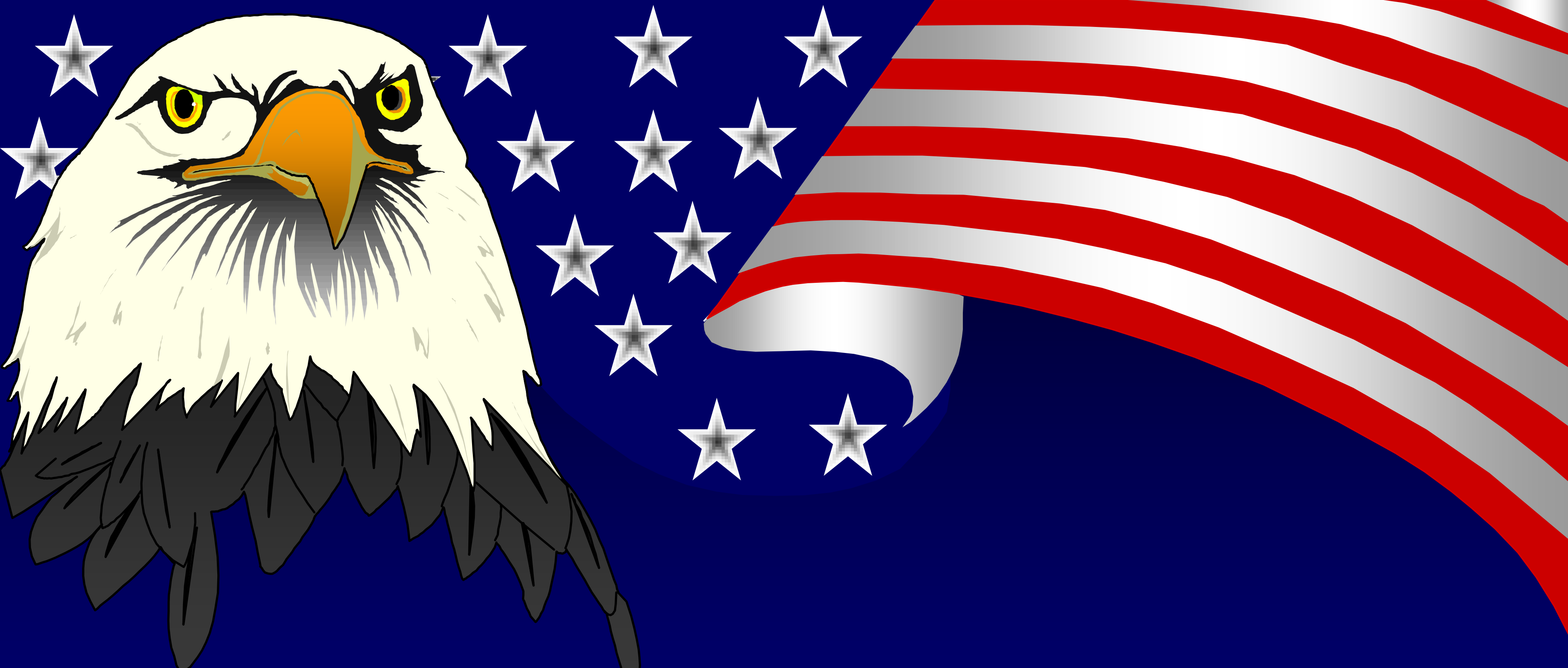
MEGGITT

Thank you



Spectrum Processes:
What does it take to Radiate?

Mr. Joe P. Giangrosso
RF Spectrum Engineer
Office of the DoD Gulf Area Frequency Coordinator
96 CS/SCXF
Eglin AFB, FL 32542
850-882-4416

Briefing Outline

- Introduction
- Spectrum Certification Process
- Frequency Assignment Process
- Office Contact Information
- Presidential Broadband Plan
- Conclusion

INTRODUCTION

- Access to RF Spectrum Is Increasingly Critical to the AF Mission:
  - Needs Are Increasing –
  - Access Threatened by Commercial/International Competing Interests - Threat to Info Superiority Getting Worse
- High Value Spectrum Is Often Over-Allocated - Military Uses Are Often Lower Priority, esp. Outside US
- Spectrum Management Is a Complex, Highly Political Process:
  - Policy and processes governed by Federal Law and DoD Regulations
    - Federal Agency oversight by the National Telecommunications Information Administration (NTIA) as per CFR Title 47
  - Complex National/International Organizational Structures Affect AF's Ability to Influence Spectrum Decisions & Defend Interests
- Current Situation Is Heavily Biased In Favor of Commercial Interests:
  - National/International Spectrum Management Organizational Structure
  - Lack of Understanding of National Security Aspects of Spectrum Allocation In Congress & Most Agencies
  - Huge money maker

What is Spectrum Management

"Planning, coordinating, and managing joint use of the electromagnetic spectrum through operational, engineering, and administrative procedures, with the objective of enabling electronic systems to perform their functions in the intended environment without causing or suffering unacceptable interference."

DoD Operational Challenge

Spectrum Certification Process

Allocation vs. Assignment

- **Allocation (Equipment certification)**
  - **Builder's permit**
  - **Design Data (DD FM 1494)**
    - **Engineering focus**
  - **Customer = Mostly AQ**
  - **Interfere with another community? (broad view)**
  - **Emanation fits US/Host Nation use rules?**
  - **Can drive redesign**
  - **Outcome is MCEB directed operating restraints**

- Assignment (Specific use)
  - License to Radiate
  - Operating Data (Standard Frequency Action Format)
    - Location and Time focus
  - Customer = Warfighter
  - Interfere with neighbor?
  - Receive interference from others?
  - Adhere to Military Communications-Electronics Board (MCEB) operating restraints

Spectrum Certification Process
Spectrum Planning Subgroup Review

- All systems used by DoD in the US require NTIA certification and USMCEB review .
- NTIA review/approval is through the Spectrum Planning Subgroup (SPS)
- Other than the systems listed below, the AFSMO determines which DD Forms 1494 require SPS review.
  - New systems or subsystems and major modifications to existing systems involving use of satellites or spacecraft.
  - All new systems or subsystems and major modifications to existing systems previously reviewed by the SPS if there is a significant impact on the RF spectrum when considering geographical location and frequency availability.
  - Land mobile radio (LMR) trunked systems.
  - Other systems or facilities that the NTIA, Interdepartmental Radio Advisory Committee (IRAC), or other government agencies refer to the SPS.

Spectrum Certification Process

- DoD assigned the responsibility for military frequency engineering and management to the US Military Communications-Electronics Board (USMCEB). To obtain authority to Radiate, there are two processes:
  - DD Form 1494, Application for Equipment Frequency Allocation-certification of spectrum support
  - the frequency assignment proposal or request-operator's license.
- The USMCEB, through the SPS, reviews the characteristics of C-E equipment purchased or developed by the DoD.
- Joint Frequency Equipment Allocation Process (also called the J/F-12 Process)
  - defined by requirements established by NTIA/SPS, and military joint or allied system review groups.

Getting The Spectrum Support Process Started

- **RF transmitting or receiving device design must be presented on a DD Form 1494 as early as possible in the acquisition (or modification) process. This is required regardless of power output.**
- **Inclusion of DFAR clause 252.235-7003 in contracts involving these (RF) devices is recommended.**
- **Including the DD Form 1494 in the CDRL for Stage 3 and Stage 4 is a requirement. These reflects the contractor's developmental and production equipment.**
- **Completed DD Form 1494 should be submitted to the Program Office (PO) designated as the lead agent for the program.**

Spectrum Certification
Stage Definition

- DD Form 1494-Stage Definition
  - <u>Stage 1 Conceptual:</u> Usually for Lab concepts and development. Completed prior to possible obligation of Government funds.
  - <u>Stage 2 Experimental:</u> Usually for all PO's and approval is required prior to Government obligation of funds. The Form is completed by the PO and reflects the specified technical parameters as calculated by the engineering staff.

Spectrum Certification Stage Definition

- **DD Form 1494-Stage Definition (cont)**
  - **Stage 3 Development:** At this stage the contractor is responsible for completing the form. The program should have just completed its final technical review. This stage provides the contractor's position for the device and once approved, would allow the contractor to perform open air testing prior to a production decision. The approval of this stage will allow frequency assignments for test purposes only.
  - **Stage 4 Operational:** At this stage, the contractor is responsible for completing the form. The data provided shall be measured from one of the first production or LRIP units. With approval of this stage, operational frequency assignments are requested for the operating locations with the exception of OCONUS locations.

CLASSIFICATION **UNCLASSIFIED**

TRANSMITTER EQUIPMENT CHARACTERISTICS

NOMENCLATURE, MANUFACTURER'S MODEL NO (U) TN-X/30	**2. MANUFACTURER'S NAME** (U) Northern Radio and Wireless
3. TRANSMITTER INSTALLATION (U) Fixed	**4. TRANSMITTER TYPE** (U) QAM Communications
5. TUNING RANGE (U) 7442 MHz - 7883 MHz	**6. METHOD OF TUNING** (U) Synthesizer
	8. EMISSION DESIGNATORS (U) 28M0D7W (U) (U)
7. RF CHANNELING CAPABILITY (U) 7442 MHz, 28 MHz increments	**12. EMISSION BANDWIDTH** ☐ CALCULATED ☒ MEASURED
9. FREQUENCY TOLERANCE (U) 10 ppm	a. -3 dB (U) 22 MHz (U) (U)
10. FILTER EMPLOYED (U) ☒ a. YES ☐ b. NO	b. -20 dB (U) 26 MHz (U) (U)
	c. -40 dB (U) 36 MHz (U) (U)
11. SPREAD SPECTRUM (U) ☐ a. YES ☒ b. NO	d. -60 dB (U) 44 MHz (U) (U)
	e. OC-BW (U) 28 MHz (U) (U)
13. MAXIMUM BIT RATE (U) 171.7 Mbps	**15. MAXIMUM MODULATION FREQUENCY** (U) NA
14. MODULATION TECHNIQUES AND CODING (U) 128 QAM; FEC	**17. DEVIATION RATIO** (U) NA
	18. PULSE CHARACTERISTICS
16. PRE-EMPHASIS (U) ☐ a. YES ☒ b. NO	a. RATE (U) NA (U) (U)
19. POWER	b. WIDTH (U) NA (U) (U)
a. MEAN (U) 1.4 mW - 1.35 W (U) (U)	c. RISE TIME (U) NA (U) (U)
b. PEP (U) NA (U) (U)	d. FALL TIME (U) NA (U) (U)
	e. COMP RATIO (U) NA (U) (U)
20. OUTPUT DEVICE (U) Solid state	**21. HARMONIC LEVEL**
	a. 2nd (U) -45 dB
22. SPURIOUS LEVEL (U) -109 dB	b. 3rd (U) -45 dB
23. FCC TYPE ACCEPTANCE NO. (U) CXP7UJ8X30A1	c. OTHER (U) -45 dB

24. REMARKS (U) Item 10: 6-pole waveguide filter.

CLASSIFICATION **UNCLASSIFIED**

J/F 12/09120

RECEIVER EQUIPMENT CHARACTERISTICS

NOMENCLATURE, MANUFACTURER'S MODEL NO.
(U) TN-X/30

2. MANUFACTURER'S NAME
(U) Northern Radio and Wireless

. RECEIVER INSTALLATION
(U) Fixed

4. RECEIVER TYPE
(U) Singel Conversion Superheterodyne

TUNING RANGE
(U) 7442 MHz - 7883 MHz

6. METHOD OF TUNING
(U) Synthesizer

8. EMISSION DESIGNATORS
(U) 28M0D7W

RF CHANNELING CAPABILITY
(U) 7442 MHz, 28 MHz incr.

FREQUENCY TOLERANCE
(U) 10 ppm

11. RF SELECTIVITY
☐ CALCULATED ☒ MEASURED

a. -3 dB	(U)	52 MHz
b. -20 dB	(U)	70 MHz
c. -60 dB	(U)	140 MHz
d. Preselection Type	(U)	SAW/Waveguide

10. IF SELECTIVITY	1st (U)	2nd (U)	3rd (U)
a. -3 dB	32 MHz	NA	NA
b. -20 dB	52 MHz	NA	NA
c. -60 dB	64 MHz	NA	NA

12. IF FREQUENCY
140 MHz

NA

13. MAXIMUM POST DETECTION FREQUENCY
(U) NA

14. MINIMUM POST DETECTION FREQUENCY
(U) NA

16. MAXIMUM BIT RATE
(U) 171.7 Mbps

15. OSCILLATOR TUNED	1st (U)	2nd (U)	3rd (U)
a. ABOVE TUNED FREQUENCY			
b. BELOW TUNED FREQUENCY			
c. EITHER ABOVE OR BELOW THE FREQUENCY	X		

17. SENSITIVITY

a. SENSITIVITY	(U)	- 68 dBm
b. CRITERIA	(U)	BER=10x-6
c. NOISE FIG	(U)	2.9 dB
d. NOISE TEMP	(U)	NA

18. DE-EMPHASIS
(U) ☐ a. YES ☒ b. NO

19. IMAGE REJECTION
(U) 120 dB

20. SPURIOUS REJECTION
(U) 130 dB

21. REMARKS (U)

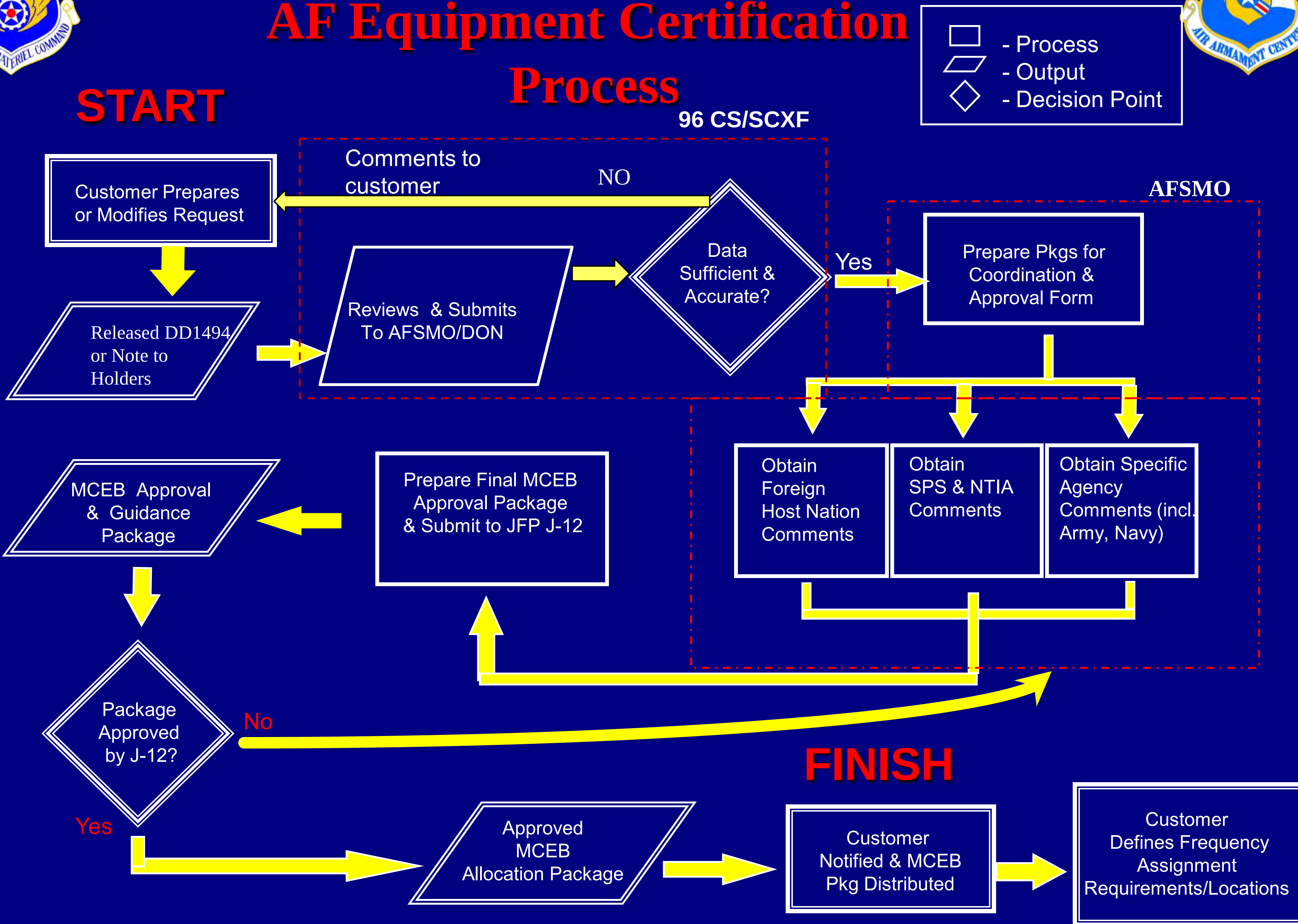
ANTENNA EQUIPMENT CHARACTERISTICS

1. (U) [ ] a. TRANSMITTING [ ] b. RECEIVING [X] c. TRANSMITTING AND RECEIVING

2. NOMENCLATURE, MANUFACTURER'S MODEL NO. (U) PL4-71W	**3. MANUFACTURER'S NAME** (U) Andrew Corporation
	5. TYPE (U) Parabolic Reflector
4. FREQUENCY RANGE (U) 7100 MHz - 8500 MHz	**7. SCAN CHARACTERISTICS**
	a. TYPE (U) FIXED
6. POLARIZATION (U) Linear Horizontal/Vertical	**b. VERTICAL SCAN** (U) NA
	(1) Max Elev (U) NA
8. GAIN	**(2) Min Elev** (U) NA
a. MAIN BEAM (U) 36.5 dBi	**(3) Scan Rate** (U) NA
	c. HORIZONTAL SCAN (U) NA
b. 1st MAJOR SIDE LOBE (U) 20 dBi @ 5 deg	**(1) Sector Scanned** (U) NA
9. BEAMWIDTH	
a. HORIZONTAL (U) 2.2 deg	**(2) Scan Rate** (U) NA
b. VERTICAL (U) 2.2 deg	**d. SECTOR BLANKING** (U) [ ] (1) YES [X] (2) NO

10. REMARKS (U)

AF Equipment Certification Process



PROBLEM AREA
ACQUISITION REFORM

FAST TRACK PROCUREMENT

puts

FREQUENCY APPROVAL

on

Critical path

Spectrum Certification Process
Note to Holder

- Use the MCEB Note-to-Holder for amendments and updates to approved DD Forms 1494 (J/F-12) documents and MCEB memoranda.
- Note-to-Holder requests are sent through 96 CS/SCXF to the AFSMO and follow same process as DD Form 1494.
- Distribute host nation comments to applications by a Note-to-Holder. A Note-to-Holder to distribute host nation and CINC comments received about an application is created by the AFSMO, approved by the MCEB J-12 Permanent Working Groups, and distributed to the MCEB J-12 distribution list.

FREQUENCY

ASSIGNMENT PROCESS

Allocation vs. Assignment

- Allocation (Equipment exam)
  - Builders permit
  - Design Data (DD FM 1494)
    - Engineering focus
  - Customer = Mostly AQ
  - Interfere with another community? (broad view)
  - Emanation fits US/Host Nation use rules?
  - Can drive redesign
  - Outcome is MCEB directed operating restraints

- **Assignment (Specific use)**
  - **License to Radiate**
  - **Operating Data (Standard Frequency Action Format)**
    - **Location and Time focus**
  - **Customer = Warfighter**
  - **Interfere with neighbor?**
  - **Receive interference from others?**
  - Adhere to Military Communications-Electronics Board (MCEB) operating restraints

FREQUENCY ASSIGNMENT PROCESS

- **Before making a frequency assignment, the USMCEB must review the RF equipment via an approved DD Form 1494 (J/F 12)**
- **For all equipment developed at Eglin, the Eglin Installation Spectrum Manager (ISM) is required to request assignments for ALL LOCATIONS in which that equipment is planned to operate.**
- **The Installation Commander, through the ISM, can prohibit use of ANY RF emitter (cease and desist) when anticipating interference to mission essential electromagnetic equipment.**
- **All RF emitters must have a frequency assignment prior to operation. DoD GAFC has inherent authority from NTIA to make assignments as deemed necessary to meet mission requirements. A DD Form 1494 must have been submitted before this is valid.**

Frequency Coordination

- The DoD does not own any spectrum exclusively for military use. In fact, spectrum is not owned by any organization,
- It is "allocated" or managed by either the FCC (state, local, public and private users) or the NTIA (federal users). These two agencies manage all of the spectrum for the US.
  - Example: The DoD manages the spectrum between 225 MHz and 399.9 MHz for the federal government (NTIA) through the Military Assignment Group but is used by both DoD and FAA.
- When it is necessary for the Air Force to use frequencies managed by another federal department or agency, the Air Force must coordinate with the appropriate agency prior to submitting a frequency request to the NTIA for assignment action.

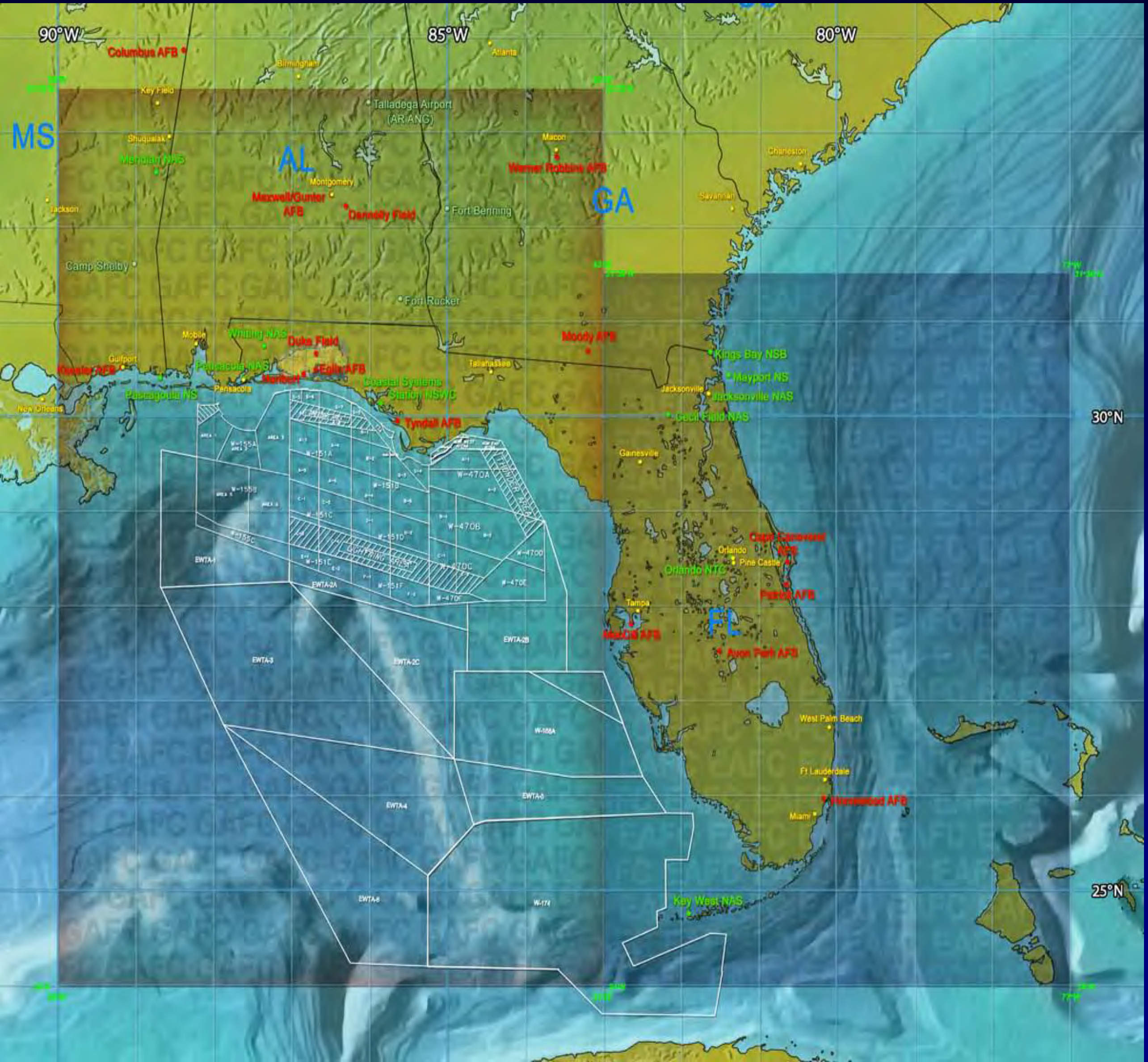
AFSMO lead-times

- For US&P operations
  - **Permanent Assignments. Sixty days.**
  - **Experimental Assignments. Sixty days.**
  - **In most cases, additional lead-time is required for all actions requiring coordination with the FCC or the FAA.**
  - **Requirements not in accordance with the national table of allocations, or have unusual technical parameters, may require additional engineering time or study, consequently requiring even longer lead-times. It is not uncommon for such requests to take more than six months at the national level.**

Contractor Use of Frequencies.

- **Air Force contracts.**
  - Contractors must submit frequency requests in direct support of Air Force contracts through the PO representative to the ISM.
  - The contractor must obtain frequency assignments from the FCC for requirements not in direct support of an AF contract. Example: Foreign direct sale of a military article.
- **Multiple service contracts.**
  - Contractors must submit frequency requests in support of a multiple service contract through the appropriate spectrum management channels to the military department that is the executive service for the contract.
  - The contractor must obtain frequency assignments from the FCC for requirements not in direct support of the contract.

DoD GAFC AOR/Contact Info



DoD GAFC
AOR REPRESENTS
313,200 SQ MILES

EGLIN LAND RANGE
724 SQ MILES

TOTAL AIRSPACE
AVAILABLE TO EGLIN
INCLUDING MOAS
APPROX. 134,000 SQ MILES

Contact

DOD Gulf Area Frequency Coordinator
96 CS/SCXF
201 W. Eglin Blvd., Ste. 256
Eglin Air Force Base, FL 32542-6829
Tel: 850-883-7535

Presidential Wireless Broadband Plan

- Signed in June 2010
- Locate 500 MHz of spectrum for wireless broadband application: plan signed in Oct 2010
  - Study 11 Bands-both Federal and non-Federal allocations
- Vacate bands within 10 years
- First priority to vacate: 1755-1850 MHz TM band
  - May sell off 1755-1780 in first round – Vacate in 5 years
  - Second round to include 1780-1850 MHz – Vacate in 10 years
  - NTIA rule: no new system allowed in this band-status quo
  - UAVs cannot co-exist with other systems merging into compressed band: 1780-1850 MHz
  - UAV operations impacted CONUS wide: may require exclusion zones for continued operations

Conclusion

- **RF Spectrum is a** scarce **and** finite “NATURAL RESOURCE**” and a “Cash Cow”.**
- **Certifications and Assignments required before authority to “Radiate” can be granted.**
- **Used world wide: processes must be followed for interoperability amongst all users .**
- **Certifications and Assignments are required under the authority of NTIA Manual/CFR Title 47 as well as DoD and Service Acquisition Regulations**
- **Loss of spectrum will see movement into new bands**
  – **New technical challenge: relocate without capability losses**

QUESTIONS ??????

Common Range Integrated Instrumentation System (CRIIS)

National Defense Industrial Association

49th Annual Targets, UAVs & Range Operations Symposium & Exhibition

NDIA
National Defense Industrial Association

CRIIS Program Overview

October 2011

Mr. Chris Hughes, CRIIS Program
Email: christopher.hughes2@eglin.af.mil

Distribution Statement A: Approved for public release. Distribution unlimited.

Outline

- Background
- Strategy
- Accomplishments
- Summary

CRIIS

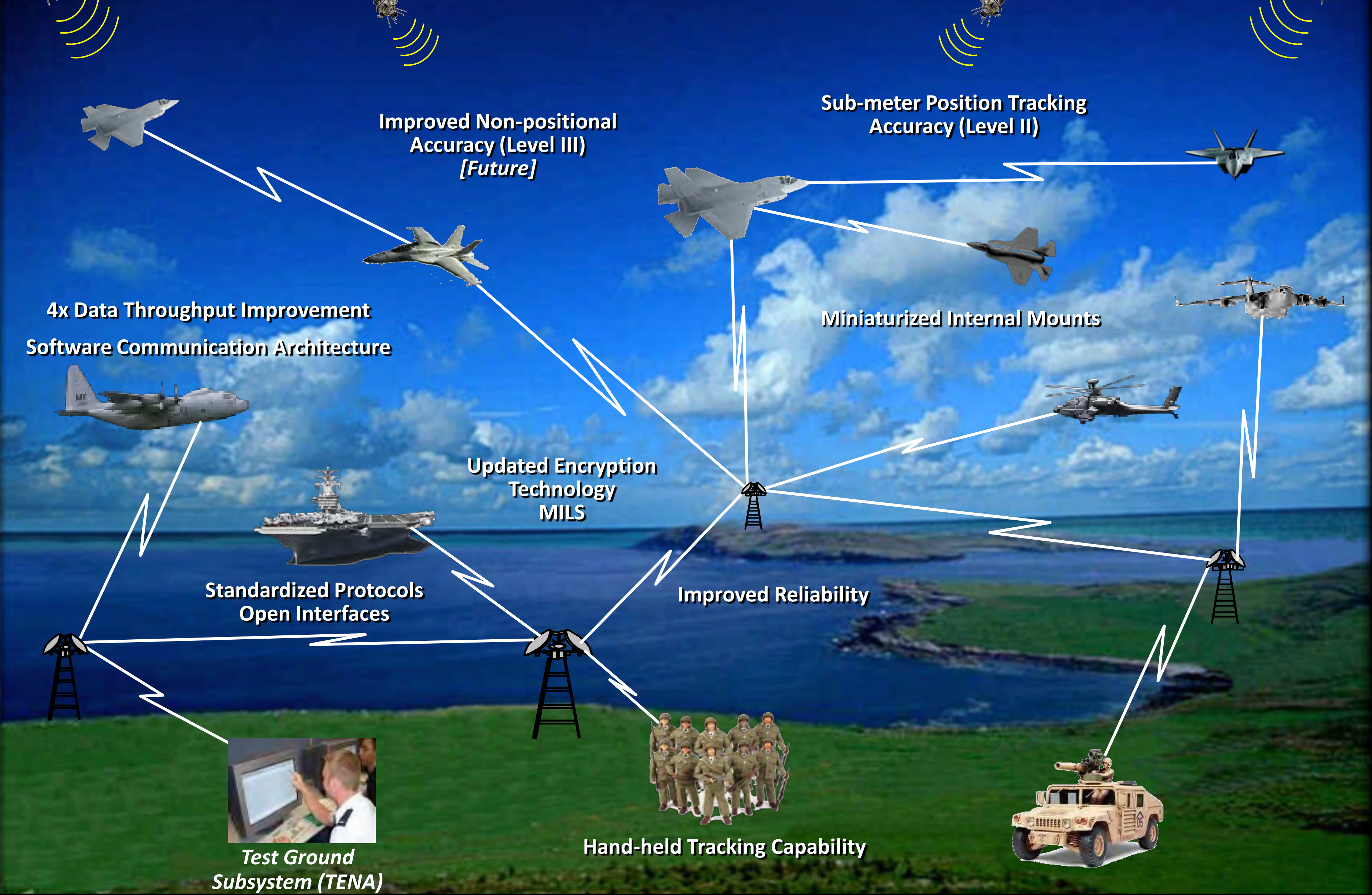
- Development Funded by OSD via Central Test & Eval Investment Program
  - CTEIP Highest Priority Program
- Production and Sustainment Funded by Each Service
- Advanced Tri-Service Range Instrumentation System
  - Supports 5th Generation Fighters
  - Provides Sub-meter High Dynamic Tracking Accuracy with Secure Datalink
    - Top Secret & Multiple Independent Levels of Security Capable
- 50-Person Project Office
- $500M Development and Production Value
- Prime Contractor: Rockwell Collins, Cedar Rapids, IA

Background

- Primary Function: Test Data Collection
  - Land, Sea, and Airborne Platforms (Including F-22A and F-35)
  - Requires Equipment More Accurate than System Under Test (SUT)
- CRIIS Provides:
  - High Accuracy Time, Space, Position Information (TSPI) of SUT
  - Secure Datalink(s) Transmit Real Time TSPI and Aircraft Data
    - Avionics
    - Weapons Targeting and Status Data
    - Aircraft Status
- CRIIS Maximizes Interoperability Among T&E Ranges
- Potential Use on Training Ranges
- CRIIS Development Funded by Central Test & Evaluation Investment Program
  - CRIIS Production and Sustainment Funded by Individual Services

CRIIS is A Test Range Replacement of the Existing GPS Based ARDS
With Advanced Datalink, TSPI, Security Features

CRIIS Overview



Test Package Directive (TPD) Issued 7 Jul 10

Functional Configurations

INCREMENT 1

Configurations 1, 2, 3

Level IA TSPI
Short Range DL

Config. 1
Dismounted Soldier

Level IB TSPI
Mid Range DL
Encryption

Config. 2
Low Dynamic Vehicles

Config. 3
Ship-to-Shore

Level IB TSPI
Extended Range DL

INCREMENT 2

Configurations 4, 5, 6

Level II TSPI
High Throughput DL
Encryption

Config. 4 Pod

Config. 5 Moderate Accuracy
Multi-Package Internal Mount

Config. 6 Moderate Accuracy
Single Package Internal Mount

INCREMENT 3

Configurations 7, 8

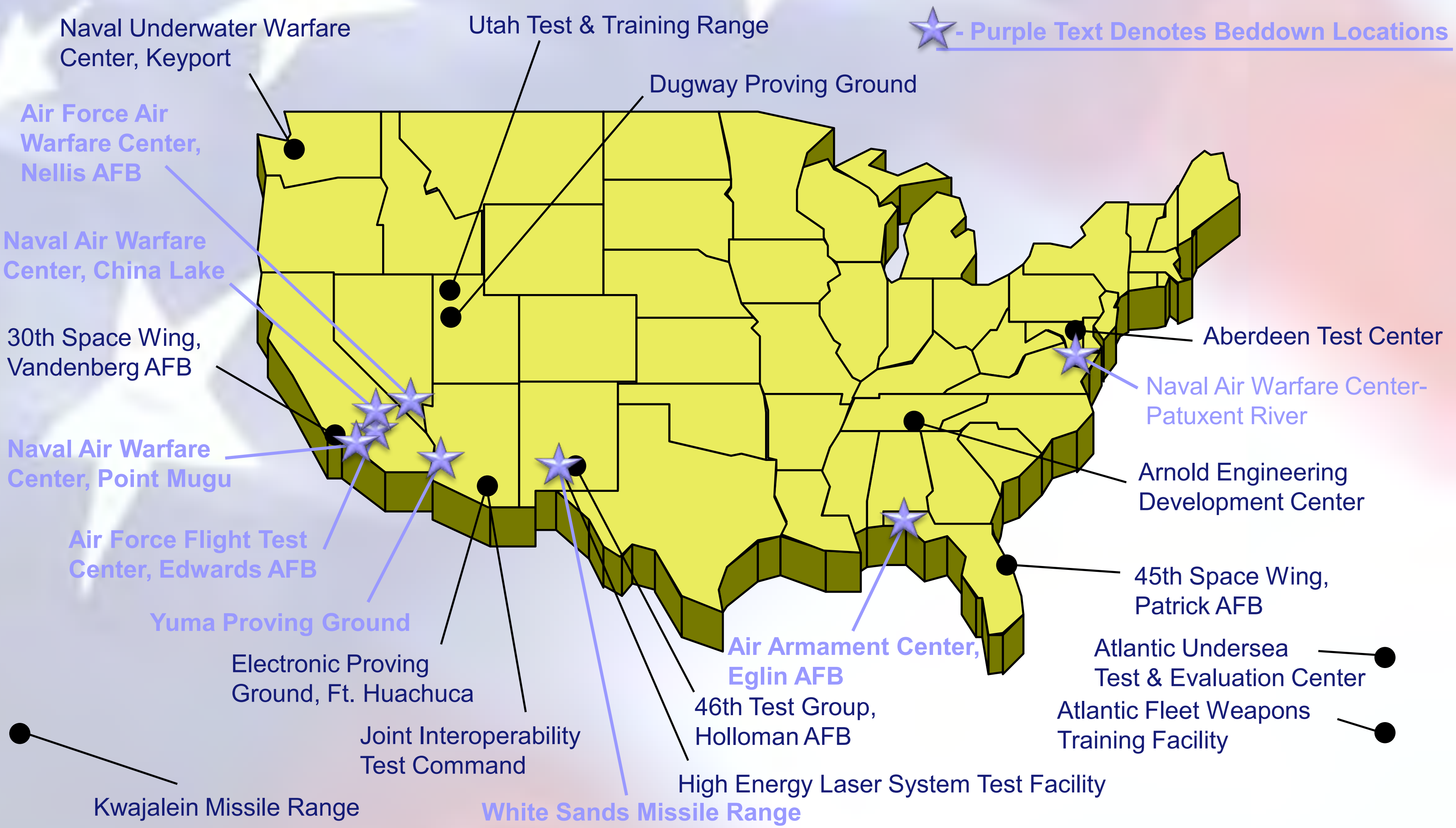
Config. 7 High Accuracy
Multiple-Package Internal Mount

Level III TSPI
High Throughput DL
Encryption

Config. 8 High Accuracy
Single Package Internal Mount

Ground Subsystem (GS)

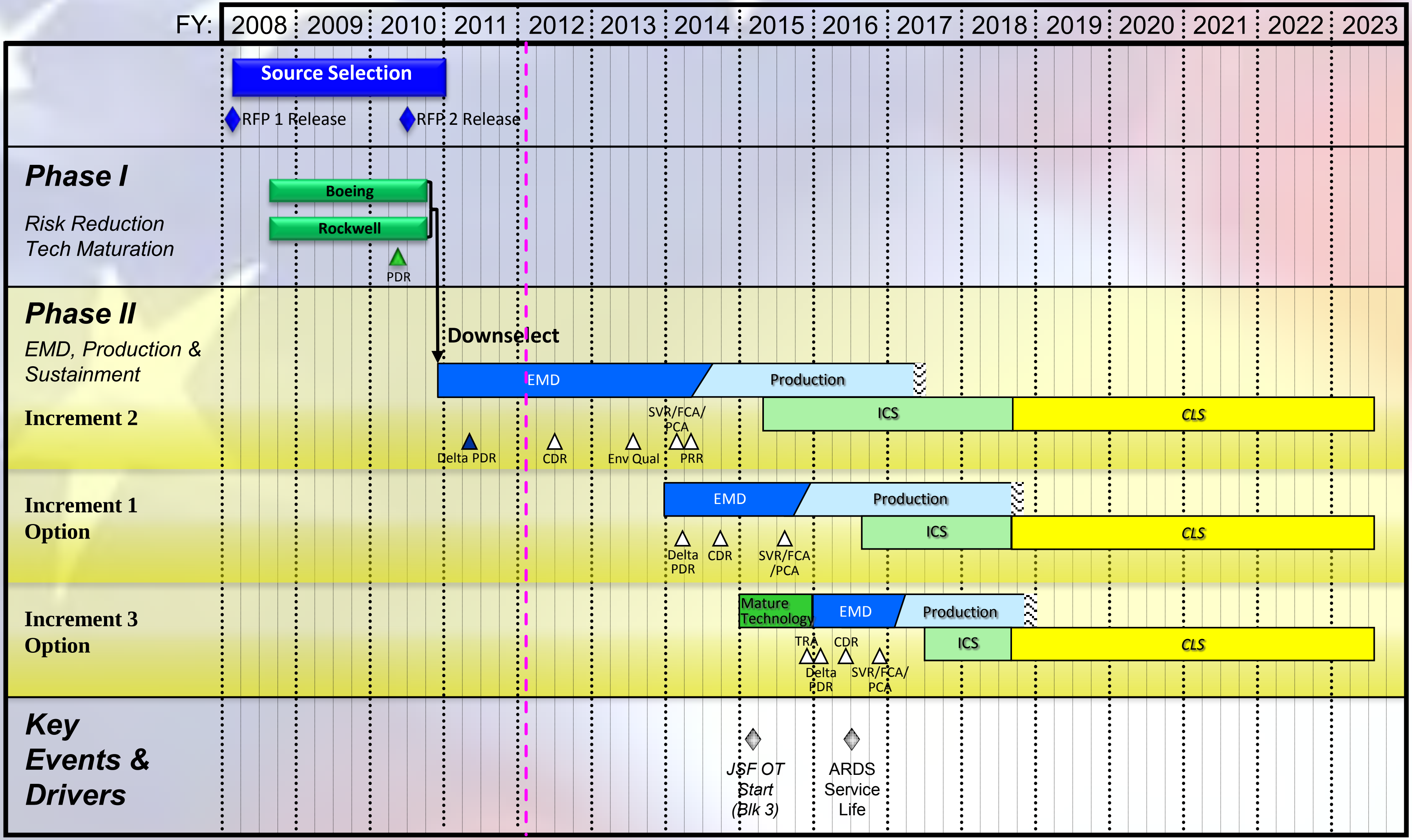
Major Range and Test Facility Base (MRTFB) and Initial Beddown Locations



Accomplishments/Status

- **Phase I Completed May 2010 – On Time and Within Budget**
  - ✓ Matured and Demonstrated TSPI Technology
  - ✓ Reduced Risk, Demonstrated High Throughput Datalink
  - ✓ Developed System Architecture and Preliminary Design, PDR
  - ✓ Conducted Phase II Source Selection
    - ✓ Fixed Price Production Options in Hand
    - ✓ Sustainment Strategy in Place
- **Phase II EMD Activities Accomplished/Planned**
  - ✓ Completed Delta PDR 15-17 Feb 11
  - ✓ Developed Prototype Boards
  - – Complete Detailed Design and Demonstration
  - – Perform Qualification Testing, Verification, and Validation
  - – Conduct Technical Reviews: CDR, TRR, PCA, FCA
  - – Develop Proof of Design/Manufacturing Units
  - – Transition to Production & Sustainment

CRIIS Program Schedule



Sustainment Approach

Sustainment Activities	ICS	CLS
Depot Repair Facility (for All Assets that Cannot be Repaired at O-level)	✓	✓
On-Call Tech Support 24/7 Via Phone	✓	✓
On-Site Tech Support Visit (Once per Year per Range)	✓	
RAMPOD Data Maintenance for Depot Assets	✓	✓
Central Stocking Location	✓	✓
Spares Management	✓	✓
Ship Repaired Assets to Ranges	✓	✓
Demil and Disposal		✓
Performance-Based Logistics (Material Availability and Material Reliability)		✓

Summary

- CRIIS is Funded and Executing Phase II
- CRIIS Technologies are Leading Edge
  - TSPI Pushing GPS Boundaries
  - Secure High Throughput, High Spectrally Efficient Datalink
- CRIIS is a Future Enabler
  - Conducive to Live, Virtual, Constructive Applications
  - Potential Operational Use




Target Support in a Resource Constrained Environment

CAPT William Jensen
Ranges and Targets Readiness Branch Head

OPNAV Prisoner #N433

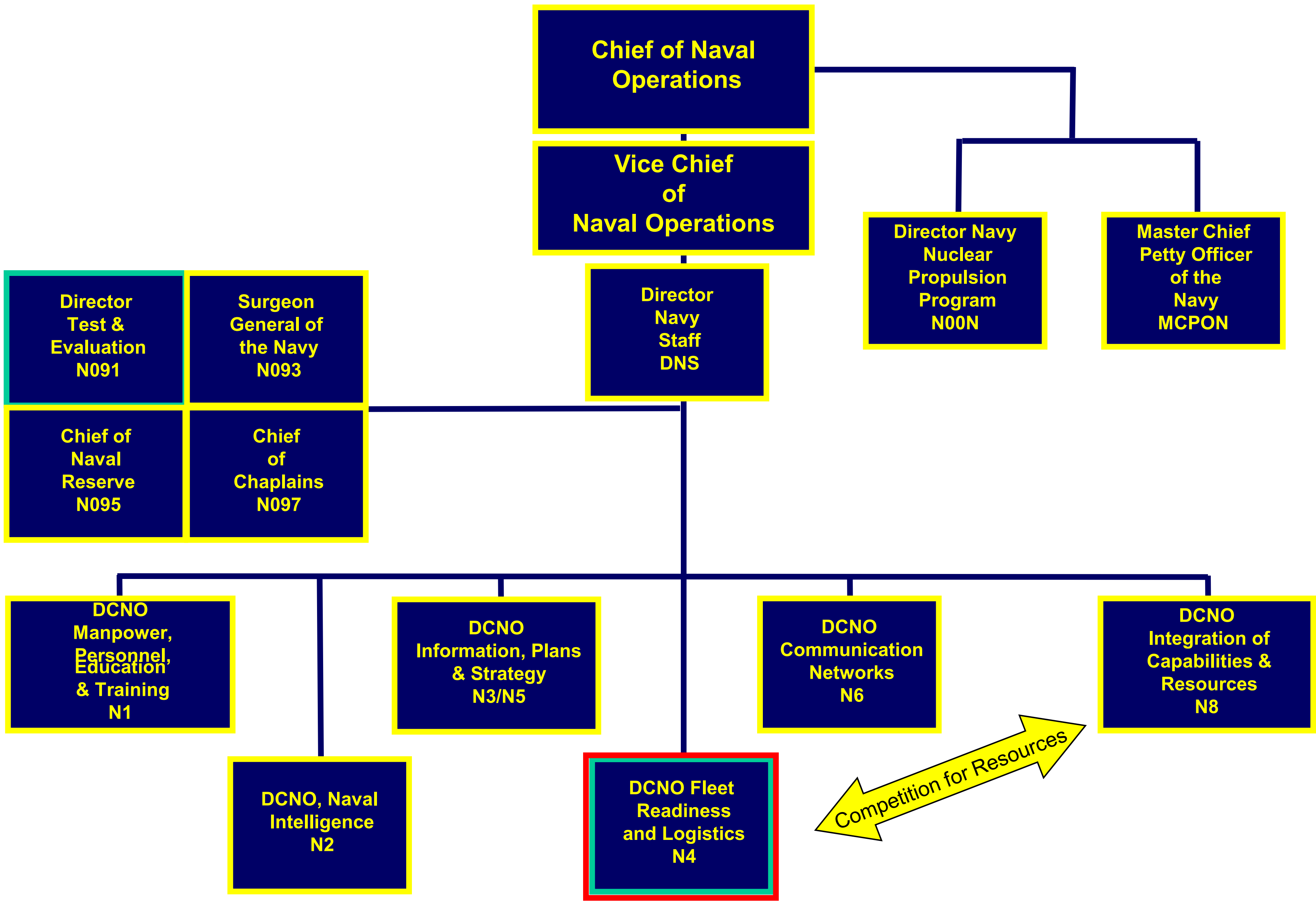
27 October 2011



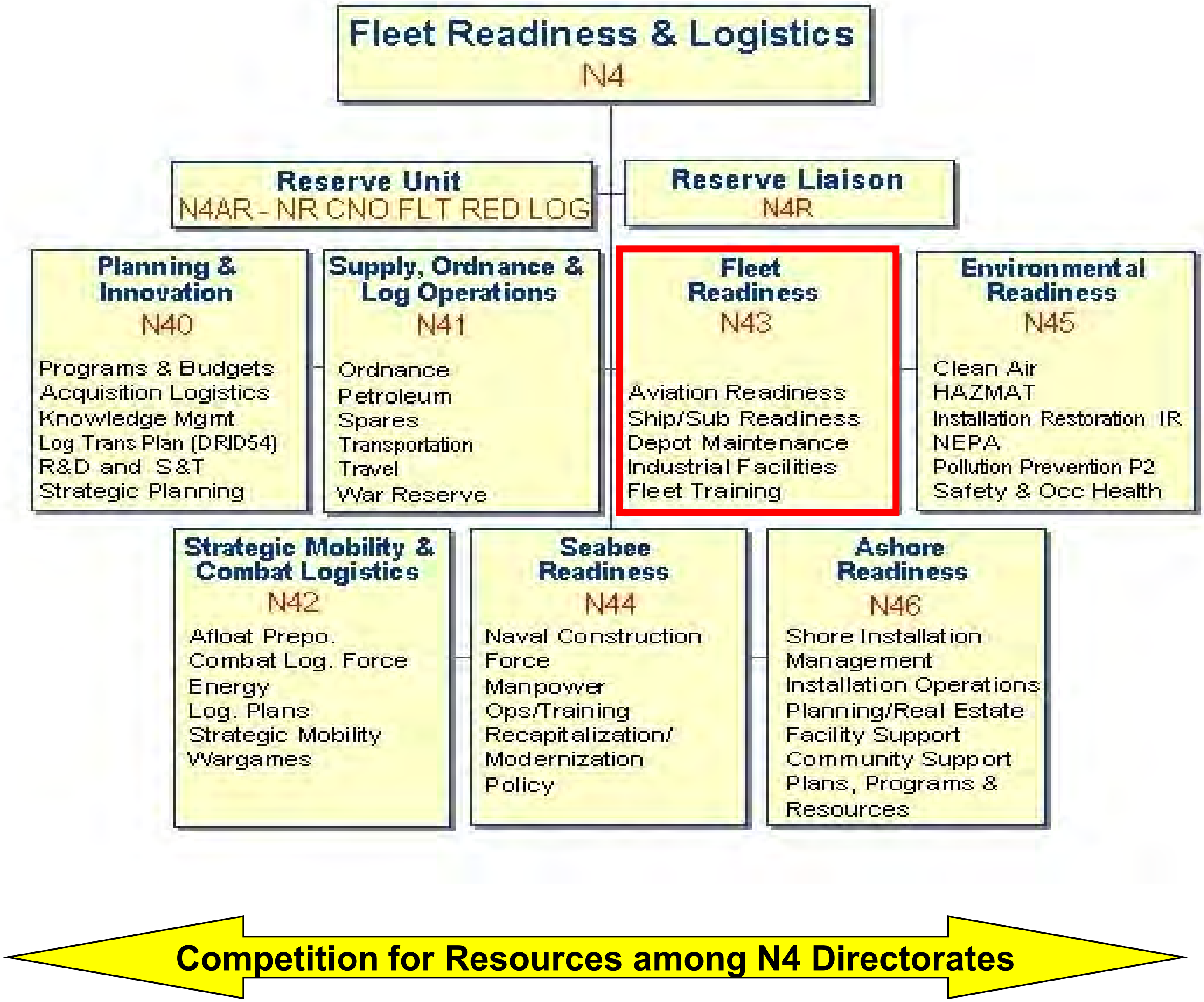

Overview

- Navy Target Program 101
- Emergent Unmet Requirements
- Inventory Challenges
- Target Program Cost Reduction Strategies
- “Joint” Use of Targets
- Joint Target Opportunities

OPNAV Organization

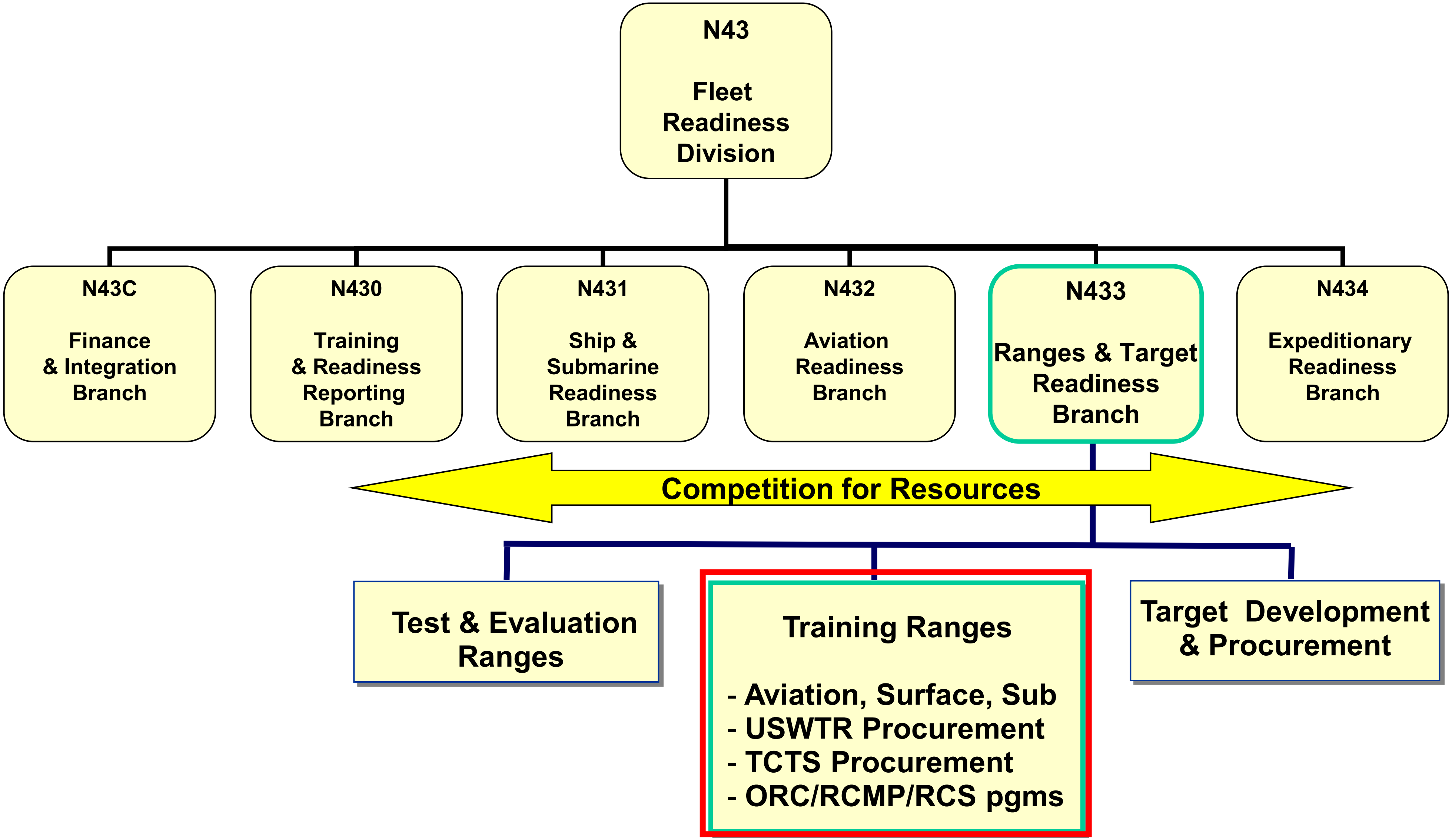


OPNAV N4



Fleet Readiness & Logistics
N4
Reserve Unit
N4AR - NR CNO FLT RED LOG
Reserve Liaison
N4R
Planning & Innovation
N40
Programs & Budgets
Acquisition Logistics
Knowledge Mgmt
Log Trans Plan (DRID54)
R&D and S&T
Strategic Planning
Supply, Ordnance & Log Operations
N41
Ordnance
Petroleum
Spares
Transportation
Travel
War Reserve
Fleet Readiness
N43
Aviation Readiness
Ship/Sub Readiness
Depot Maintenance
Industrial Facilities
Fleet Training
Environmental Readiness
N45
Clean Air
HAZMAT
Installation Restoration IR
NEPA
Pollution Prevention P2
Safety & Occ Health
Strategic Mobility & Combat Logistics
N42
Afloat Prepo.
Combat Log. Force
Energy
Log. Plans
Strategic Mobility
Wargames
Seabee Readiness
N44
Naval Construction Force
Manpower
Ops/Training
Recapitalization/ Modernization
Policy
Ashore Readiness
N46
Shore Installation Management
Installation Operations
Planning/Real Estate
Facility Support
Community Support
Plans, Programs & Resources
Competition for Resources among N4 Directorates

OPNAV N43



N43
Fleet Readiness Division
N43C
Finance & Integration Branch
N430
Training & Readiness Reporting Branch
N431
Ship & Submarine Readiness Branch
N432
Aviation Readiness Branch
N433
Ranges & Target Readiness Branch
N434
Expeditionary Readiness Branch
Competition for Resources
Test & Evaluation Ranges
Training Ranges
- Aviation, Surface, Sub
- USWTR Procurement
- TCTS Procurement
- ORC/RCMP/RCS pgms
Target Development & Procurement

Navy Targets Program

- **Primary Focus: Ship Self Defense Weapon System Tests**
  - Anti-Ship Cruise Missile Threat
  - Air Threat
  - Surface Swarm / Fast Attack Craft Threat
  - Mine Threat

- **Target Types**
  - Aerial
  - Surface
  - Subsurface/Submarine
  - Mine
  - Moving Land Target
  - NOT:
    - Helicopter
    - UAV
    - Static Land Targets

- **Training (Presentations and Live-Fire)**
  - Anti-Air Warfare
  - Surface Warfare/Counter Swarm
  - Anti-Submarine Warfare/Counter-Mine
  - Strike Warfare

Target impact by a surface-to-surface missile

International “Interest”

ВОЗДУШНАЯ РАКЕТА-МИШЕНЬ (РМ) BQM-74E «ЧУКАР» (Chukar), разработанная компанией «Нортроп-Грумман», состоит на вооружении ВМС США и ряда других стран. Она предназначена для имитации атаки противокорабельной ракеты вероятного противника со схожими тактико-техническими характеристиками на корабль (или на береговой объект) во время отработки вопросов противовоздушной обороны корабля (группы кораблей). Старт РМ может осуществляться с пусковой установки (ПУ), размещенной на берегу или на корабле, с применением твердотопливного стартового ускорителя или с борта военно-транспортного самолета типа С-130 «Геркулес». В качестве маршевого двигателя применен турбореактивный J400-WR-404 «Вильямс». Ракета-мишень оборудована аппаратурой линии телеуправления. При необходимости приводнение аппарата может выполняться парашютным способом с целью возвращения на корабль и дальнейшего использования. Основные ТТХ BQM-74E «Чукар»: длина 3,9 м, размах крыла 1,76 м, диаметр 0,35 м, стартовая масса при запуске с рельсовой ПУ 270 кг, с самолета – 211 кг, максимальная скорость полета 270 м/с, максимальная дальность полета 900 км, высота полета над уровнем моря 2–12 200 м, максимальное время полета 1 ч 36 мин, уровень аэродинамических перегрузок 6 g.

НА ПОЛИГОНАХ МИРА

ых государств в рамках учебно-
продолжается отработка вопро-
шной обороны кораблей (кора-
ок) от ударов противокорабель-
оятного противника, в том числе
ет-мишеней (РМ). Дистанционно
-мишени, развитие которых про-
явления ПКР с новыми характе-
яют во время учебных стрельб
кипажа и средств ПВО корабля
ально приближенную к боевой.
РМ BQM-74E «Чукар» с фрегата
оэл Б. Робертс» ВМС США (**1**) и
оде учений «Унитас» (**2**). (Основ-
и данной мишени см. на цветной
«Си Дарт» с британского эсминца
проекта 42 (**3**) для поражения РМ «Мирач-100/5» (Mirach, **4**). Основные ТТХ мишени: разработана компанией «Селекс Галилео», высота полета 3–12 500 м, максимальная скорость полета 925 км/ч, уровень аэродинамических перегрузок (УАП) до 8 g, максимальная продолжительность полета 60 мин. РМ «Ирис Джет» (Iris Jet), запущенная с фрегата ВМС Нидерландов (**5**). Разработана компанией «3Сигма» (концерн ЕАДС). Максимальная скорость полета 850 км/ч, высота полета 10–12 000 м, УАП до 6 g, максимальная продолжительность полета 60 мин. Поражение воздушной мишени «Скюа» (Skua, **6** и **7**). Разработана южноафриканской компанией «Денел дайнэмикс», ее длина 6 м, размах крыла 3,6 м, масса 160 кг, максимальная скорость полета 0,86М на высоте 10 000 м, дальность действия радиоканала управления 200 км, высота полета 10–10 700 м).

Aerial Targets

SUPERSONIC

AQM-37C

GQM-163A (SSST/Coyote)

ZGQM-173A Multi-Stage Supersonic Target (MSST)
(development)

SUBSONIC

BQM-34S

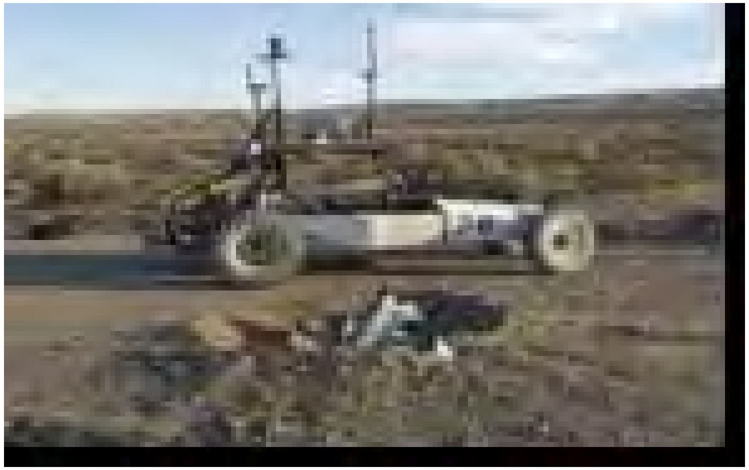
BQM-74E

Sub-Sonic Aerial Target (SSAT)
(development)

FULL SCALE

QF-4

QF-16



QLT-1C

Moving Land Target
Kairos Autonomi

Seaborne Targets

P
O
W
E
R
E
D

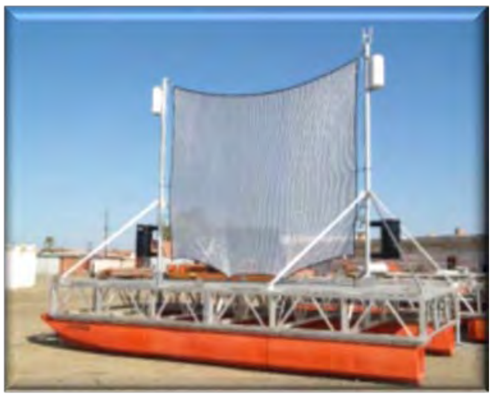
High Speed Maneuverable Seaborne Target (HSMST)

Fast Attack Craft Target (FACT)

QST-35

Ship Deployable Seaborne Target (SDST)

T
O
W
E
D



Low Cost Modular Target (LCMT)

Polyethylene Tow Target (PETT)

Low Cost Towed Target (LCTT)

Anti-Submarine Warfare Targets

MK 39/ Expendable Mobile Anti-Submarine Warfare Training Target (EMATT)

MK 30 Mod 2

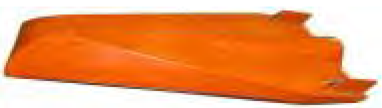
MK 30 Mod 1

Mine Warfare Targets

MK 44 MOD 0/1

MK 46 MOD 1

MK 47 Mod 0



MK 48 MOD 0

MK 49 Mod 0

MK 50 Mod 0

MK 51 Mod 0

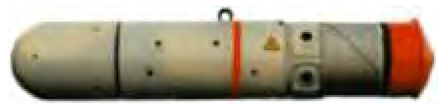
MK 52 Mod 0

MK 53 Mod 0/1

MK 57 Mod 0/1

MK 58 Mod 0

MK 59 Mod 0



MK 74 Mod 0

MK 75 Mod 0

Target Program Challenges

- **Fiscal Environment – Global Cooling**
- **Emergent Requirements**
- **POM vs Execution Year Planning**
- **Inventory Droughts**

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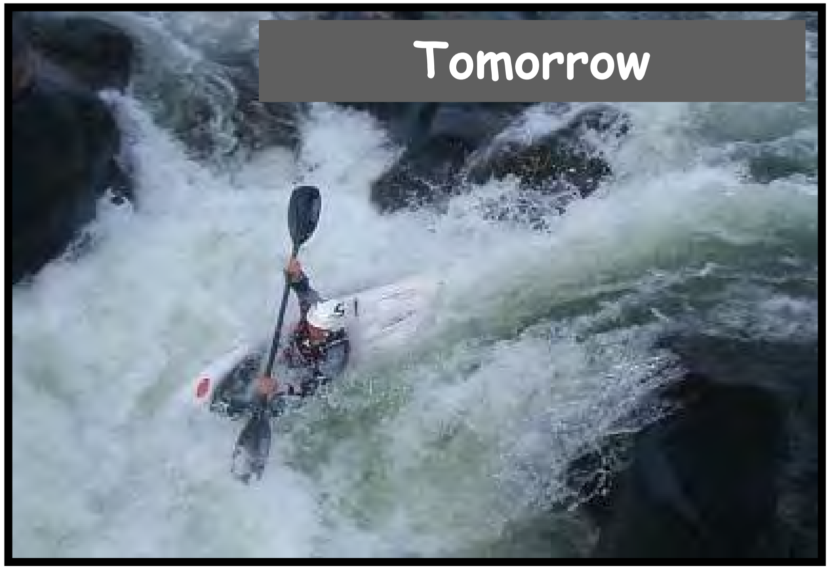
Fiscal Realities



We are headed for permanent white water!

Emergent Requirements

- **Fleet's Return to Aegis Missile Live-Firing for Training**
  - Increase operator proficiency
  - Stresses limited subsonic target inventory
- **Counter Swarm Tactics – Live Fire Training**
  - Assumptions: 100xHSMSTs per coast
  - Stresses limited surface target inventory

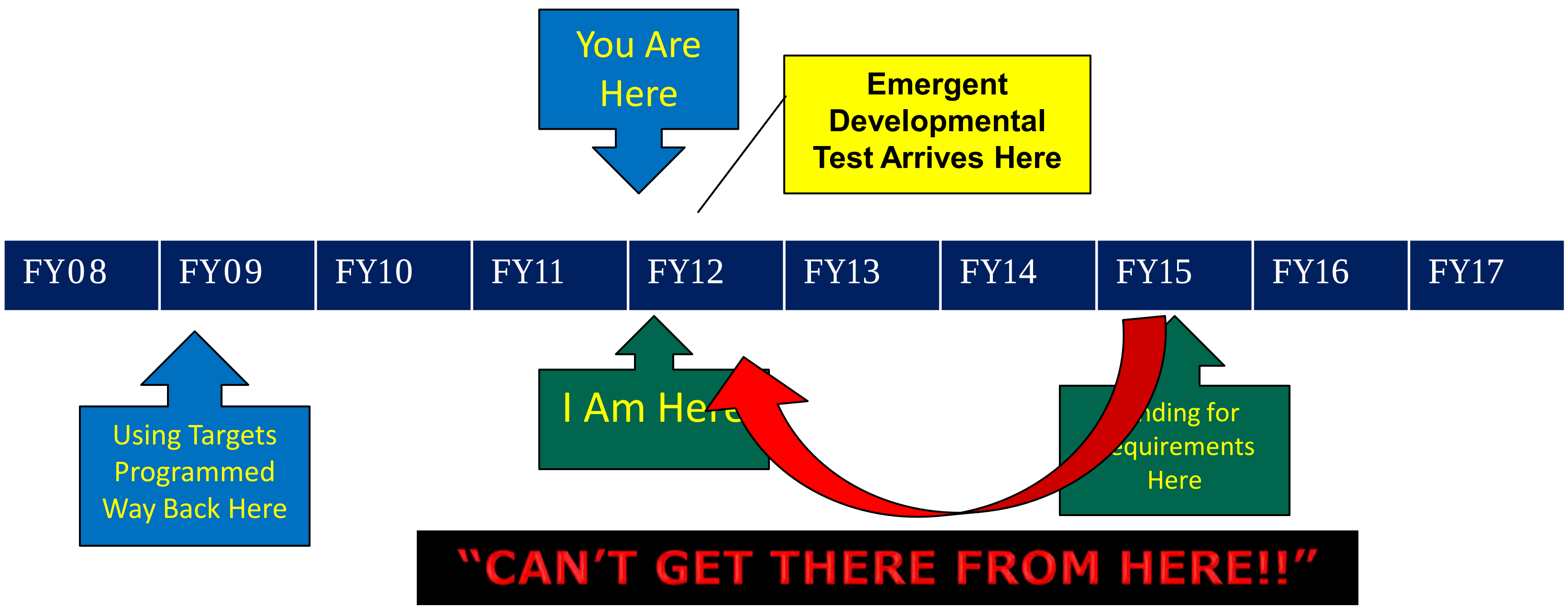
USS Bataan (LHD-5) Fast Inshore Attack Craft exercise

Emergent Requirements

- **Fleet's Return to Aegis Missile Live-Firing for Training**
  - Increase operator proficiency
  - Stresses limited subsonic target inventory
- **Counter Swarm Tactics – Live Fire Training**
  - Assumptions: 100xHSMSTs per coast
  - Stresses limited surface target inventory
- **Urgent Operational Needs / Quick Reaction Assessment**
  - Fast Attack Craft emergent threat
    - Engagement systems under rapid development
    - Advanced Precision Kill Weapon System / Griffin / Spike / 20mm / Medusa
  - Directed Energy Weapons
    - Maritime Laser Demo
  - UAVs
  - Ballistic Anti-Ship Missile

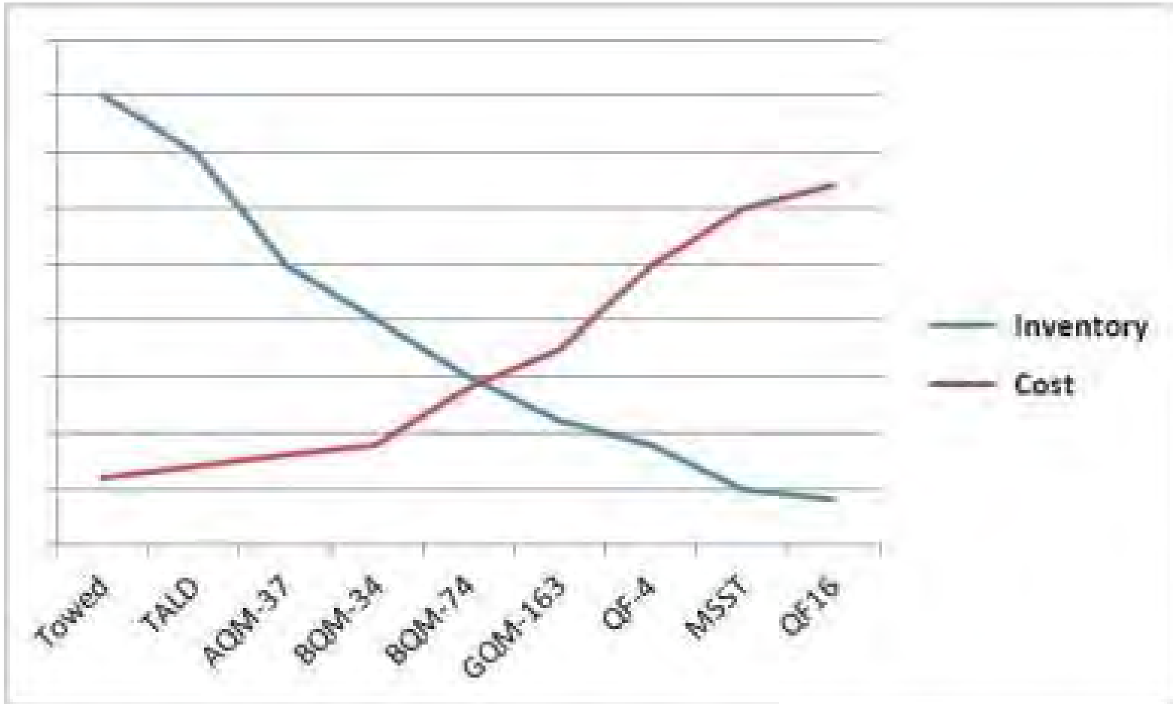
POM vs Execution Year Planning

- **Targets Provided Today were Programmed in 2008**
  - POM-11 Planning began in October 2008
  - POM-11 Finalized April 2009
  - Procurement in 2011 -> 2012 Delivery
- **POM14 Planning = Deliveries in 2015!**
- **Increased Execution Year Requirements -> Out-year Programs at Risk**



Inventory Challenges

- **Threat Realism**
  - Signature: RF Signal, RCS, IR
  - Profile: Dive, Sea-Skimming
  - ↑ Capabilities = ↓ Inventories



Target Tradeoffs

L E N G T H

Self-Deployable Surface Target (SDST) 11.5 ft	Poly-Ethylene Tow Target (PETT) 15 ft	Low Cost Modular Target (LCMT) 16 ft /24 ft	High Speed Maneuvering Surface Tgt (HSMST) 26 ft	Fast Attack Craft Target (FACT) 50 ft

T O P S P E E D / S E A S T A T E (S S)

25 knots SS2	25-30 knots SS1	48 knots SS0 20 knots SS2	46+ knots SS0 35 knots SS3	56+ knots SS0 50 knots SS2

R E P L A C E M E N T C O S T

~$5,000	~$15,000	~$35,000	~$180,000	~$700,000

Inventory Challenges

- **Threat Realism**
  - Signature: RF Signal, RCS, IR
  - Profile: Dive, Sea-Skimming
  - ↑ Capabilities = ↓ Inventories
- **Multiple Target Operating Sites**
  - Minimal on-hand inventory requirements
  - Backup targets on the rail
- **Subsonic Aerial Target Gap**
  - 5 year production gap from BQM-74 contract to SSAT first delivery
  - MILCON requirement to support BQM-34 move from Wallops to Dam Neck
  - Over 100 non-RFI BQM-34s (Legacy control systems)
- **Target Recovery Reliability**
  - Recoverable targets lost at sea

"Have you seen me?"

Target Program Cost Reductions

Four pillars to Navy Target Total Cost Ownership accountability

- **Target Survivability**
- **Inventory Preservation**
- **Enterprise Developmental/Operational Testing**
- **“Joint” Target Support**

Aggressive Expenditures

"The second target, target 4, was damaged to the point where it was declared unsafe for recovery and therefore sunk"

USS Greenbay (LPD-20)

Combat System Ships Qualification Trials

Oct 2009

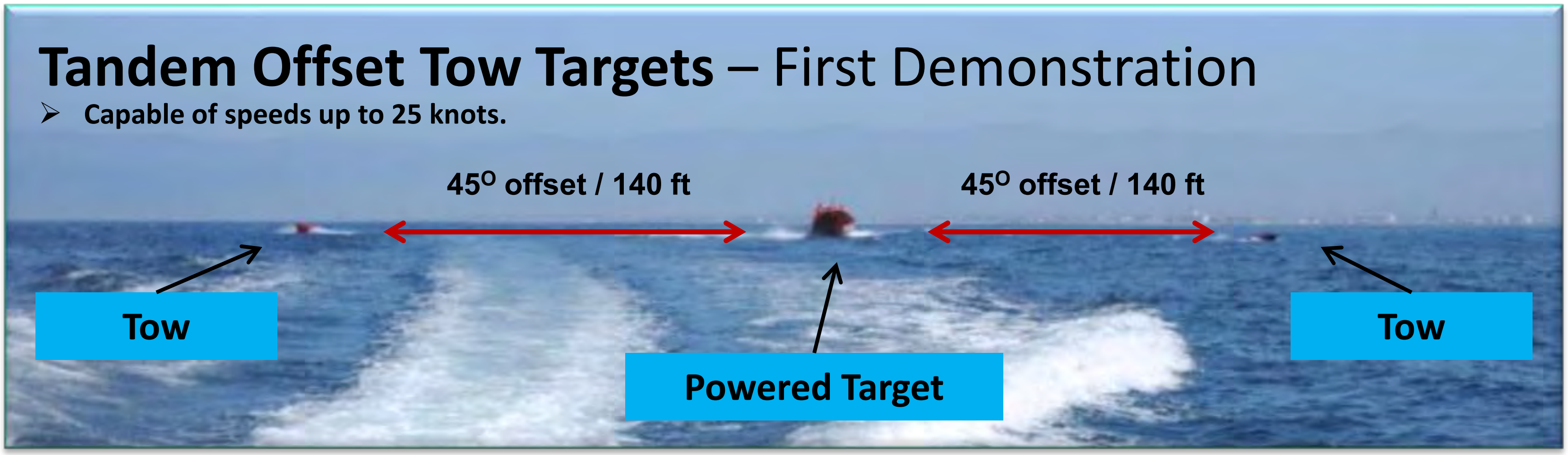
Target Survivability

- **Tight Rules of Engagement**
  - Clear test/training objectives
  - Cease fire when test/training objectives are met
  - Weapon system operator change of mindset/behavior
- **Target Augmentation**
  - Flares / Chaff / Towed decoy
  - Proximity target
  - Kill sensors on skin of target
  - “Humannequin” target
    - impact sensor scoring system

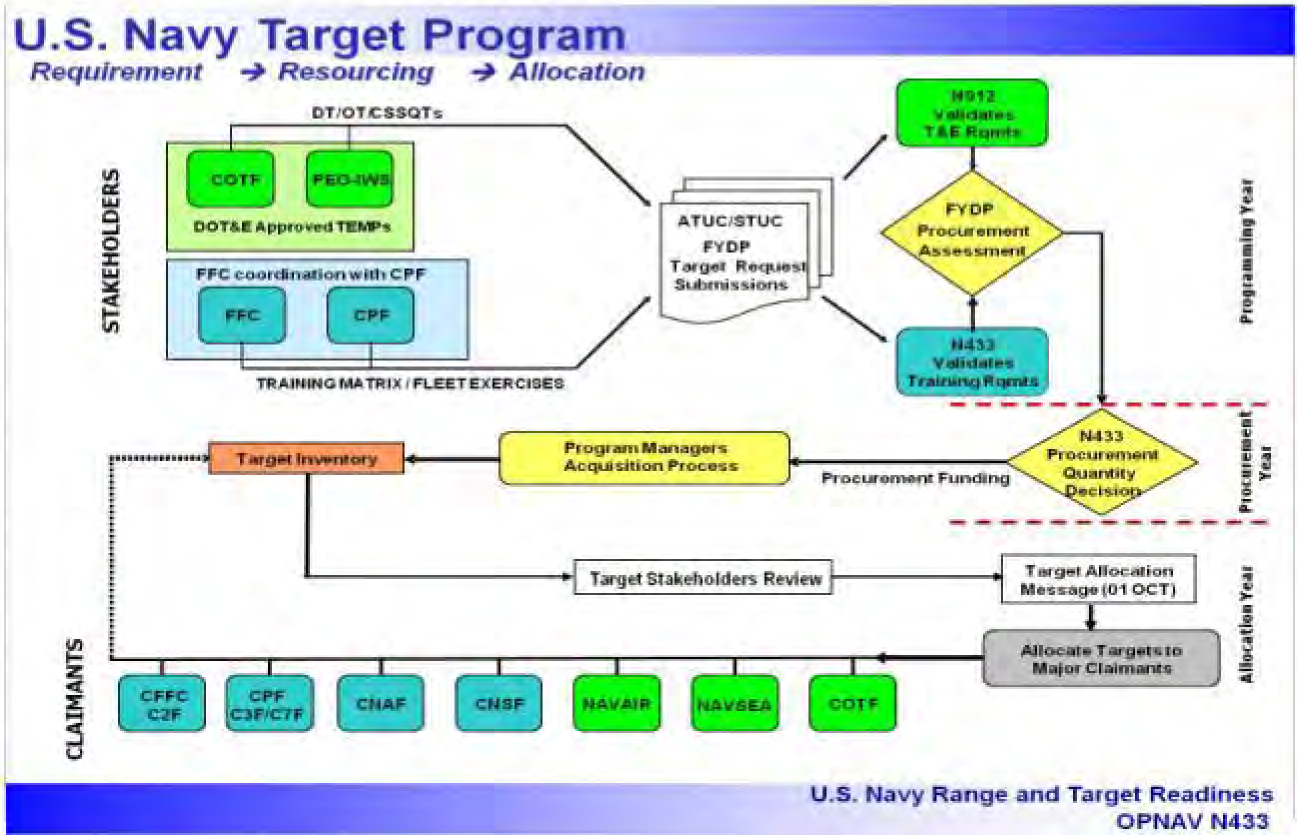
Inventory Preservation

- **Target Substitutes**
  - Press for lower cost target when threat representation is less critical
  - Heavy dependence on Modeling & Simulation
  - Numerous Target Tracking events prior to Live Fire

- **Tow Targets = Increased Raid Count**



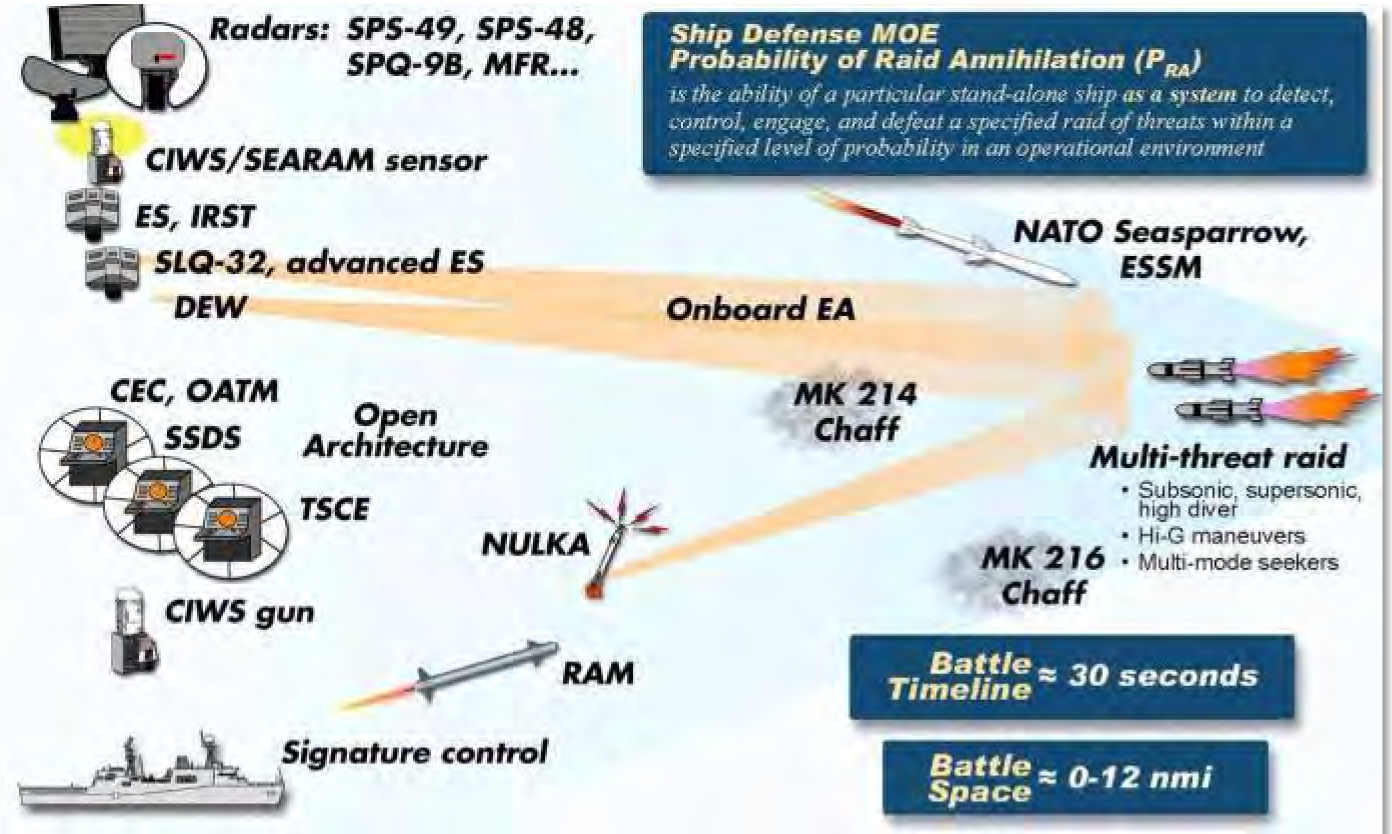
- **Stringent Requirements Validation Process**
  - Requirement must be documented
    - Test and Evaluation Master Plan (TEMP)
    - Training and Readiness Matrix



- **Target Recovery – an "All Hands" effort**
  - Delineated in Test Plan
  - Shooter to assist with locating target
  - Augment target with signaling device(s)
  - Schedule for recovery to occur in daylight
  - Helicopter airborne in vicinity of ops
  - Contracted helicopter service since 1996
    - 675 aerial targets recovered
    - $281M replacement costs avoided

Enterprise Testing

- **Multiple Weapons System Tests vs One Target Set**
  - Consolidation of Air Warfare Ship Self Defense at-sea testing
  - Different hulls, different configurations…same threat models, same range conditions
  - Many specific parameters, assumptions, and limitations are negotiated between the testing and acquisition communities
  - Validate models with live testing



"Joint" Target Support

- **JSF Testing at Pt Mugu and China Lake**
  - BQM-167 (USAF) and BQM-74 (USN)
- **U.S. Army**
  - Joint Land Attack Cruise Missile Defense Elevated Sensor (JLENS)
    - Aerostat tracking of BQM-74s
- **USAF**
  - White Sands – USAF Low Altitude Tracking (BQM-74)
  - F-15 Targeting Capability Upgrades (BQM-74)
  - F-22 Testing at China Lake (BQM-34)
  - F-22 /AFOTEC Testing at Utah Test and Training Range (UTTR) (BQM-74)

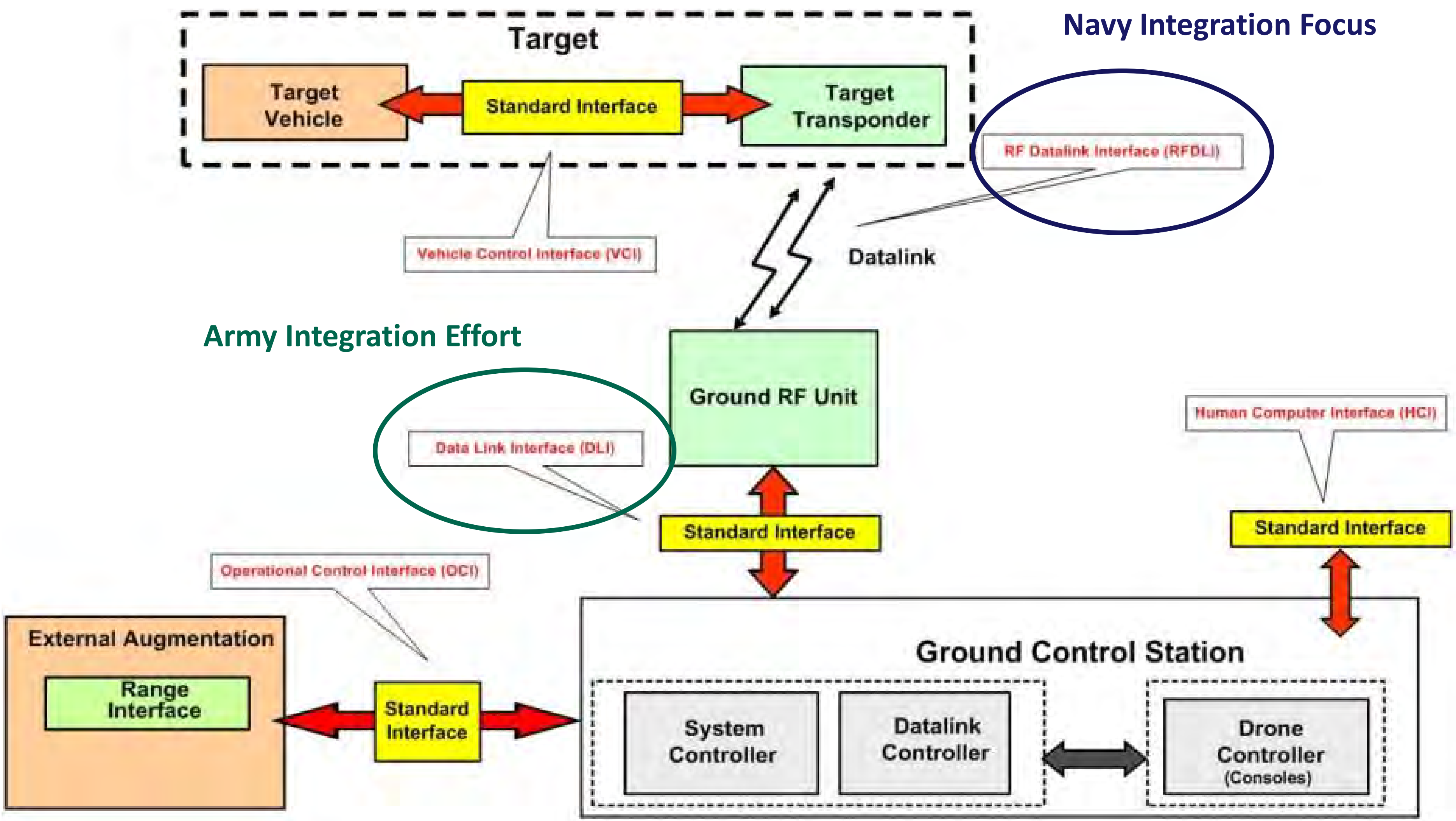
"Joint" Target Support cont.

- **USAF-USN Full Scale Aerial Target (QF-4 / QF-16)**
- **USAF support to Navy Weapons Evaluation Program**
  - BQM-167 targets for air-to-air tactics development
- **Coast Guard**
  - Target support to maritime weapon systems
- **Moving Land Target has USA/USAF interest**
- **Navy has the "Monopoly" on Surface and Mine Targets**

"Joint" Target Control System Development

- **Common Target Control System**
  - DOT&E standard target control interface initiative
    - "Develop Tri-Service Standard Interfaces to reach interoperability by developing hardware independent interfaces for Ground Target Control System, Ground RF unit, and Target transponder"
  - Army updating Data Link Interface (DLI) from DOT&E DLI baseline
    - Army test complete Jan–Feb 2012
  - Navy to assess Army Target Common Control System (ACCS) DLI variant for incorporation into a future Standard Navy Target Control (SNTC) ECP
    - Navy engaging with Army development/testing
  - Navy to recommend a standardized RF DLI format that is optimal for Navy aerial and surface targets
    - OSD to evaluate Navy RF DLI format proposal, if supportable, OSD will socialize with USAF + USA at Target Control Steering Groups for adaptation for service-unique requirements

DOT&E TCS Initiative



Possible Joint Target Opportunities

- **Unmanned Aerial Systems – Threat Surrogate**
  - No Program of Record for the UAV target program
  - Numerous unmet UAV training requirements
    - However, Training customers disagree over threat requirement
  - Navy Aegis program procures Vindicator target services directly from Meggitt
- **Helicopter Target**
  - Navy Training needs unmet
  - Navy Tests (limited) vs Army helicopter targets
- **Hypersonic Development**
  - DOT&E pressing for test against next generation threat
- **Moving Land Target**
  - Kairos Autonomi: 60 targets for Navy training
  - USA/USAF interest

Summary

- **“More with Less” - really?**
  - Requires co-service/tri-service commonality
  - Requires cross service target support
  - Decreased threat representation on most tests

- **Vendor survival requires migration away towards single customer solution**
  - DoD acquisition process makes new development unrealistic for targets
  - Generic -“off the shelf” target solutions are more desirable

Questions?


Photo# 80-G-12906 X-Wing Fighter in catwalk on the USS Long Island after landing accident July 1942
POSTED AT
theBRIGADE.com

Backup Slides

LSTS vector scoring system – proof of concept test results

Firing trials March 2011, NSWC test range, Dahlgren VA

50 YEARS OF INNOVATION

NDIA targets and ranges conference

Gary Kemp

Cambridge Consultants

1	**Short introduction to Cambridge Consultants**
2	**LSTS development program**
3	**Trials results from March 2011**
4	**Program going forwards**
5	**Questions**

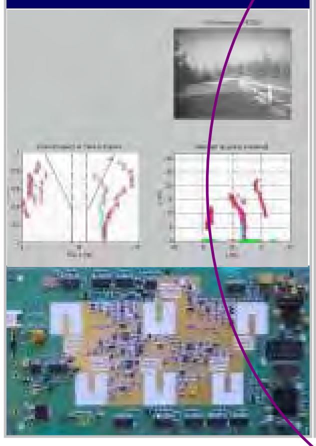
We are a leader in short range radar systems development and a supplier of specialist systems

- Over thirty years' experience in developing radar sensors
  - Missile test and evaluation systems – ARMS vector scoring system
  - 3D imaging radar systems – automotive, through-wall, infill
  - Holographic radar – real-time performance in heavy clutter for infill and sco

Arctic exploration

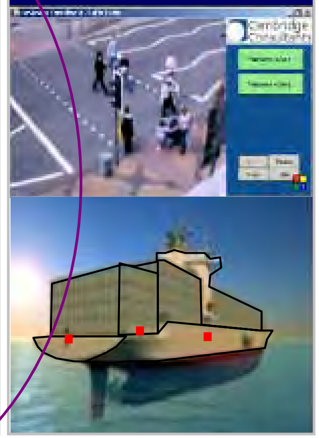
Military T&E

Automotive



PRISM 200
through-wall radar

Road & Marine



Holographic radar

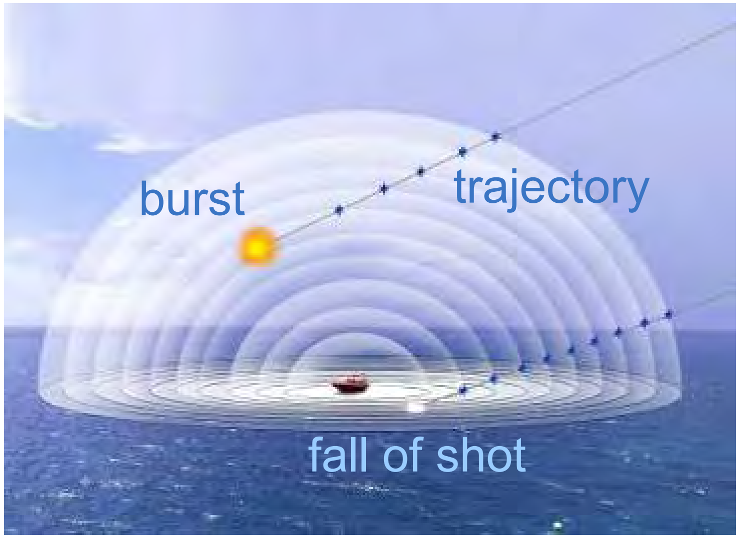
1980 → 2011

1	Short introduction to Cambridge Consultants
2	LSTS development program
3	Trials results from March 2011
4	Program going forwards
5	Questions

Land and Surface Target Scorer (LSTS)

- The Land and Surface Target Scorer is a real-time vector scoring system for highly mobile targets operating in very cluttered environments.
- The LSTS proof of concept development was funded by the OSD Target Management Initiative program, sponsored and managed by NAWC-WD, Point Mugu, Target Systems Division, 5.3.1

HSMST



1000ft scoring volume

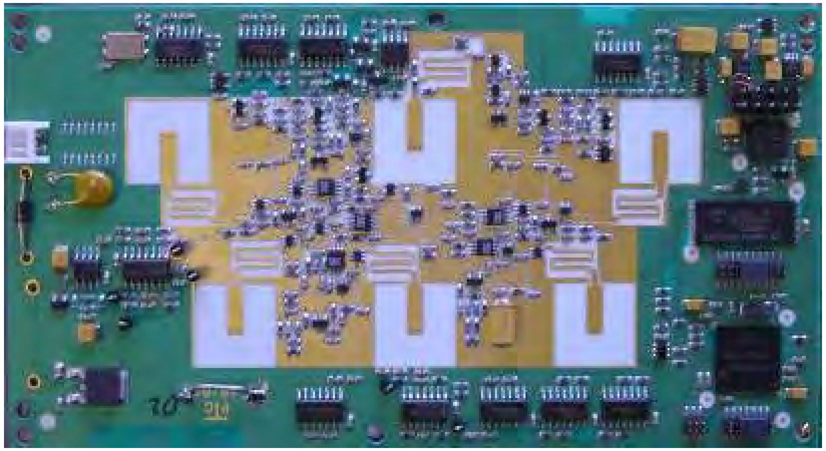
Key functionality of the LSTS system

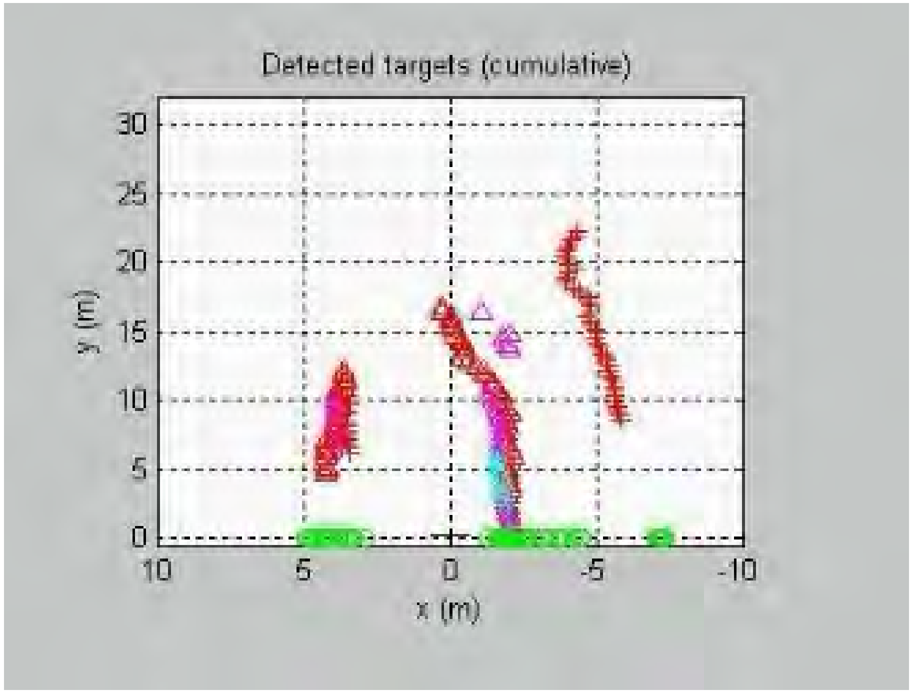
Parameter	Final system	PoC system
Coverage	Hemispherical	Quadrant
Range (5” shell)	1000 feet	330 feet
Range (.50 calibre)	300 feet	100 feet
Firing rate	20 rounds per minute	40 seconds continuous capture
Projectile closing velocity	2500ft/sec	2500ft/sec
Simultaneous operation	up to 4 targets with not less than 1000 ft separation	1 radar operating required
Reporting	Real-time	15 minutes

Land and Surface Target Scorer (LSTS)

- We had already developed a small, single card holographic radar system that tracks multiple targets in real time, for the automotive market.
- We had tested a variant of this system in longer range and in marine applications.

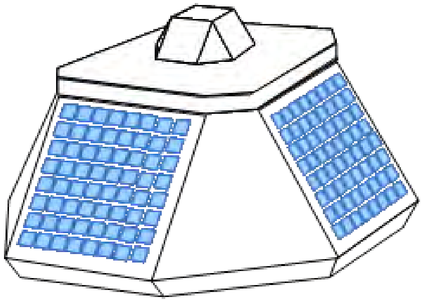
‘SPOT’ radar 6” x 3.1”





Land and Surface Target Scorer (LSTS) Proof of Concept system

- The system was developed from start to TRL6 in 15 months.
- The proof-of-concept equipment has been engineered to a form that is close to that of the final system.



Concept

Jan 2010

CAD design

June 2010

Build

Nov 2010

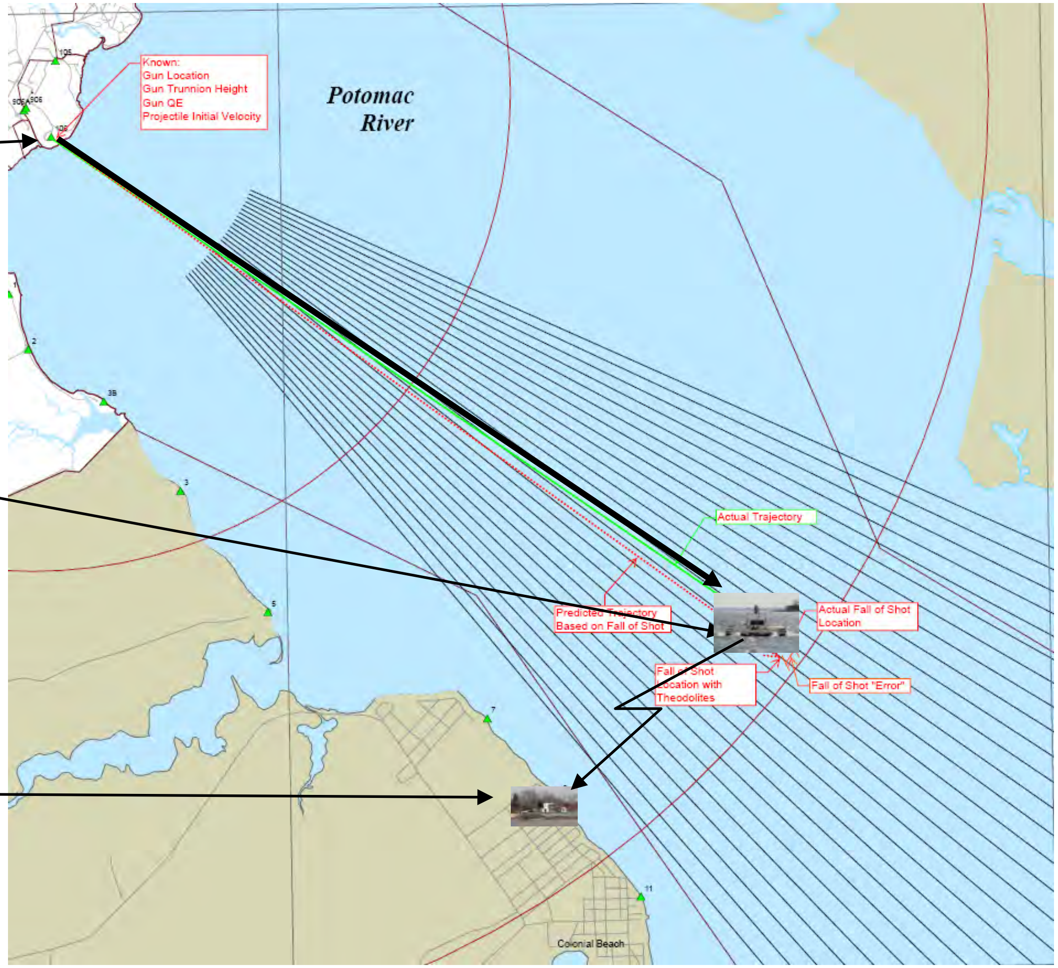
Sea trials

Mar 2011

1	Short introduction to Cambridge Consultants
2	LSTS development program
3	**Trials results from March 2011**
4	Program going forwards
5	Questions

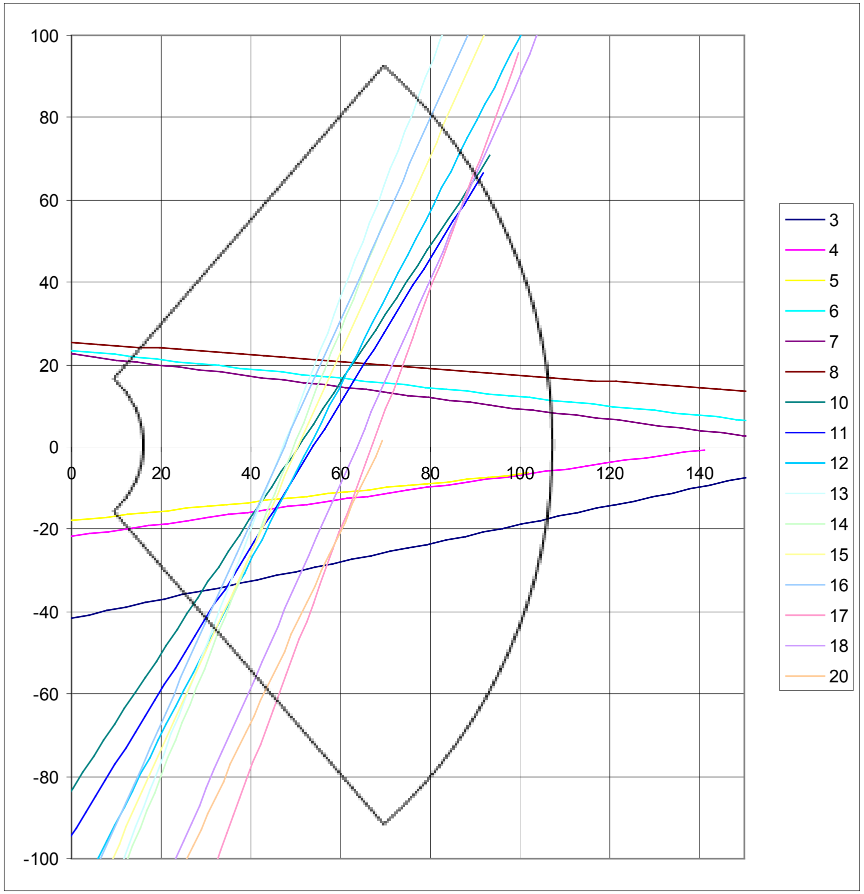
PoC system – Sensor Head, Radar Data Processor and Battery

Sensor pontoon 9000 yards down range

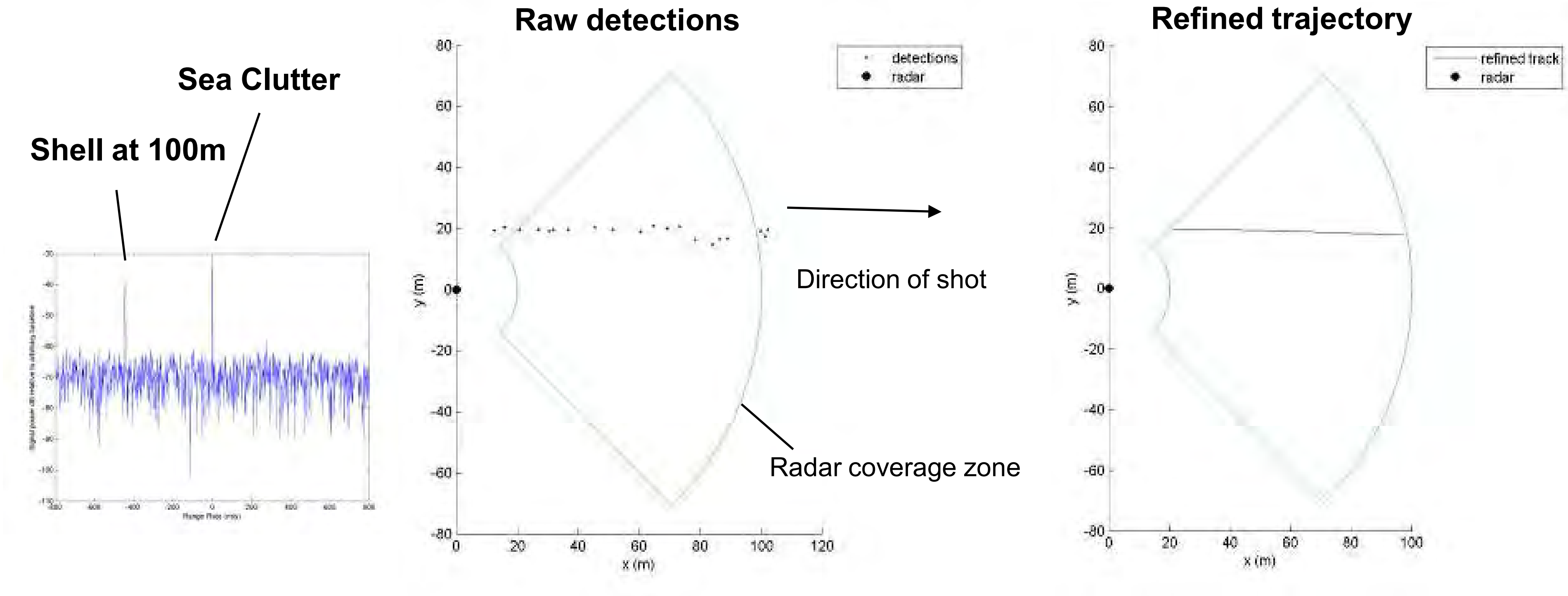


PoC Demonstration Results

- 16 x 5” shell shots scored:
  - mixture of BL&P and HE
  - Mixture of up-range, down-range and broadside trajectories
  - One 4-shot burst (3 second intervals)
- Results confirmed predicted performance:
  - good detection rate
  - good discrimination from clutter
  - good signal-to-noise at longest range
  - low noise on individual position estimates
- Ability to detect distinctive splash point and blast point returns

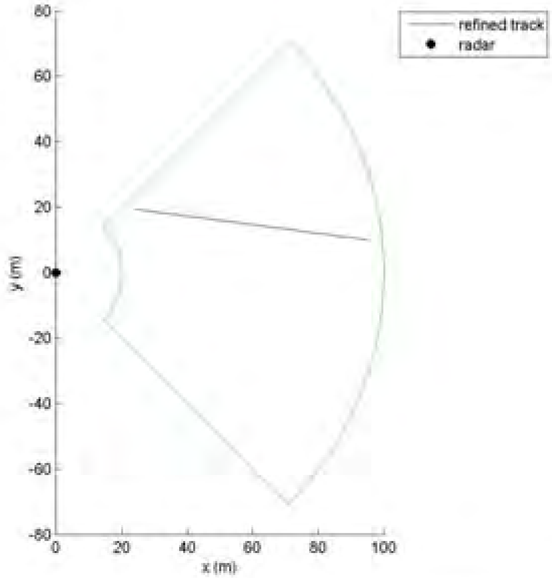


A tracked trajectory of a 5” shell fired from 6 miles range over the top of our radar with a muzzle velocity of 800m/s

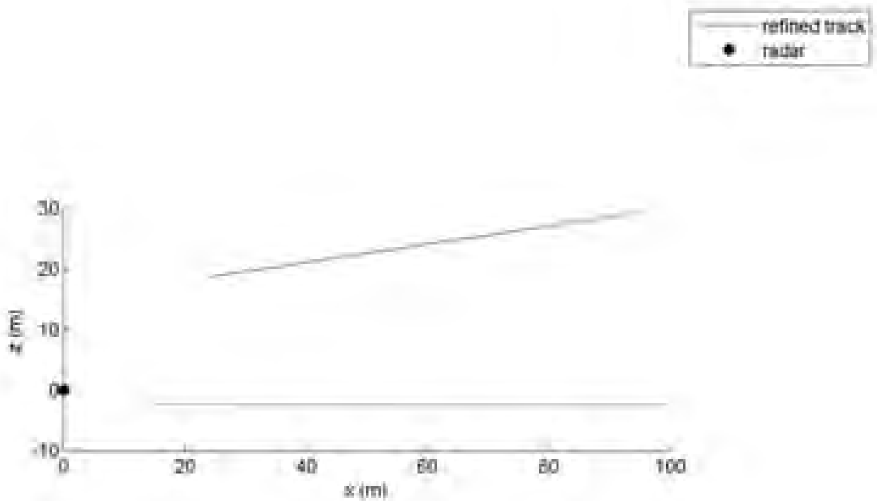


Up-range shot

Plan view

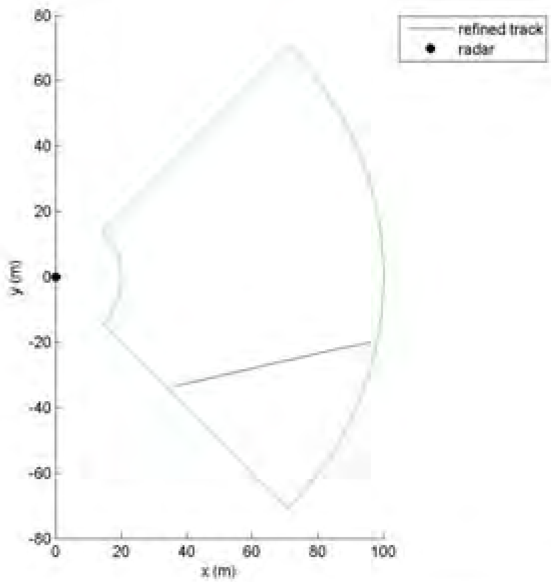


Elevation view

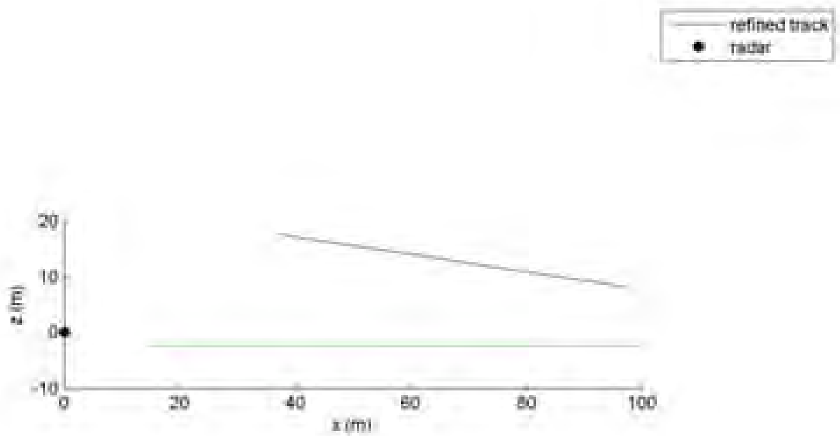


Down-range shot

Plan view

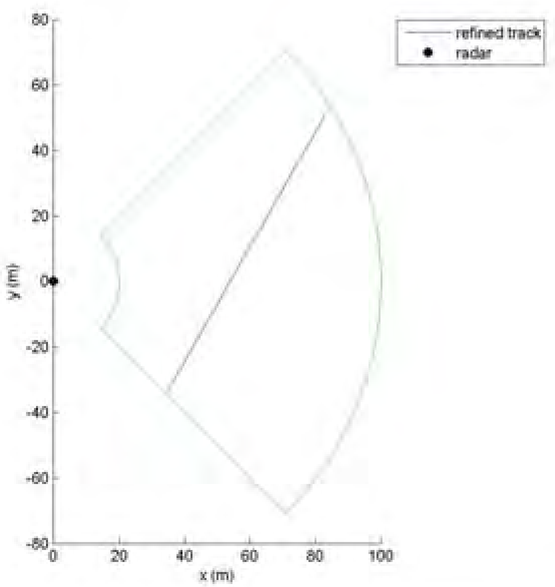


Elevation view

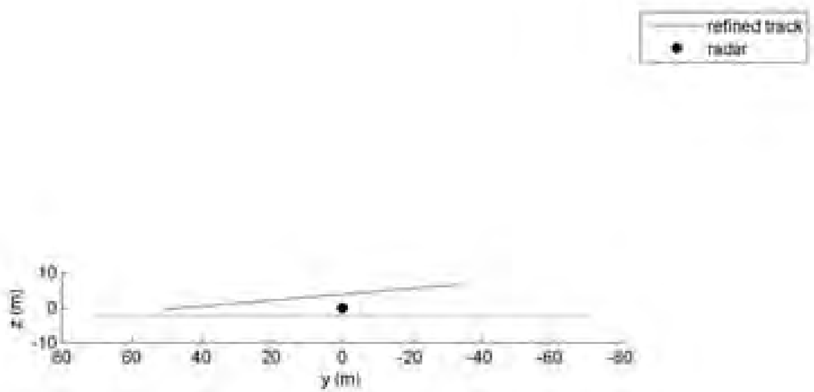


Cross-track shot

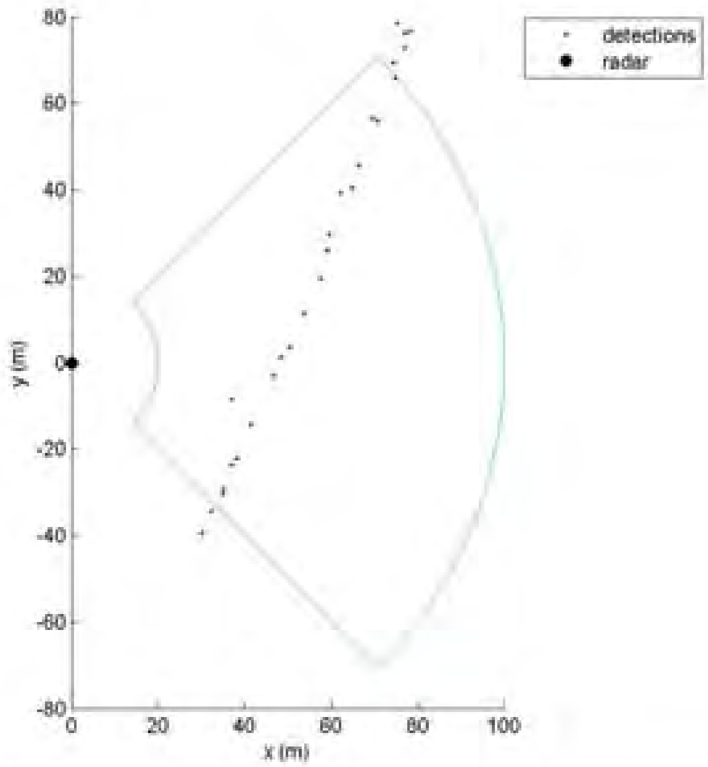
Plan view



Elevation view



4 shot burst



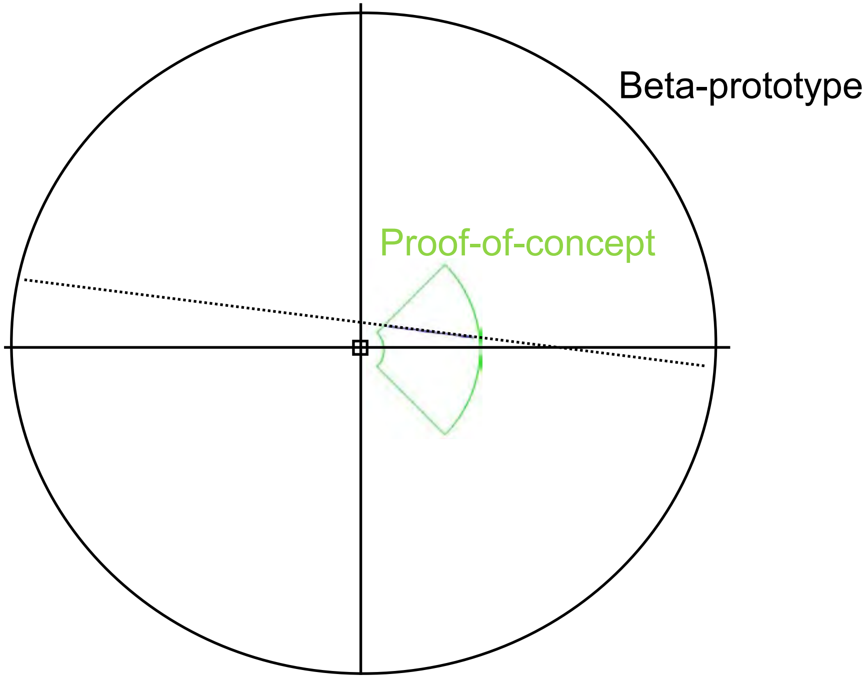
HE shot

1	Short introduction to Cambridge Consultants
2	LSTS development program
3	Trials results from March 2011
4	**Program going forwards**
5	Questions

Land and Surface Target Scorer Beta-prototype build

Beta prototype phase to include:

- Scale up to 1000’ range
- Full hemispherical coverage
- Real-time processing
- Trials on fixed and mobile platforms
- Trial against 50 cal




Questions?

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U.S. Navy Aerial Target Systems

Presented to 49th Annual NDIA Symposium

27 October 2011

Fort Walton Beach, FL

Captain Dan McNamara
Program Manager
PMA-208, Navy Aerial Target & Decoy Systems

Mr. Tim Barnes
Principal Deputy Program Manager
PMA-208A, Navy Aerial Target & Decoy Systems

Outline

- Product Line
- Operating Sites
- Supersonic Targets
- Subsonic Targets
- Full Scale Targets
- Target Control System
- Foreign Military Sales
- Challenges

PMA-208 Target Product Lines

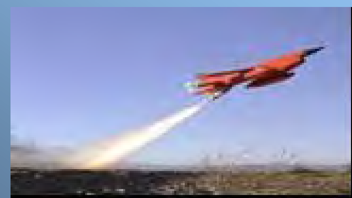
Supersonic

GQM-163A

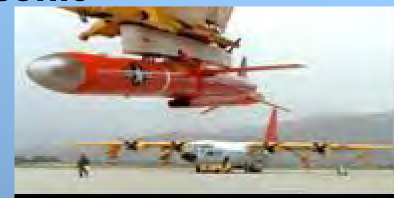
AQM-37C

GQM-173A
Multi-Stage
Supersonic Target (MSST)
(development)

Subsonic



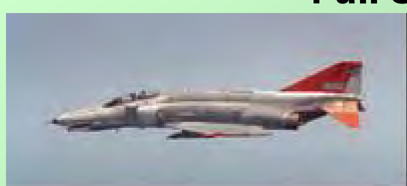
BQM-34S



BQM-74E

Subsonic Aerial Target
(SSAT)
(development)

Full Scale



QF-4

QF-16

Moving Land
Target (MLT)
(development)

Other / Support

Tactical Air Launched Decoys

Common Equipment / Augmentation

Threat Simulation

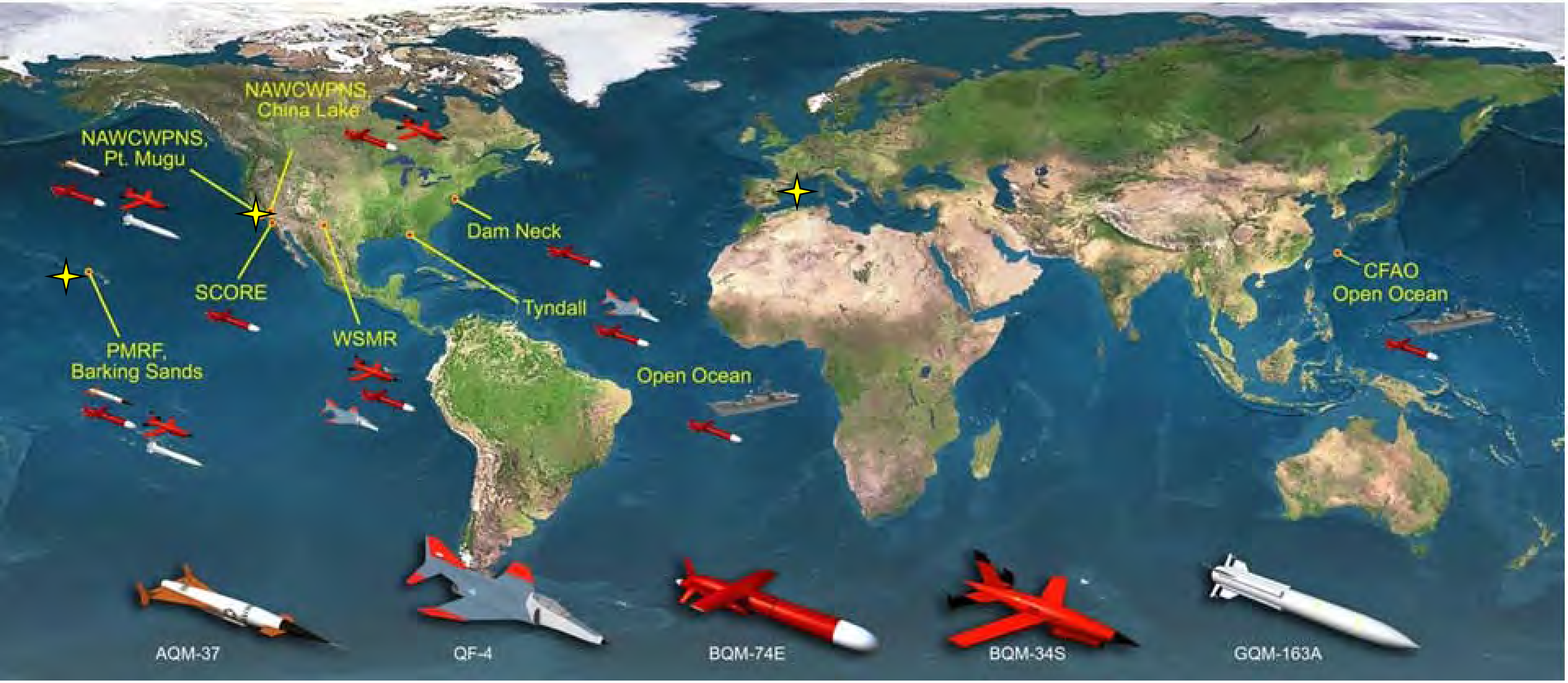
Banners

System for Naval Target Control (SNTC)

Operating Sites

GQM-163 capability at Point Mugu CA and the following ranges:

- **Stood up Pacific Missile Range Facility Hawaii in 2010** - **Stood up Levant Island France (via FMS case) in 2011, first launch 2012**



Air Launch:

BQM-34

AQM-37

BQM-74

Ground Launch:

BQM-34

BQM-74

SSAT

GQM-163

GQM-173

Ship Launch:

BQM-34

BQM-74

SSAT

GQM-163A
Supersonic Sea Skimming Target

- Prime Contractor: Orbital Sciences Corporation
- Production
- Emulates supersonic sea skimming anti-ship cruise missile threats
- Targets Expended to date: 17
- Operations to date: 11
  - 6 Oct 2005 (1)
  - 12 and 13 Jun 2007 (2)
  - 12 Dec 2007 (2 as stream raid)
  - 3 Dec 2008 (1)
  - 18 Dec 2008 (2 as stream raid)
  - 9 Dec 2009 (2 as stream raid)
  - 15 Jan 2011 (1)
  - 29 June 2011 (1) – PMRF HI
  - 30 June 2011 (2 as stream raid) – PMRF HI
  - 29 Sep 2011 (2 as stream raid)
- Demonstrations to date: 3
  - 8 June 2010 (1 as EPOD)
  - 8 July 2010 (1 as High Diver)
  - 8 December 2010 (1 as Orbital Front End Subsystem (OFES))

Current Inventory <u>33</u>
28 targets in work
(1 Heritage / 27 OFES)

Preparations to support two operations at SNI Oct-Dec 2011

AQM-37

- Medium to high altitude supersonic cruise with dive capability
  - Mach 2.0 – 4.0
  - Range 100 mi
  - Altitude 1000 ft – 100 Kft
  - Demonstrated TBM profiles (300 Kft, 120 nmi downrange)
  - F-16 launch platform (MOA with ANG)

- Out of production system
  - Last Delivery Dec 2001
  - 48 AQM-37C in inventory; 30 AQM-37D (USAF flight clearance expected 2nd Qtr FY2012)
  - GPS range tracking/scoring capability (JAMI)
  - Capability to provide power dive

- Historically have conducted approximately 6-12 operations per year (some FMS)

- Low fidelity high-diver

Current Inventory <u>78</u>

FY08 Ops/Expenditures – 5/8
FY09 Ops/Expenditures – 8/10
FY10 Ops/Expenditures – 7/7
FY11 Ops/Expenditures – 7/8

GQM-173A
Multi-Stage Supersonic Target (MSST)

- Replicates a family of multi-stage supersonic ASCM Threats
  - Subsonic cruise with transition to supersonic terminal phase
- Program in Engineering & Manufacturing Development (EMD) phase
  - MS B completed August 2008
  - EMD contract awarded to Alliant Techsystems Incorporated (ATK), Woodland Hills, CA
  - EMD effort planned for 4.5 years
  - Planned Initial Operational Capability in FY14
- Program Status
  - Program designated nomenclature GQM-173A
  - Technical activities completed
    - System Requirements Review (SRR) Jun 09
    - Integrate Baseline Review (IBR) Jul 09
    - System Functional Review (SFR) Dec 09
    - Software Specification Review (SSR) Mar 10
    - Preliminary Design Review (PDR) Apr 10
    - Critical Design review (CDR) Feb 11
    - EEU prototype flight test May 11
  - Activities planned
    - Test Readiness Review and Flight Readiness Review planned for Nov 11
    - First EDM flight test planned for Feb 12

BQM-34S

- Prime Contractor: Northrop Grumman
- Sustainment
- Missions
  - Low fidelity A/C simulator
  - T&E workhorse – special configurations
    - Open Loop Seeker (OLS) integration
  - Launch: ground, ship, air
- Product Improvements
  - Upgraded Integrated Avionics Unit (UIAU) integration fielded Oct 09:
    - Replaced existing autopilots with UIAU from BQM-74
    - Common avionics, radar altimeter, Support Equipment with current production BQM-74E
    - Addressed obsolescence issues
    - Reduced logistics
    - Allows for performance growth if required
    - 20 retrofits completed

Current Inventory ~ 191

FY07 Ops/Expenditures - 14/3
FY08 Ops/Expenditures - 12/0
FY09 Ops/Expenditures - 4/1
FY10 Ops/Expenditures – 18/1
FY11 Ops/Expenditures – 18/6

Great T&E "Truck" but does not adequately represent many of today's threat ASCMs

BQM-74E

- Prime Contractor: – Northrop Grumman

Current Inventory ~ 339
FY07 Ops/Expenditures - 158/52
FY08 Ops/Expenditures - 231/68
FY09 Ops/Expenditures - 207/46
FY10 Ops/Expenditures - 200/49
FY11 Ops/Expenditures - 129/24

- Sustainment
  - Training and T&E workhorse
  - Final delivery ***Dec 10***

- Missions:
  - High fidelity Anti-Ship Cruise Missile (ASCM) Surrogate
  - Low-fidelity A/C simulator
  - Launch: ground, ship, air

- Product improvements
  - Programmable semi-autonomous navigation
    - Selectable Lost Carrier Sensitivity from waypoint to waypoint
    - Return to Recovery Area
    - Planned fielding FY12

Target still adequately represents many but not all threat ASCMs

Subsonic Aerial Target (SSAT)

- Provides increased subsonic performance capabilities to improve fidelity in representing aircraft and missile threat characteristics
- Prime Contractor: Composite Engineering, Inc. (CEi), Sacramento, CA
  - Three Year EMD program
  - Two production options
  - Options for Contractor Logistics Support
- Chronology
  - ✓ Contract Awarded 28 Jan 2011
  - ✓ Wind Tunnel Testing successful May 2011
  - ✓ SRR 8th-9th Aug 2011
  - ✓ IBR 26th-30th Sep 2011
  - SFR/PDR/SSR Feb 2012

KPP's (Complete details in CDD)	OBJECTIVE	THRESHOLD
Maximum Speed at Low Altitude [Mach (M) at feet (ft) above wave crest]	≥ 0.95 M @ 6.6 ft in WMO SS 5	≥ 0.90 M @ 10 ft in WMO SS 3
[Terminal Altitude [ft above wave crest]	≤ 6.6 ft @ 0.95 M in WMO SS 5	≤ 10.0 ft @ 0.9 M in WMO SS 3
Terminal Maneuverability [Constant Gravitational Force (g)]	8.0 g sustained	6.0 g sustained
Maneuverability During Programmable Weave [Instantaneous g at Minimum Altitude and Maximum Speed]	≥ 8.0g instantaneous at 6.6 ft altitude and 0.95 M	≥ 6.0g instantaneous at 10 ft altitude and 0.9 M
Radar Cross Section (RCS) Reduction [X-band, monostatic]	≤ -17.0 dBsm	≤ -14.6 dBsm
Target Size Characteristics [inches (in)]: Length/ Diameter	Threshold = Objective Threshold = Objective	149.0 - 258.0 in 13.0 - 21.0 in
Material Availability (A_M)	≥ 95%	≥ 85%

QF-4/QF-16
Full Scale Aerial Targets

- Provides Threat Representative Target capabilities to meet Public Law Title 10 US Code 2368, that New and Improved Weapon Systems demonstrate Lethality prior to Production
- QF-4 Full Scale Aerial Target
  - A/F led procurement
  - A/F provides Operational, Maintenance & Sustainment services at Tyndall and Holloman
  - Navy procurements from USAF (FY03 –FY10)
    - Total Navy quantity procured: 27
  - Navy trading QF-4's for BQM-167's to support (N)WSEP
    - 1 QF-4 traded for 4 BQM-167's in FY08
    - 3 QF-4's traded for 10 BQM-167's in FY10
- QF-16 Provides 4th Generation to replace QF-4
  - A/F led development with Army/Navy participation
  - A/F awarded pre EMD contract to Boeing St. Louis Mar 10
  - MS B/Low Rate Initial Production buy 3QFY13
  - MS C/Full Rate Production 2QFY14
  - Planned Initial Operating Capability in 3QFY15
  - Planned Full Operating Capability in 2QFY16

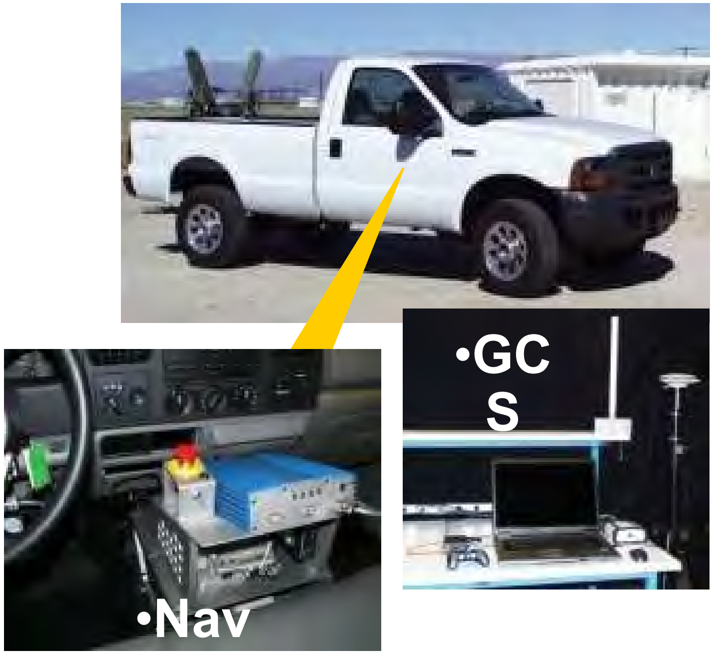
Available QF-4 Inventory <u>17</u>

FY07 Ops/Expenditures - 4/2
FY08 Ops/Expenditures - 2/2
FY09 Ops/Expenditures - 1/1
FY10 Ops/Expenditures - 1/0
FY11 Ops/Expenditures –2/1

Moving Land Targets (MLT)

- Provide threat representative MLT to train aircrews in the demands of Close Air Support, Time Sensitive Targeting, Target Identification and Forward Air Controller Procedures

- Program in Production & Fielding
  - Abbreviated Acquisition Program (AAP)
  - Full & Open Competition held for production of logistics support
    - Base year contract with 4 priced options
    - Firm Fixed Price Production and Cost Plus Incentive Fee for logistics support
  - Contract awarded to Kairos Autonomi, Inc., Sandy, UT 1 Apr 2011
  - Milestone C conducted Mar 2011
  - Initial Operational Capability 1QFY12



System for Naval Target Control (SNTC)

- SNTC
  - Prime Contractor: Micro Systems, Inc
  - Controls BQM-74/34 aerial targets & seaborne targets
  - UHF 435–450 & 358-380 MHz
  - 200 nm line of sight
  - 330 nm via Relay
  - Supports Training and T&E

- Several hardware and software upgrades scheduled due to:
  - frequency limitations and interference
  - information assurance requirements
  - hardware obsolescence
  - new target types

Foreign Military Sales (FMS)

Background

PMA-208 manages 8 active cases / 1 Lease Agreement

- 8 countries / Case Values Total: $ 29M

•Other international funding of target operations = FMS case managed by NAVSEA, Range or some other source such as a cooperative program

•If the USN is hosting an event for a country not noted here (FMS case or 'other') the funding source for target reimbursement may be in question

Description

- **PMA-208 Hardware Case**
  - USN is reimbursed for Targets & TAAS expended from USN inventory in support of international operations on US ranges
  - Some are managed by PMA-208, but can also be a line on range case
- **Range Services Case (Typically not managed by PMA208)**
  - Separate FMS Case to fund target presentation at US Range
  - NCEA
- **Presentations on OCONUS Ranges**
  - Target presentations performed on foreign range
  - France: GQM-163A
  - Normally managed by PMA-208

FMS Activities

- **Potential FY11/12 LOA requests:**
  - France: GQM-163A follow on case
  - Japan & Germany: GQM-163A
  - Canada, Australia, Japan: BQM-74E/BQM-34S
- **OCONUS FMS deliveries:**
  - FR-P-LGV; 1 GQM-163A sent to France in CY10
- **Typical FMS Range Sites**
  - Pt. Mugu / China Lake, CA
  - PMRF Barking Sands, HI
  - Atlantic Range Facilities, VA

Target System Challenges

- Keep pace with evolution of threats
  - Electronic emission, vehicle capability, other characteristics
- Develop and field new targets
  - MSST, SSAT, MLT, QF-16
- New capabilities to existing targets
- Evolve target control systems to a more common, government-owned solution across the services
- Manage target production
- Maintain out of production targets
- Support test and training presentations
- Control and reduce cost of acquisition, maintenance, and operations
- Inventory and obsolescence management

A critical enabler to the successful development & fielding of future Naval combatants and their associated defensive weapons systems . . .

"Just Targets"

Questions?

U.S. Navy Aerial Target Systems

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Ogden Air Logistics Center
309th Maintenance Wing

309 AMARG

Mr. Jeff Peterson
(520) 228-8235
jeffrey.peterson@dm.af.mil

309 AMARG History

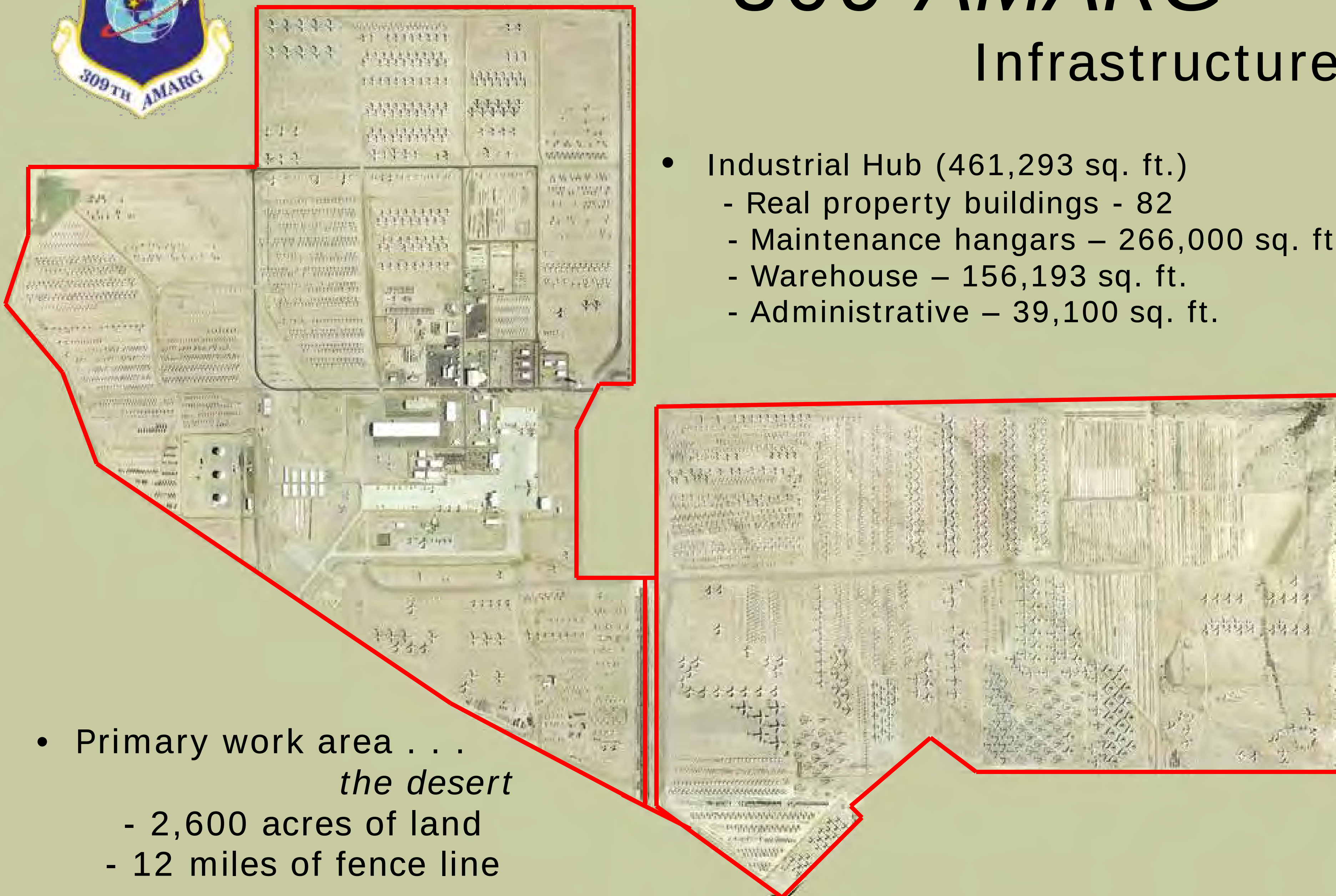
65 year history

Tucson, Arizona selected for
- low humidity,
- firm "caliche" sub-soil supporting the largest of aircraft

1964 SecDef designated Group sole storage, reclamation & disposal mgr.

309 *AMARG*

Infrastructure



- Industrial Hub (461,293 sq. ft.)
  - Real property buildings - 82
  - Maintenance hangars – 266,000 sq. ft.
  - Warehouse – 156,193 sq. ft.
  - Administrative – 39,100 sq. ft.

- Primary work area . . . *the desert*
  - 2,600 acres of land
  - 12 miles of fence line

Resources

- **800+ civilian, military, and contractors**
- **2,600 acres storage space**
- **460K sq ft industrial space**
- **Annual revenue of $122M**
- **4,000+ aircraft/6,000+ engines**

AMARG Mission Areas

Storage & Preservation

Five Primary Storage Levels

- Inviolate – Type 1000 (XS & XT)
- Modified Inviolate – Type 1500
- Parts Reclamation – Type 2000 (XV)
- Flyable Hold – Type 3000 (XS)
- Excess to Single Manager Req'mts – Type 4000

Parts Reclamation

OGDEN AIR LOGISTICS CENTER

P-3 Wing Assembly

Structural Components

Flight Control Actuator

Diversity in Parts Reclamation

Aircraft Regeneration

Depot-level Maintenance Overflow

- A-10 Service Life Extension Program
- A-10 Speedline
- C-130 Program Depot Maintenance



Aircraft Disposal

- Final Defueling
- Assurance Pressure Systems Safe
- Security and Demilitarization of Classified
- Remove/Remediate All Hazardous Materials
- Purging All Halon Serviced Systems
- Engine Dispositions Separate From Aircraft
- Remove Explosive Items/Devices
- Control of Demil/Disposal of Composite Materials

Protecting the Public From Harmful Exposure

AMARG FSAT Program

OGDEN AIR LOGISTICS CENTER

- AMARG Full-Scale Aerial Target Program

- Long-term program
- Began in early 1970's
- F-102, F-100, F-106, F-4, & F-16
- Aircraft regenerated for manned flight
- Drone conversion at BAE Mojave

AMARG FSAT Program

•AMARG Full-Scale Aerial Target Program

Historic FSAT Deliveries

F-102 - 153

AMARG FSAT Program

- AMARG Full-Scale Aerial Target Program

Historic FSAT Deliveries

F-102 - 153

F-100 - 312

AMARG FSAT Program

- AMARG Full-Scale Aerial Target Program

Historic FSAT Deliveries

F-102 - 153

F-100 - 312

F-106 - 184

AMARG FSAT Program

- AMARG Full-Scale Aerial Target Program

Historic FSAT Deliveries	
F-102	- 153
F-100	- 312
F-106	- 184
F-4	- 300 (of 318)

AMARG FSAT Program

- **Depot Level Support**
  - **SLEP**
    - **FY09 2**
    - **FY10 4**
    - **FY11 2**
  - **DFT**
    - **RF-4C Safe Flights**
    - **Transit Aircraft**
    - **Water Intrusion TCTO**
    - **Damage Repairs**

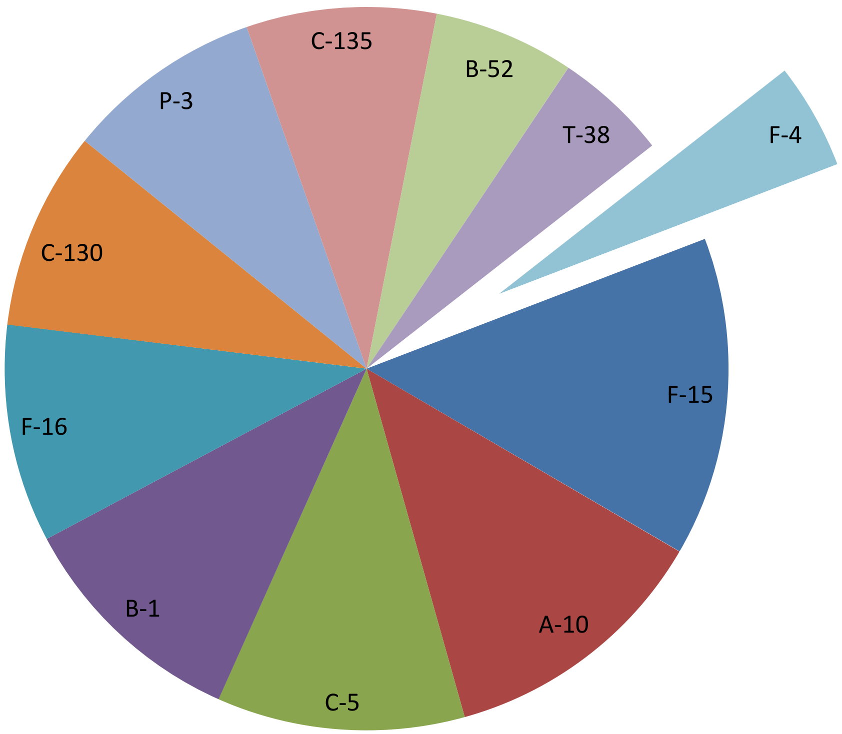
AMARG FSAT Program

OGDEN AIR LOGISTICS CENTER

- **Reclamation Activities**

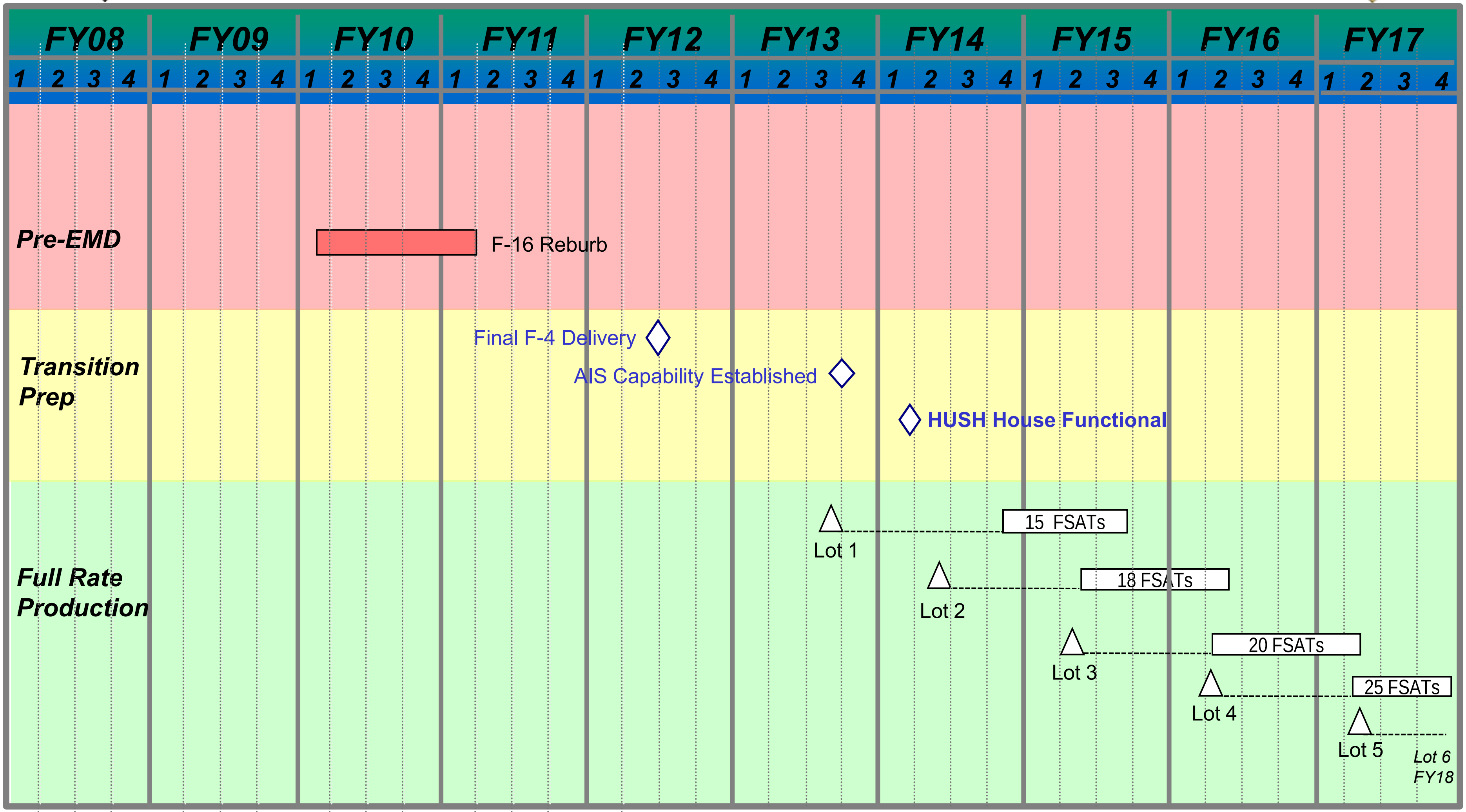
  Number of Parts

  - **FY 07 484**
  - **FY08 410**
  - **FY09 410**
  - **FY10 641**
  - **FY11 385**



F-4 to F-16 Transition

AMARG QF-16 Program Schedule



F-16 Engine Re-preservation

- Long Term desert preservation rqmts changed for F110s from 4 yr to 1 yr cycle

- 83 F100/F110 engines required re-preservation before Oct 11
  - 28/28 engines shipped to CONUS CIRFs
  - 39/55 engines run at DM

Engine Hush House

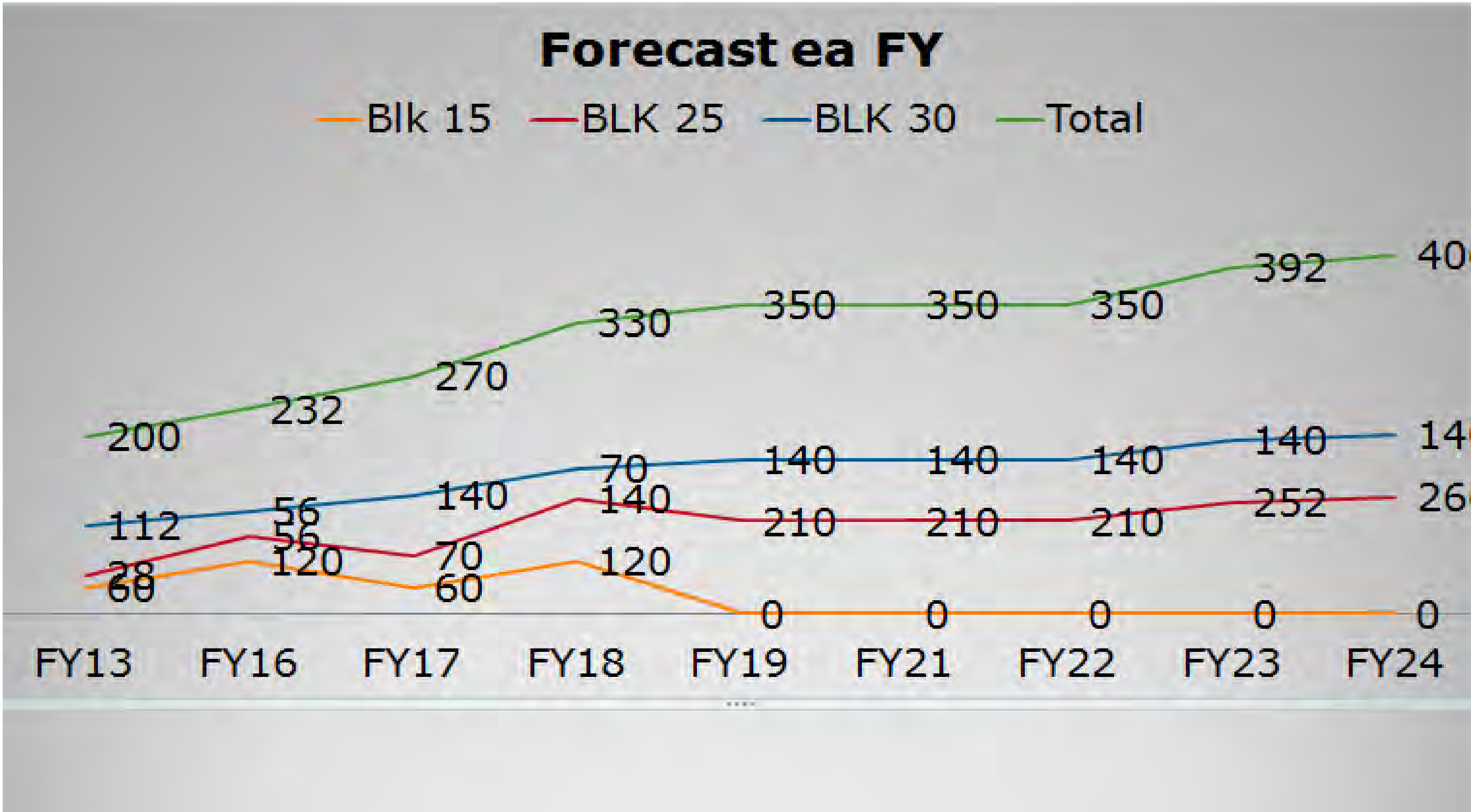
- Acquiring Hush House to regenerate QF-16s & represerve F100/F110 engines

- Awaiting Air Staff P341 MILCON funding for $1.9M Hush House concrete pad

- Induct 1st Aircraft summer 2013
  - Open Field run Jun 13 – Jan 14
  - Hush house complete Jan 14

QF-16 LRU Requirement

OGDEN AIR LOGISTICS CENTER



QF-16 AIS

- Partner with 162nd AZNG
  - QF-16 SPO developing SOW for 162nd to sustain first 2 yrs
  - Transition to organic capability by FY14
- Bid/Award Contract for Turnkey operation
  - Equipment install and hook up (Aug 12)
  - Training (Nov 12 – Jul 13)
  - Sustain organic workload FY14

AMARG Vision

"To be the most admired logistics enterprise providing agile and efficient, world-class depot-level maintenance & logistics support."

...Sustaining our Warfighters 24/7


Questions?

UNITED STATES AIR FORCE

Air Force Aerial Targets

October 2011 NDIA Brief

Fort Walton Beach, FL

Ms. Holly Reedy
Chief, Full-Scale Targets
Aerial Targets Branch (AAC/EBYA)
Eglin AFB, FL

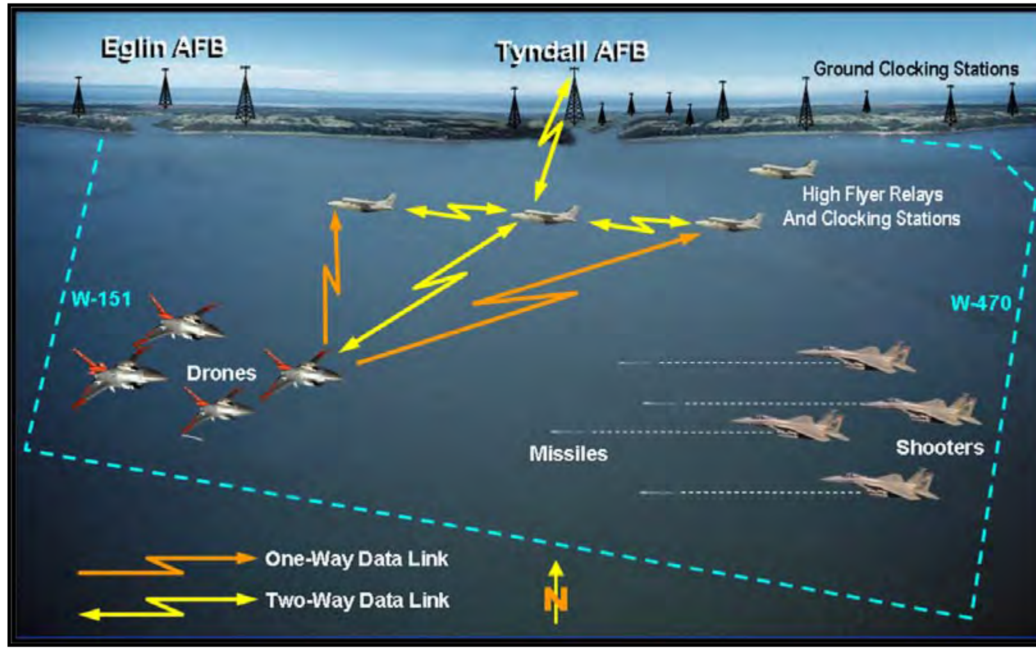
Overall Classification of This Briefing is Unclassified and Cleared by AAC/PA No. 96ABW-2010-0548

Overview

- System Description
- Organizational Structure
- Product Groups
  - Subscale Aerial Targets
  - Full-Scale Aerial Targets
  - Target Control Systems (TCS)
- Summary

Targets Operations

- **Provide "Presentations" of Realistic Threat Representative Systems in Support of Joint Requirements:**
  - Lethality Testing Required for New or Improved Weapon Systems Prior to Production (10 USC 2366)
  - USAF Air-to-Air Weapon System Evaluation Program
- **Validate Performance of DoD Air-to-Air Missiles and Aircraft Systems**
  - Emulates Performance, Signatures and Countermeasures (Infrared and Electronic Attack)



Aerial Target "Presentations" Include:

- The Target Itself
- Threat Representative EA/IR Payloads
- Target Control System (TCS)
- Missile Scoring
- Launch, Recovery, Maintenance & Repair of Target

Overview

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Aerial Targets Branch (AAC/EBYA)

Air Force Headquarters
↓
Air Force Materiel Command
↓
Air Armament Center
↓
Armament Directorate (AAC/EB)
↓
Test and Training Division (AAC/EBY)
↓
Aerial Targets Branch AAC/EBYA

Maj Gen Kenneth D. Merchant, Commander

Mr. Randy Brown, Director
Armament Directorate

Lt Col Patrick, Acting Materiel Leader
Test and Training Systems Program Manager

Mr. Michael VandenBoom, Materiel Leader
Aerial Targets Program Manager

Mr. Michael VandenBoom
Materiel Leader

Mr. Dave Osborn
Chief, Logistics

Mr. Jim Cornwell
Chief, Subscale Targets,
Target Control System

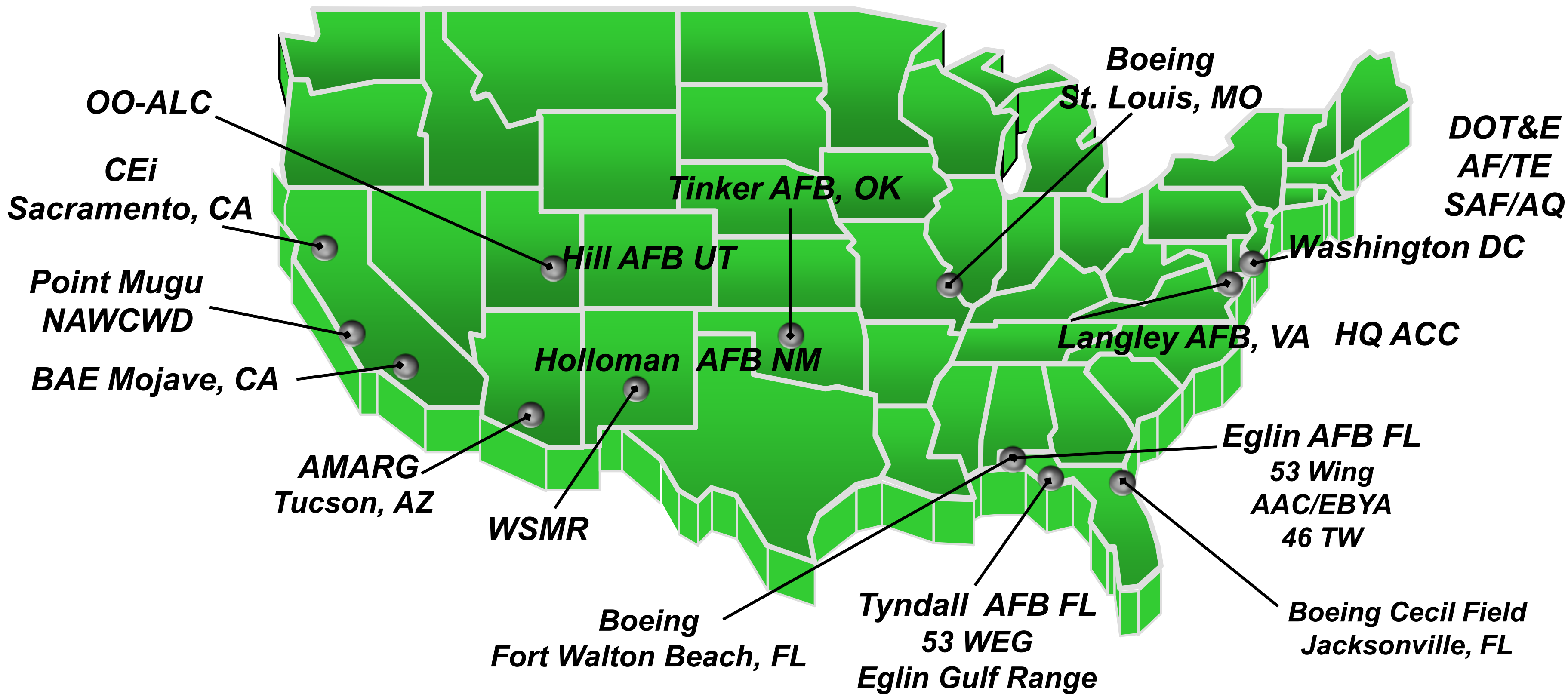
Ms. Holly Reedy
Chief, Full-Scale Targets
Section

Ms. Tammy Robbins
Chief, FM

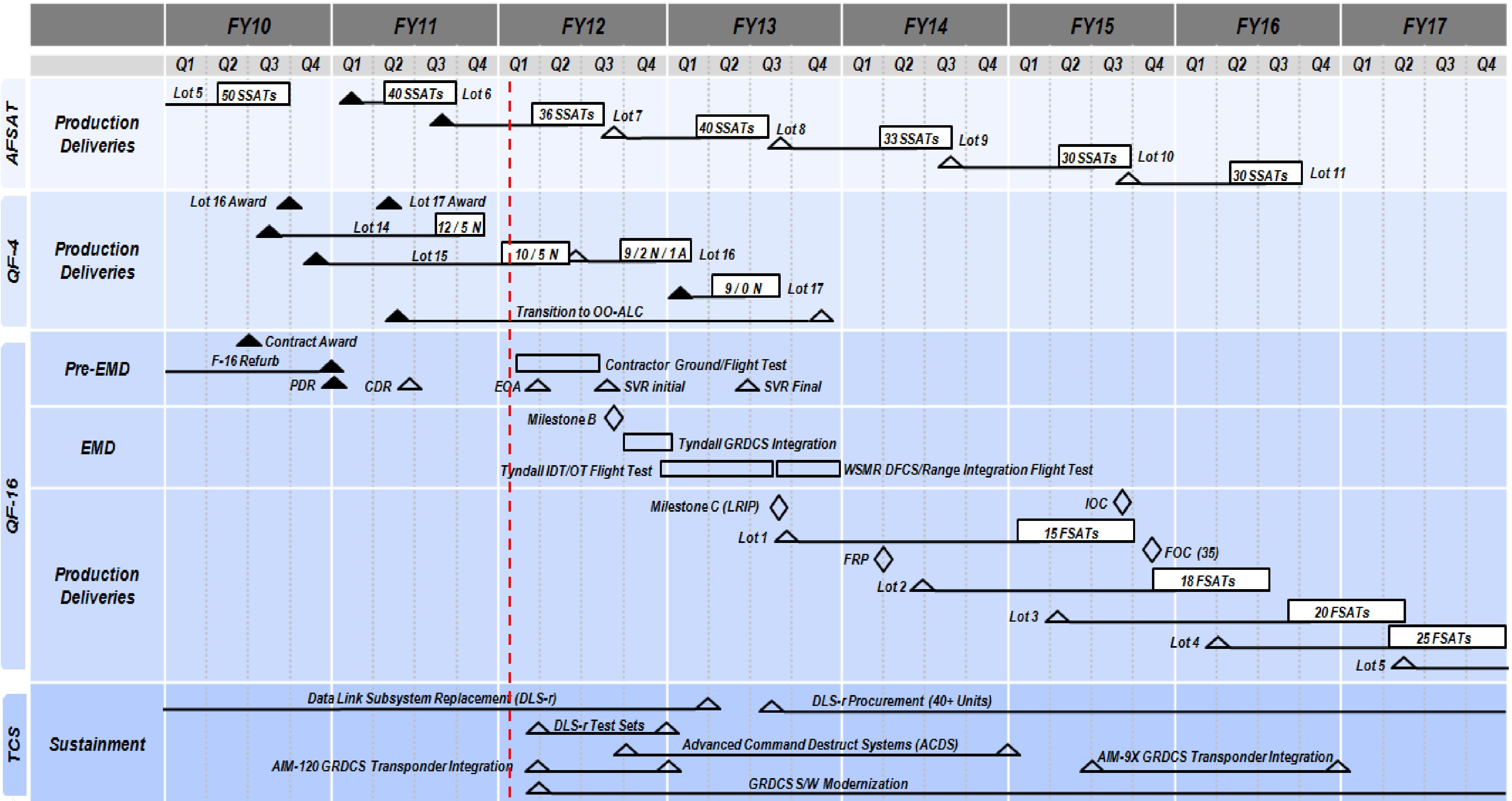
Ms. Cheryl Junkers
Chief, Contracting

Mr. Greg Pixley
Chief Engineer

USAF Aerial Targets Stakeholders



Program Schedules



96ABW-2011-0476

Overview

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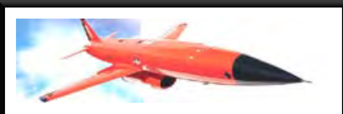
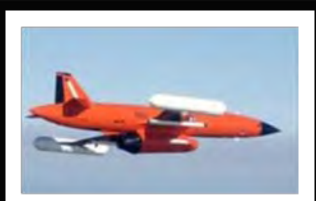
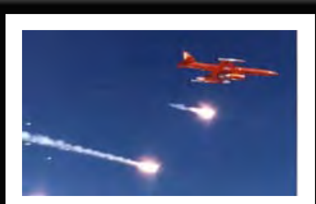
AFSAT Subscale Aerial Target

Jim Cornwell, Program Manager (Acting)







Prime Contractor: Composite Engineering, Inc. (CEi)

ACAT III ***Contract Type: FFP***

Description:

- **An Affordable, All-Composite Airframe**
- **Flies Faster/Slower, Higher/Lower, and Provides 3x+ More Presentations Than Legacy Subscale Targets**
- **Program in Production Phase**
- **Operates via Ground Based Target Control System**
- **Subsonic, Relatively Heavy Payload Capability**

AFSAT FY11 Accomplishments

- **Current Program Focus**
  - Sustainment Planning Through 2020
- **Awarded Lot 8 Productions**
  - 224 Targets Delivered to Date
  - 2 Lots (Lots 9 & 10); Final Lots Under Current Contract
- **196 WEG Operational "Hot" Missions Supported Since Fielding**

	FY11	Since Fielding (FY08)
Launches	127	412
Presentations	448	1502
Missile Shots	462	1259

- **LRS Deliveries Set For 2QFY13 (6 Tyndall; 3 UTTR)**

FY12 Road Ahead

- **Continuing Production**
  - Lot 9 Award Jan 2012
  - Acquisition Planning for Follow-On Production Contract
- **Fielding of New Launch Rail Systems**
- **Product Improvement Activities**
  - Completion of IEA Development and Testing
  - Completion of SIRS Blocks 3/4 Development and Testing
  - Development of RCS Pods

Overview

- System Description
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QF-4 Full-Scale Aerial Target

Capt Briana Mack, Program Manager

Prime Contractor: BAE Systems, CA

ACAT III ***Contract Type: FFP***

Description:

- **Full-Scale Aerial Target for Threat- Representative Weapon System Evaluation**
- **Meets USAF, USA, USN, Allied Test Requirements**
- **Droned, Refurbished F-4 Aircraft Out of AMARG**
- **Program in Full Rate Production**
- **Operates via Ground-Based Target Control System**
- **Supersonic, High-G, Heavy Payload Capability**
- **Provides 3rd Generation Threat Representation**

QF-4 2011 Accomplishments

- **Key Focus – Bridging the Gap Until QF-16 IOC**
  - Completing Production Lots 15 -17
  - Sustainment Planning Through 2017
- **Awarded Last Production Lot (Lot 17) Feb 11**
  - Total of 289 QF-4s Delivered to Date
- **FY11 Operations**
  - 1102 Missions
  - 15 NULLO
  - 8 Kills

End of Program Challenges

- **Regen/Repair Challenges With Older QRF-4C Aircraft**
- **Post Production Planning**
  - Production Deliveries Complete 4QFY13
  - Sustainment Support in Place
  - Post Production CLINs for EN/LG Reach-back
- **QF-4 Transition to OO-ALC**
  - DSM Function Complete After Last Production 4QFY13
  - Transition Execution 1QFY14

QF-16 Full-Scale Aerial Target

Mr. Kenneth Hislop, Program Manager

***Prime Contractor:* Boeing Company, St. Louis, MO**

ACAT: II ***Contract Type: FPIF / FFP***

Description

- **Next Generation Full-Scale Target for Threat-Representative Testing & Weapon System Evaluation**
- **Provides 4th Generation Threat Representation**
- **Meets USAF, USA, USN, Allied Test Requirements**
- **Refurbished F-16 Aircraft With Drone Mod Installed**
- **Supersonic, High-G, Heavy Payload Capability**
- **Operations Via Ground Based Target Control System**

QF-16 Program Snapshot

- **Production Quantity - 210 QF-16s (AF Only)**
- **DT/OT Oversight Program**
- **Upcoming Program Milestones:**
  - First A/C Mod Complete - 1Q FY12
  - Flight Testing - 2Q FY12
  - Milestone B - 3Q FY12
  - Milestone C - 3Q FY13
  - IOC - 3Q FY15
  - FOC - 2Q FY16

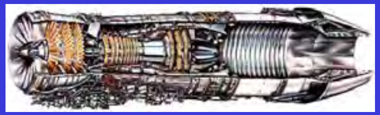
QF-16 System Integration

Airframe

F-16 A / F-16 C

Engines

F100 – PW Engines



F110 – GE Engines

Support/Test Equip

Common F-16 SE
Common Engine SE
GRDCS Datalink Tester
GRDCS Trailer

Ground Systems

GRDCS/DFCS (Tyndall/WSMR)
GRDCS Fixed Sites
Scoring Ground Station

Airborne System

Automatic Flight Control System	Command Telemetry System	Payload Control System	Flight Termination System: Warhead / Fuze	Airborne System Scoring: Encryption Chip	Peculiar Support Equip

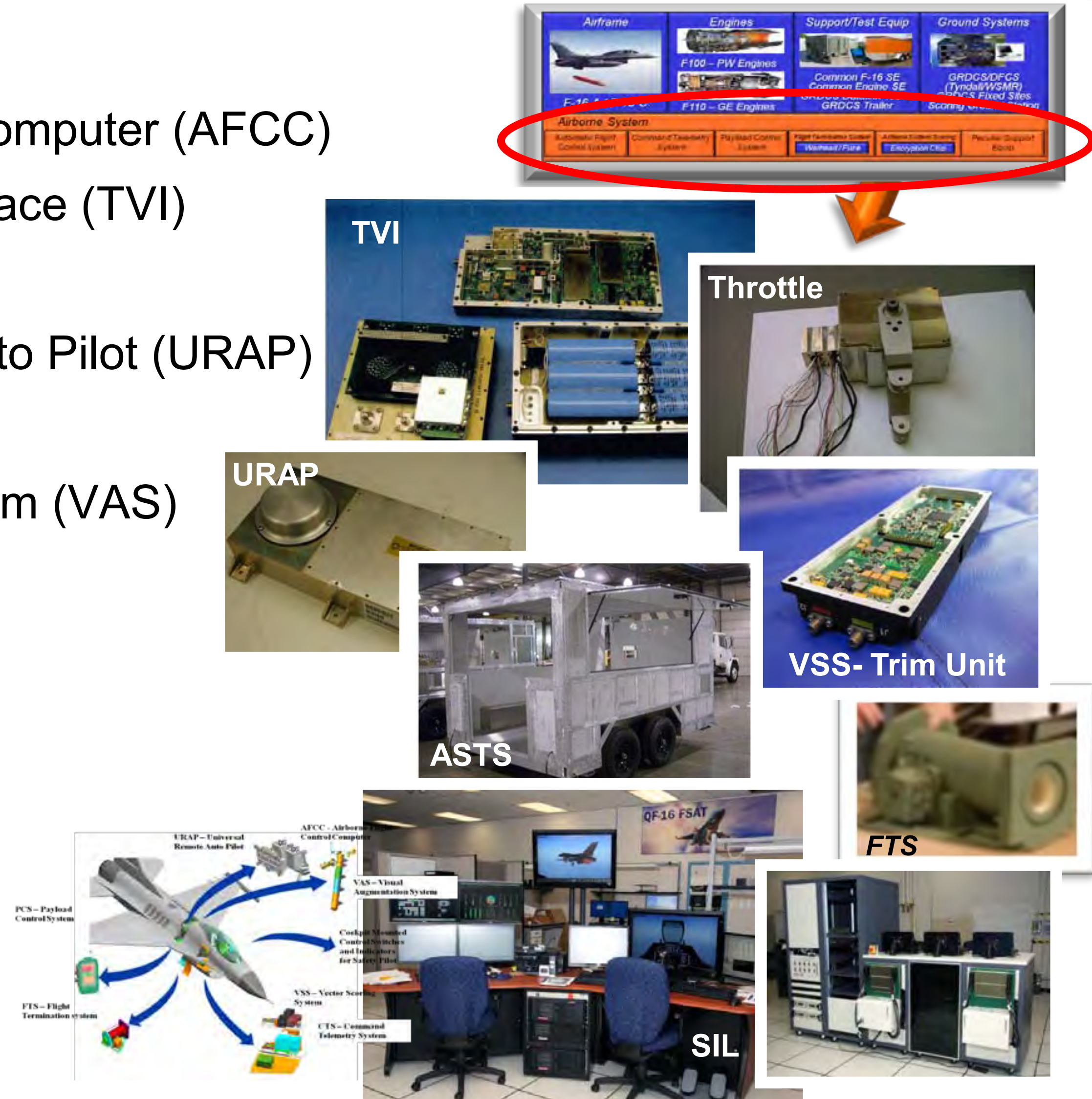
Government Furnished (67% of $)

Contractor Developed (33% of $)

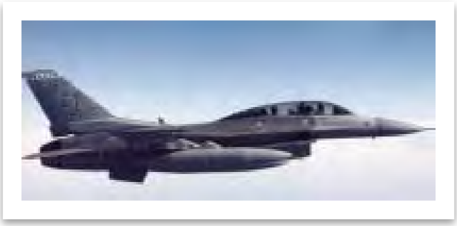
QF-16 System Integration:
Contractor Drone Peculiar Equipment w/ GFP

DPE Development

- **Boeing DPE Hardware**
  - Automatic Flight Control Computer (AFCC)
  - Transponder Vehicle Interface (TVI)
  - Autothrottle
  - Universal Replacement Auto Pilot (URAP)
  - Vector Scoring System
  - Visual Augmentation System (VAS)
  - Backup Radar Altimeter
  - FTS Components

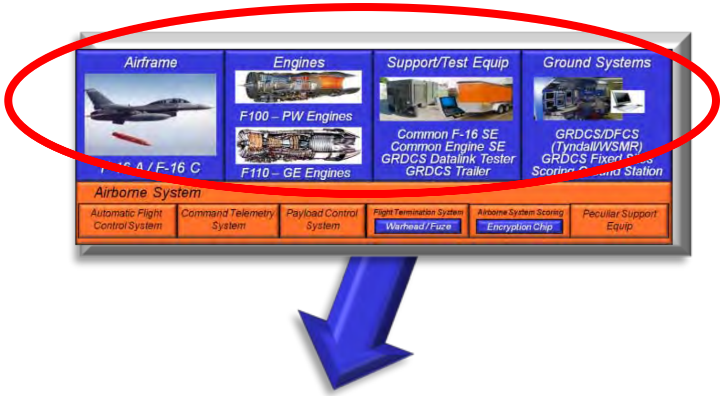


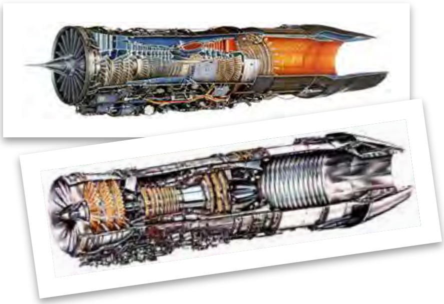
GFP Program



AIRCRAFT - Block 15/25/30

- ALL Aircraft Regenerated for MANNED flight (~300 hrs)





ENGINES

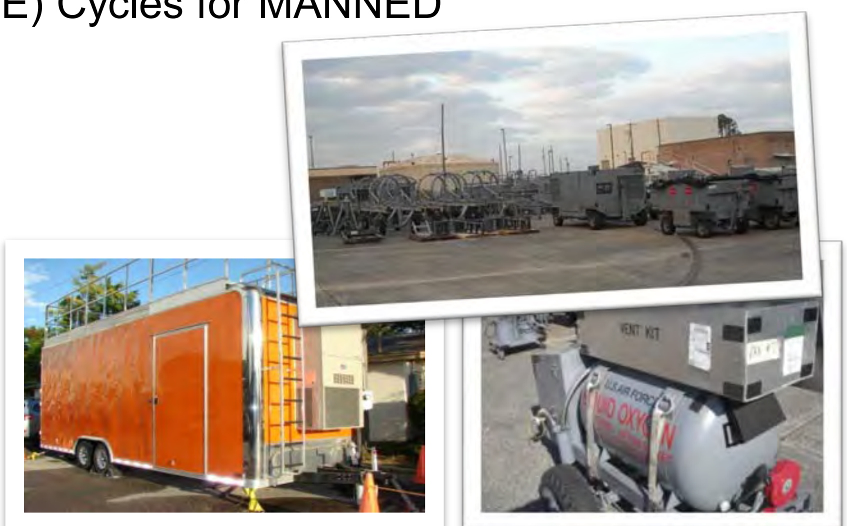
- Engines – 3 Configurations
  - F100-PW-220 (MANNED)
  - F100-PW-200D (UNMANNED)
  - F110-GE-100B (MANNED/UNMANNED)
- Minimum 600 (PW)/900 (GE) Cycles for MANNED

SUPPORT EQUIPMENT

- Required at Cecil, AMARG, Tyndall, Holloman

TARGET CONTROL SYSTEM INTEGRATION

- Emulator
- Trailer/Towers
- DataLink Tester



QF-16 Production

F-16 Records Review

REGENERATE F-16

Induct -1000 Stored F-16 in AMARG Production Line

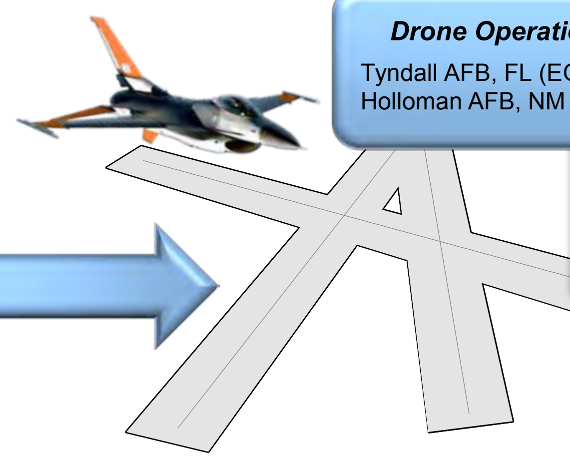
Engine Refurb

Refurb F100-PW & F110-GE Engines at JEIM/CIRFs for Delivery to AMARG

- Edwards AFB
- Tucson, AZ 162nd ANG
- New Orleans, LA ANG
- Springfield, IL ANG

DPE Installation

Boeing Install Drone Package at Cecil Field, FL
GFP Repair (O&A)



Drone Operations

Tyndall AFB, FL (EGTTR)
Holloman AFB, NM (WSMR)

QF-16 Program Status

- **All Six Regen Pre-EMD A/C Delivered to Cecil Field**
- **First Drone Mod Started Sep 11**
- **Concurrent Subsystem Qual Tests Underway**
- **Tackling Airworthiness Certification Challenges**
- **QF-16 Testing Activities**
  - QF-16 Ground Test 1QFY12
  - QF-16 Flight Test 2QFY12
- **Capturing Lessons Learned from EMD Regen Efforts**
- **Standing Up AMARG/Engine Depots for Production**

First Pre-EMD Jet Delivery To Cecil Field

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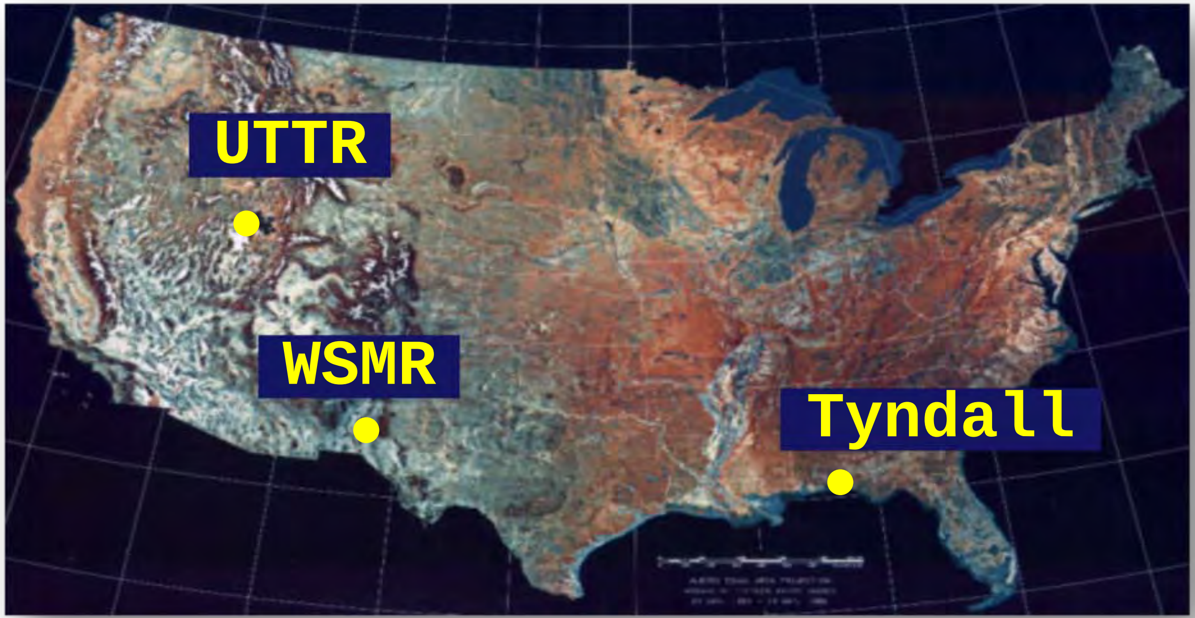
Target Control System (TCS)

Ms. Kathy Fuszner, TCS Program Manager

Description

- Tracks/controls 4 targets & 10 aircraft/missiles
- Provides command destruct of targets and missiles
- Compatible with QF-4, AFSAT (QF-16 integration ongoing)
- System developed by 46th TW, operated by 53d WEG

Ranges

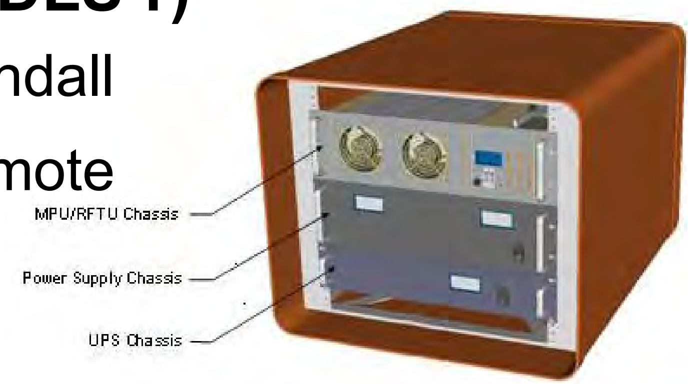


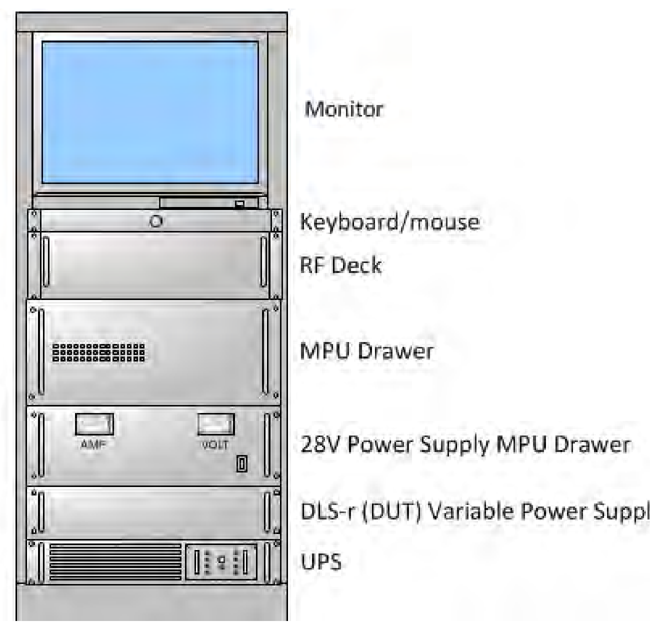
Tyndall AFB / Eglin AFB	Holloman AFB / WSMR, NM	Utah Test & Training
– Main Mission Ops (53 WEG) – GRDCS Sustainment & Dev (46 TW) – Target & Target Control Acq (AAC/EBYA)	– Support FSAT Ops (53 DET) Utilizing Drone Formation Control System (DFCS) at White Sands	– Support Combined Combat Archer and Combat Hammer Evaluation (53 WEG)

DLS-r

- **Data Link System Replacement (DLS-r)**
  - Replace unsustainable DLSs at Tyndall
  - Provide data communication for remote drone operations
  - Development Ongoing (14)
  - Test/Integration FY12
  - Follow-On Procurement FY14
- **DLS-r Interim Test Set (IACS-III)**

  46 TW (Bldg 22)
  - Pt. Mugu
  - Eglin/Tyndall



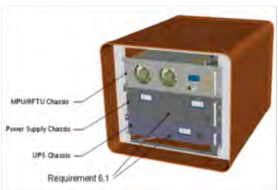


Current GRDCS Efforts

Data Link System Replacement (DLS-r)

• Provides Data Relay for Remote Drone Ops
• Replacement Reduces Risk for Tst/Trng Programs

DLS-r



DLS

GRDCS Display Upgrades

• Replacing Obsolete Propriety Systems w/ Open Standards
• Modern Technology Display

Platform Specific Efforts

• Software Updates & Integration

Mobile GRCDS Trailer/Towers

• GRDCS Capability at Cecil Filed for Contractor Ground/Flight Test
• Remains at Cecil for Production

Other GRDCS Sustainment

• Technology Refresh
• GRDCS Tech Data Package (Drawings / Manuals)

96ABW-2011-0476

Future Features

- **Insert TCS Interface Standards**
  - DLI (Data Link Interface)
  - VCI (Vehicle Control Interface)
- **Consider Other Scoring Technologies**
- **Software Modernization**
  - Migrate Control Processors to Linux Servers
  - Decoupled Simulation to Standalone Processor
  - Enhance System Startup and Configuration to Point/Click Interface
  - Enhanced Logging, Record More Data
  - Real-time Matlab® Analysis Capability
  - Integrate GRDCS Transponder for AIM-120

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Summary

- **AFSAT Workhorse for Warfighter**
  - Supported 67 Operational Missions in FY11
  - Next Step: Award Lot 9 in FY12
- **QF-4 Production Planned Through FY13**
  - Program Transition to Logistics Center for Sustainment
  - Planning for Availability Through 2017
- **QF-16 Preparing for Contractor Test**
  - First Production Delivery Late FY14
- **TCS**
  - Modernization Underway
  - Backbone for Target Platforms

Purpose:

Provide NDIA Symposium An Overview Of U.S. Army, PEO STRI, PM ITTS TMO Activities

Briefed by:
Mr. Bruce Truog
TMO Deputy Director, PMITTS, PEO STRI
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e-mail: bruce.truog@us.army.mil

FALSE IMPRESSION CAVEAT

It should be explicitly noted that the U.S. Government makes no official commitment nor obligation to provide any additional detailed information or an agreement of sale on any of the systems/capabilities portrayed during this presentation that have not been authorized for release.

OUTLINE

- Who We Are
- Mission
- Activities
- Organization (Tie-in with Testing & Training)
- Recently Developed Products
- Future Efforts
- Summary

ORGANIZATION

PM ITTS

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Project Manager for Instrumentation, Targets, and Threat Simulators
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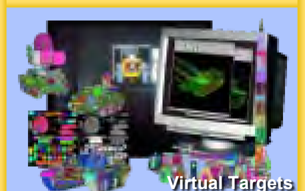
Visit our website at http://www.peostri.army.mil/PM-ITTS

TMO MISSION

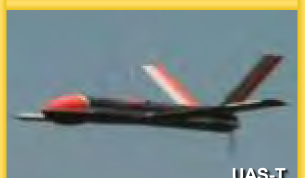
- **MANAGE TOTAL LIFE CYCLE OF TARGETS, OPERATIONAL THREAT VEHICLES, TARGET CONTROL SYSTEMS AND GROUND RANGE SYSTEMS USED IN LIVE AND VIRTUAL TESTING, AND TRAINING.**
- **PROVIDE BEST VALUE ACQUISITION, SUPERIOR LIFE CYCLE SUSTAINMENT AND OPERATION FOR THE U.S. ARMY, DoD AND INTERNATIONAL CUSTOMER.**
- **EXECUTE MISSIONS AS ASSIGNED OR DIRECTED BY PEO STRI AND PM ITTS.**

PRIMARY ACTIVITIES


MQM-107


Virtual Targets


Precision Targetry System


UAS-T

Based on Customer Target Requirements

- **Aerial – Fixed and Rotary Wing**
- **Mobile Ground / Foreign Materiel**
  (both conventional and unconventional)
  - **"Real Deal Steel"**
  - **Surrogates**
- **Virtual – Models and Simulations**
- **Precision Targetry Systems**
- **Auxiliary / Ancillary Equipment**


Towed Target


MSAT


BMP-2


RPVT


BTR-80

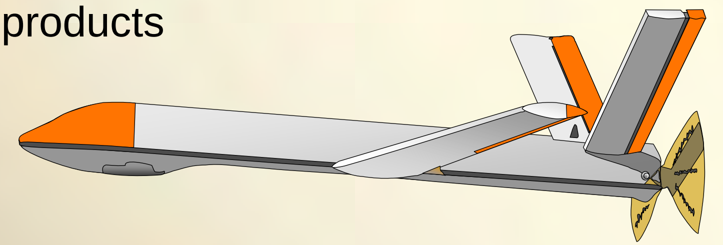

QUH-1


T-72


Technical Vehicle

WHAT WE DO

Develop products



Buy products

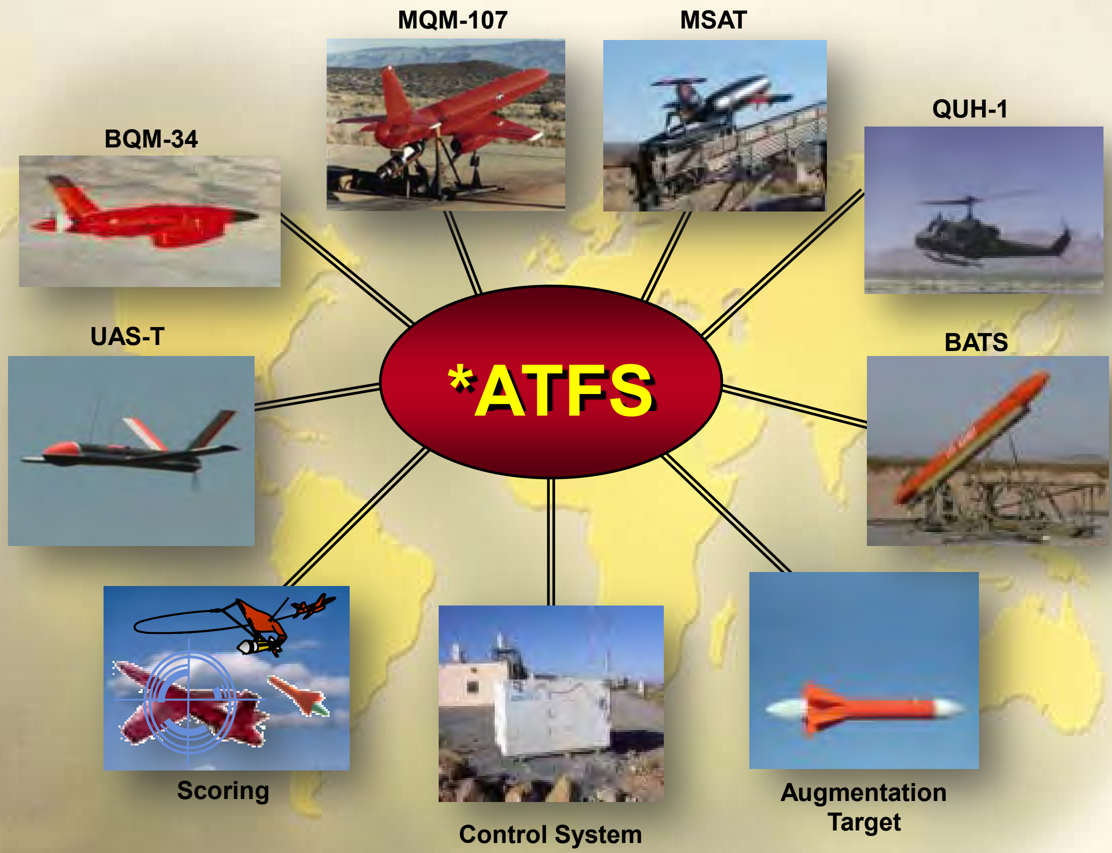
AND we

Fly

Drive

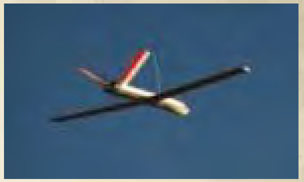
Sustain

AERIAL TARGETS



*Aerial Target Flight Services

Remote Piloted Vehicle Target



- Turnkey Operations
- Target systems flight services supporting Army and Tri-service test and training and FMS requirements
- Low Cost

Towed Targets

Simulate Aerial Threats World-Wide in Live and Virtual Domains

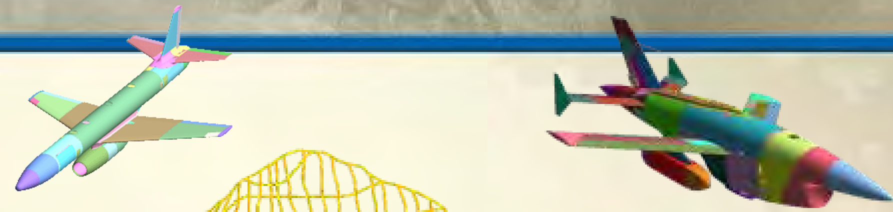
MOBILE GROUND TARGETS

Centrally Manage and Execute:

- 250 active assets
- Mobile Ground Targets for development and operational testing
- Multiple usage options:
  - Rent
  - Lease
  - Buy
- Provide accreditation support

Threat Representative Targets in Live and Virtual Domains

VIRTUAL TARGETS



- **Virtual Targets Project**: Building simulation target models capable of being used in synthetic signature prediction analysis software programs

- **Target Generation Laboratory**: Transitioning CAD models into simulation compliant visual, infrared, and radar frequency simulation target models

- **Army Model Exchange**: Distributing simulation target models to simulation developers throughout the Army T&E community

WHAT WE HAVE DEVELOPED/ PURCHASED RECENTLY

Precision Target Signature

ZSU-23-4

T-72

BMP-3

Boomer

Virtual Targets

BTR-80

FIVE YEAR FORECAST TO DEVELOP/PURCHASE

Medium Speed Aerial Targets

Precision Targets – Mobility/RCS

High Speed Aerial Targets

Mannequin IR

Looking at technology areas to enhance current capabilities

SCUD-B Virtual Target

Fully Mission Capable Threat Targets

Technical Vehicle w/crew representation

Common Control System

SUMMARY

TMO:

- ALWAYS LOOKING FOR A BETTER, FASTER, CHEAPER PRODUCT FOR OUR CUSTOMERS
- RECOGNIZED LEADER OF AERIAL AND GROUND TARGETS
- READY TO RESPONSIVELY AND RESPONSIBLY SUPPORT T&E AND SPECIAL TRAINING REQUIREMENTS

NEED INDUSTRY TO CONTINUE PROVIDING STATE OF THE ART TECHNOLOGIES FOR ADAPTATION AND INCORPORATION INTO TARGETRY

PROVIDING/OPERATING AERIAL, GROUND & VIRTUAL TARGETS

OSD VISION FORWARD FOR

Unmanned Aircraft Roadmap

Mr. Dyke Weatherington

OUSD(AT&L)/S&TS
Director, Unmanned Warfare

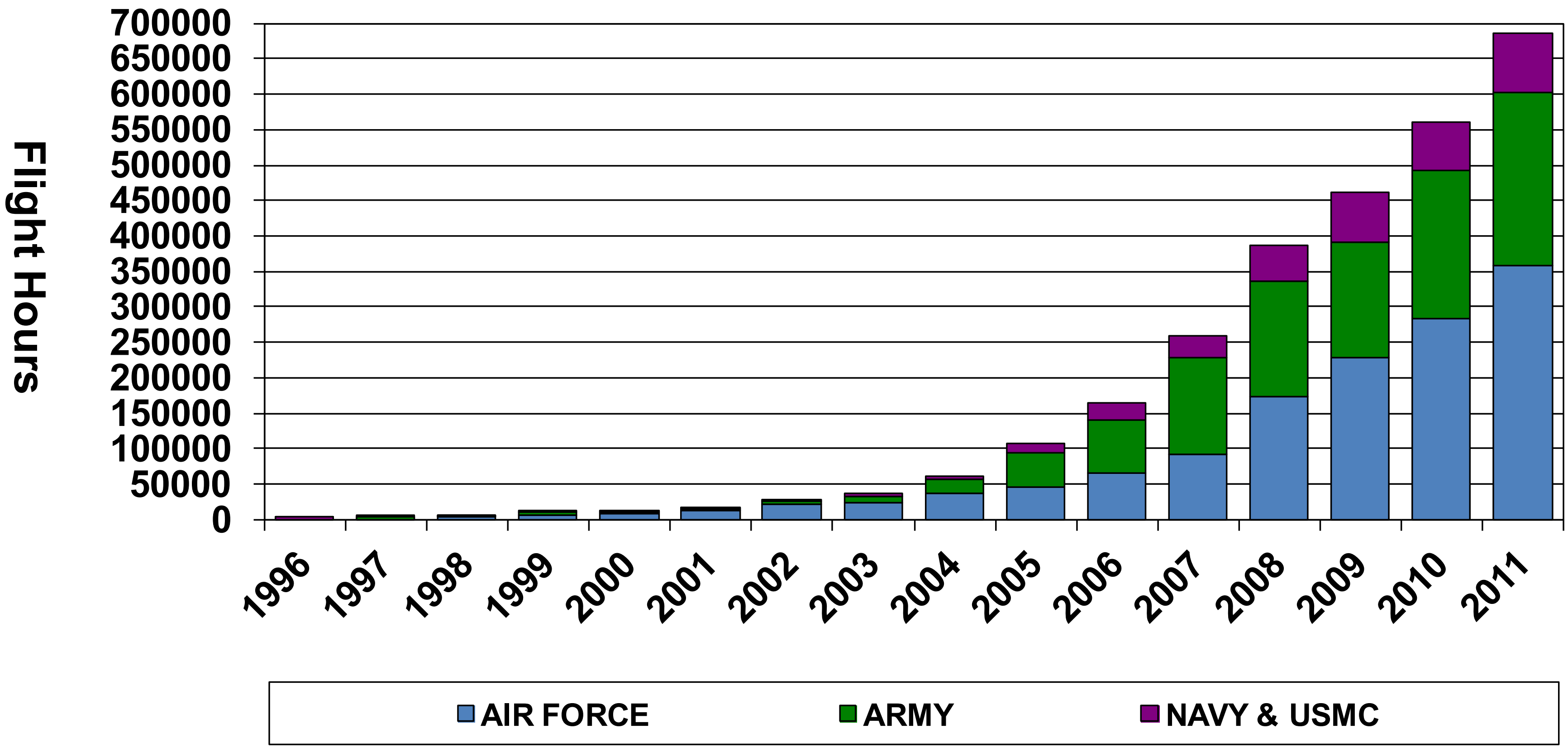
NDIA Oct 27th 2011

Cleared for Open Publication
11-S-1201

Overview

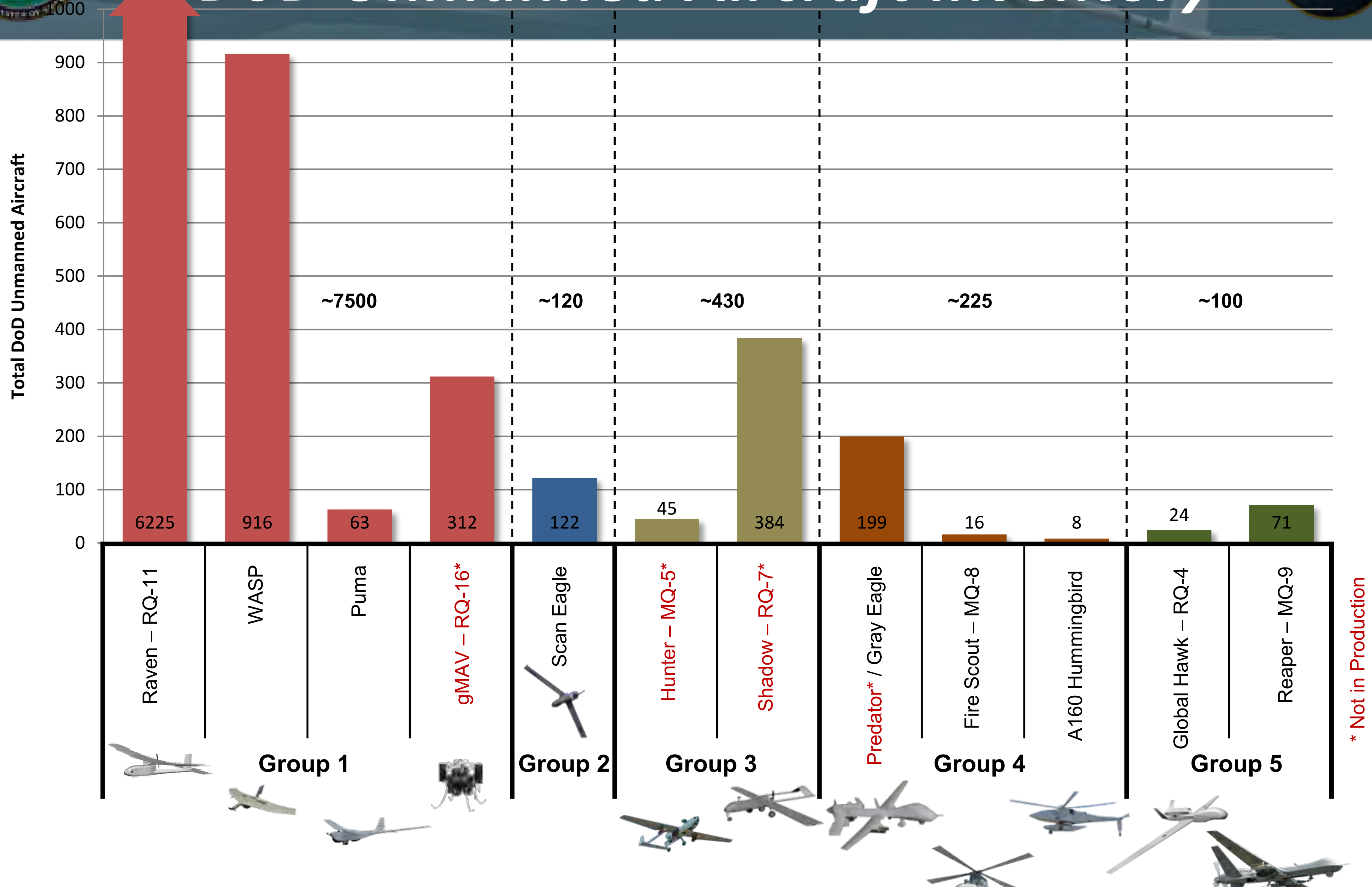
- Current UAS Status
- Acquisition Challenges
- Vision and Roadmap
  - Interoperability
  - Airspace Integration
  - Unmanned Systems Roadmap
- Summary

DoD UAS Flight Hours (By Department, By Fiscal Year)



Does not include Group 1 UAS

DoD Unmanned Aircraft Inventory



DoD *Acquisition* Challenges

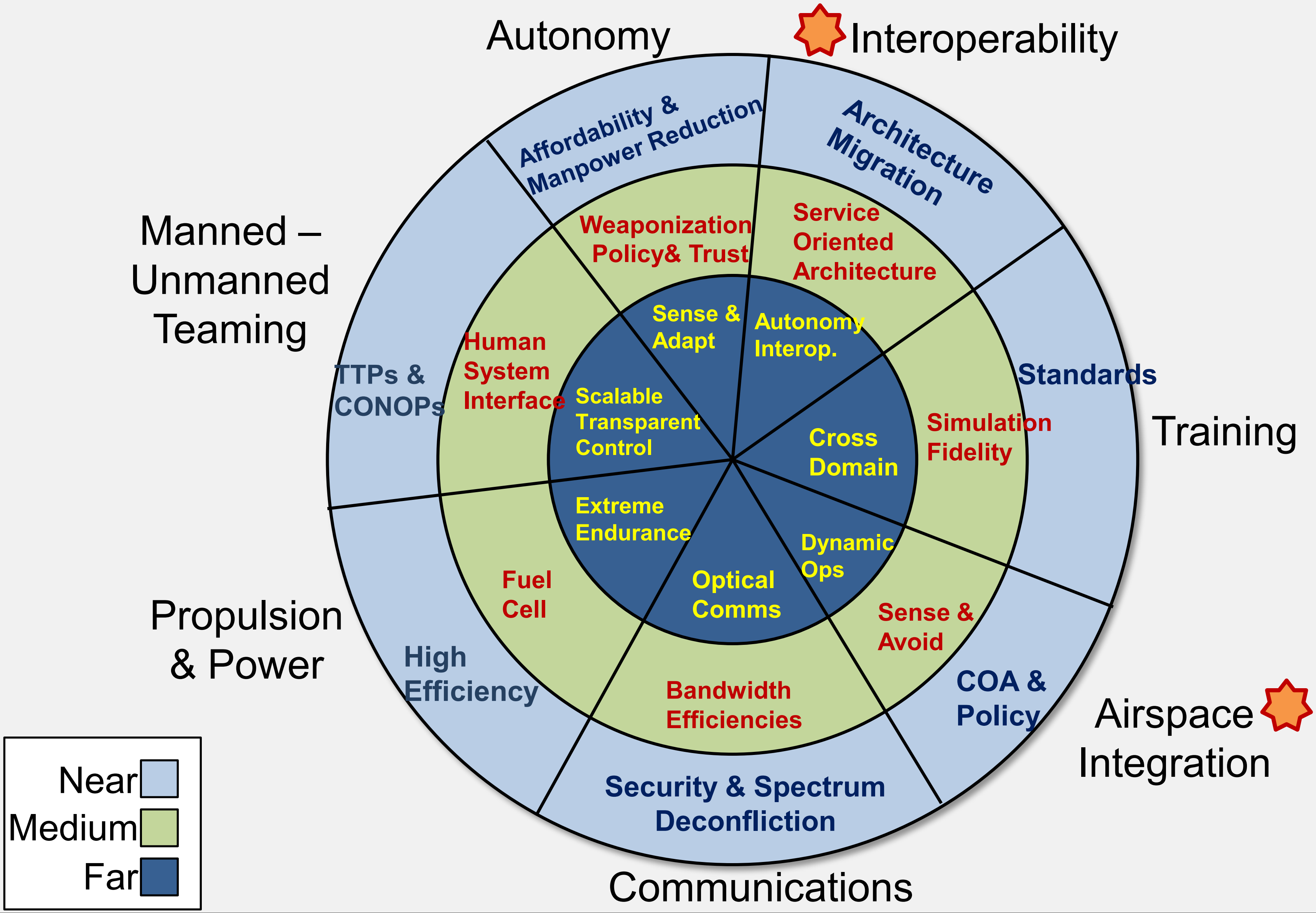
- **Acquisition Efficiencies & Affordability**
- **Interoperability**
- **Airspace Access**
- **Frequency Spectrum**
- **Cost Control**
- **Acquisition Performance**
- **Technology Transition**
- **Sustainment Planning**
- **Open Business Model**

Reuse verses Start New

Our program managers should be scrutinizing every element of program costs, assessing whether each element can be reduced relative to the year before, challenging learning curves, dissecting overheads and indirect costs, and targeting cost reduction with profit incentives - in short, executing to what the program should cost.

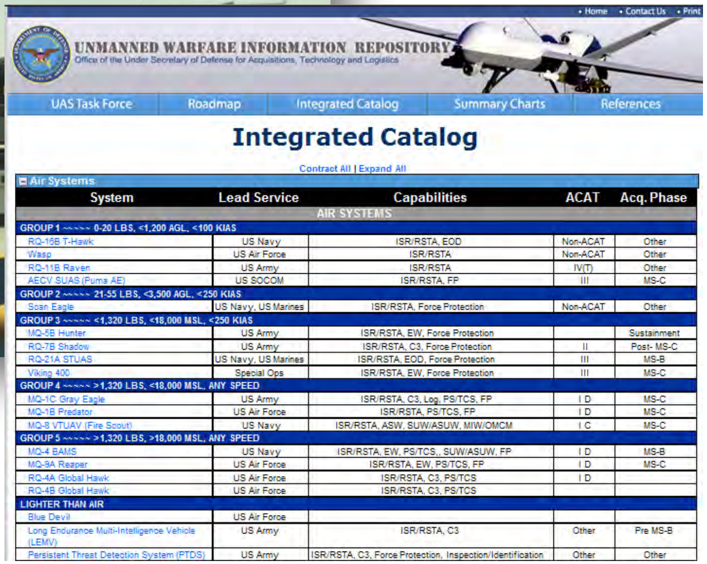
Under Secretary of Defense (AT&L) Memo to Acquisition Professionals, Better Buying Power, Sept 2010

Meeting the Challenges
Unmanned System Roadmap



Introduction/Vision

Vision: Seamless integration of diverse unmanned capabilities that provide flexible options for Joint Warfighters while exploiting the inherent advantages of unmanned technologies, including persistence, size, speed, maneuverability, and reduced risk to human life. DoD envisions unmanned systems seamlessly operating with manned systems while gradually reducing the degree of human control and decision making required for the unmanned portion of the force structure.



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UNMANNED WARFARE INFORMATION REPOSITORY
Office of the Under Secretary of Defense for Acquisitions, Technology and Logistics

UAS Task Force | Roadmap | Integrated Catalog | Summary Charts | References

Integrated Catalog

Contract All | Expand All

Air Systems

System	Lead Service	Capabilities	ACAT	Acq. Phase
AIR SYSTEMS				
GROUP 1 ~~~~~ 0-20 LBS, <1,200 AGL, <100 KIAS				
RQ-16B T-Hawk	US Navy	ISR/RSTA, EOD	Non-ACAT	Other
Wasp	US Air Force	ISR/RSTA	Non-ACAT	Other
RQ-11B Raven	US Army	ISR/RSTA	IV(T)	Other
AECV SUAS (Puma AE)	US SOCOM	ISR/RSTA, FP	III	MS-C
GROUP 2 ~~~~~ 21-55 LBS, <3,500 AGL, <250 KIAS				
Scan Eagle	US Navy, US Marines	ISR/RSTA, Force Protection	Non-ACAT	Other
GROUP 3 ~~~~~ <1,320 LBS, <18,000 MSL, <250 KIAS				
MQ-5B Hunter	US Army	ISR/RSTA, EW, Force Protection		Sustainment
RQ-7B Shadow	US Army	ISR/RSTA, C3, Force Protection	II	Post- MS-C
RQ-21A STUAS	US Navy, US Marines	ISR/RSTA, EOD, Force Protection	III	MS-B
Viking 400	Special Ops	ISR/RSTA, EW, Force Protection	III	MS-C
GROUP 4 ~~~~~ >1,320 LBS, <18,000 MSL, ANY SPEED				
MQ-1C Gray Eagle	US Army	ISR/RSTA, C3, Log, PS/TCS, FP	I D	MS-C
MQ-1B Predator	US Air Force	ISR/RSTA, PS/TCS, FP	I D	MS-C
MQ-8 VTUAV (Fire Scout)	US Navy	ISR/RSTA, ASW, SUW/ASUW, MIW/OMCM	I C	MS-C
GROUP 5 ~~~~~ >1,320 LBS, >18,000 MSL, ANY SPEED				
MQ-4 BAMS	US Navy	ISR/RSTA, EW, PS/TCS,, SUW/ASUW, FP	I D	MS-B
MQ-9A Reaper	US Air Force	ISR/RSTA, EW, PS/TCS, FP	I D	MS-C
RQ-4A Global Hawk	US Air Force	ISR/RSTA, C3, PS/TCS	I D	
RQ-4B Global Hawk	US Air Force	ISR/RSTA, C3, PS/TCS		
LIGHTER THAN AIR				
Blue Devil	US Air Force			
Long Endurance Multi-Intelligence Vehicle (LEMV)	US Army	ISR/RSTA, C3	Other	Pre MS-B
Persistent Threat Detection System (PTDS)	US Army	ISR/RSTA, C3, Force Protection, Inspection/Identification	Other	Other

Roadmap &Catalog: https://extranet.acq.osd.mil/uwir/ (CAC Protected)

Roadmap: http://www.acq.osd.mil/sts/organization/uw.shtml

OSD is Improving Interoperability and Affordability of UAS GCSs Through Open Business Processes

1 Feb. 2009, OUSD (AT&L) Mandates Common GCS Architecture

2 Sept. 2010, OUSD (AT&L), Mandates More Competition

3 Mar. 2011, UCS Publishes Common GCS Architecture Vol. 1

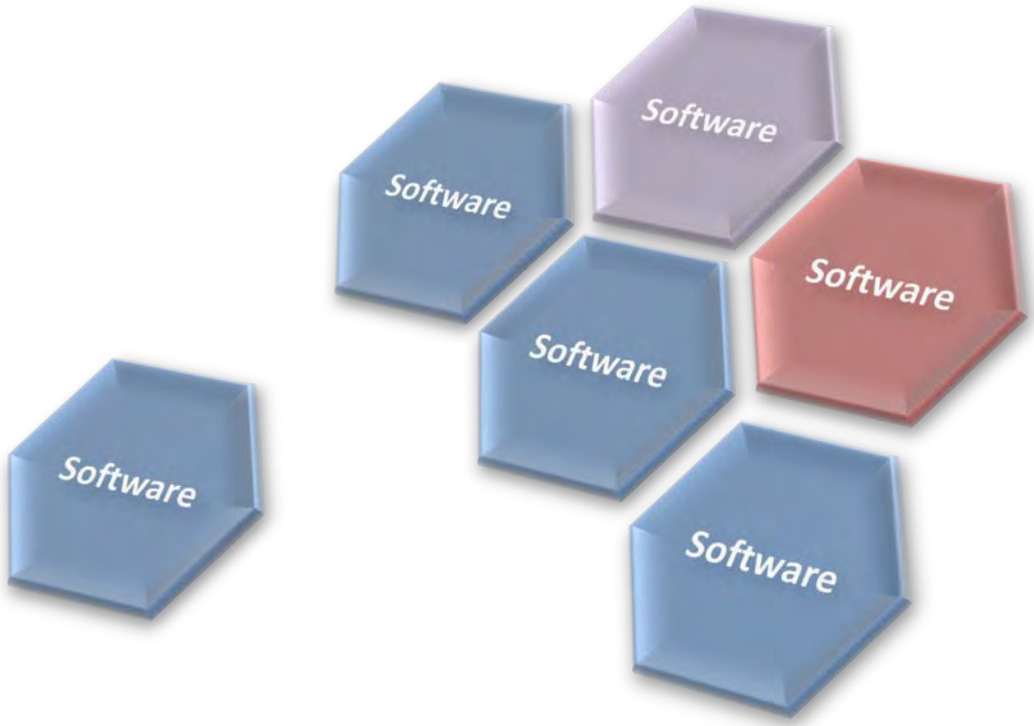
4 Mar. 2011, GCS Architecture Vol. 2 Released

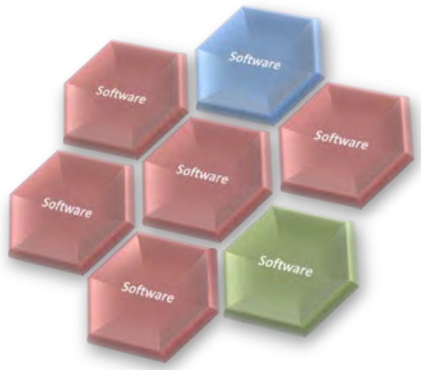
5 Jun. 2011, Open Bus Model Released

OSD has developed a common architecture and designed an open business model to meet its objectives

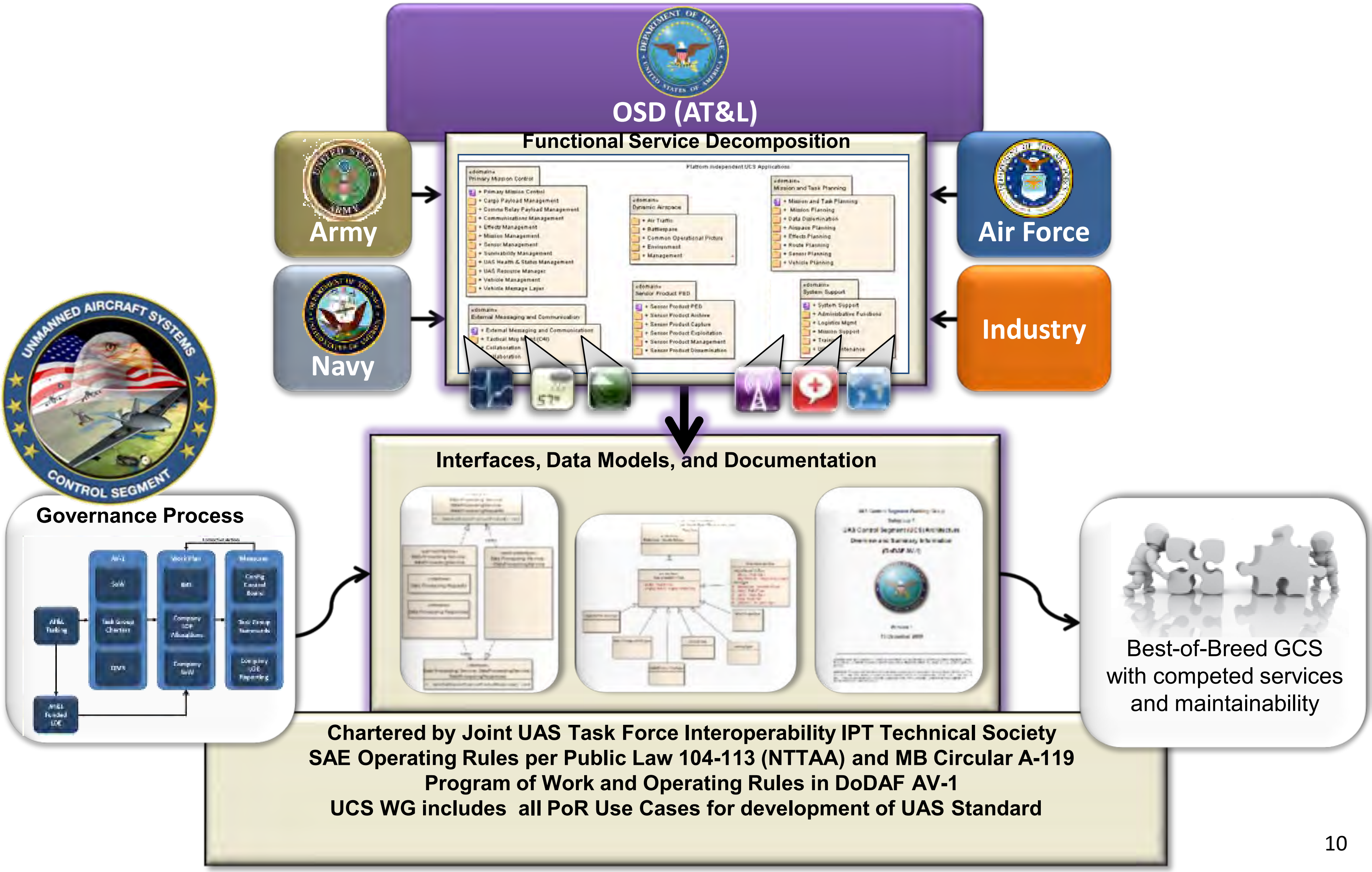
OA Acquisition Objectives

To remove the traditional barriers to Effective Competition in the UAS Control Segment and provide market access to a broad, heterogeneous industrial base of software providers in an agile acquisition and integration environment.





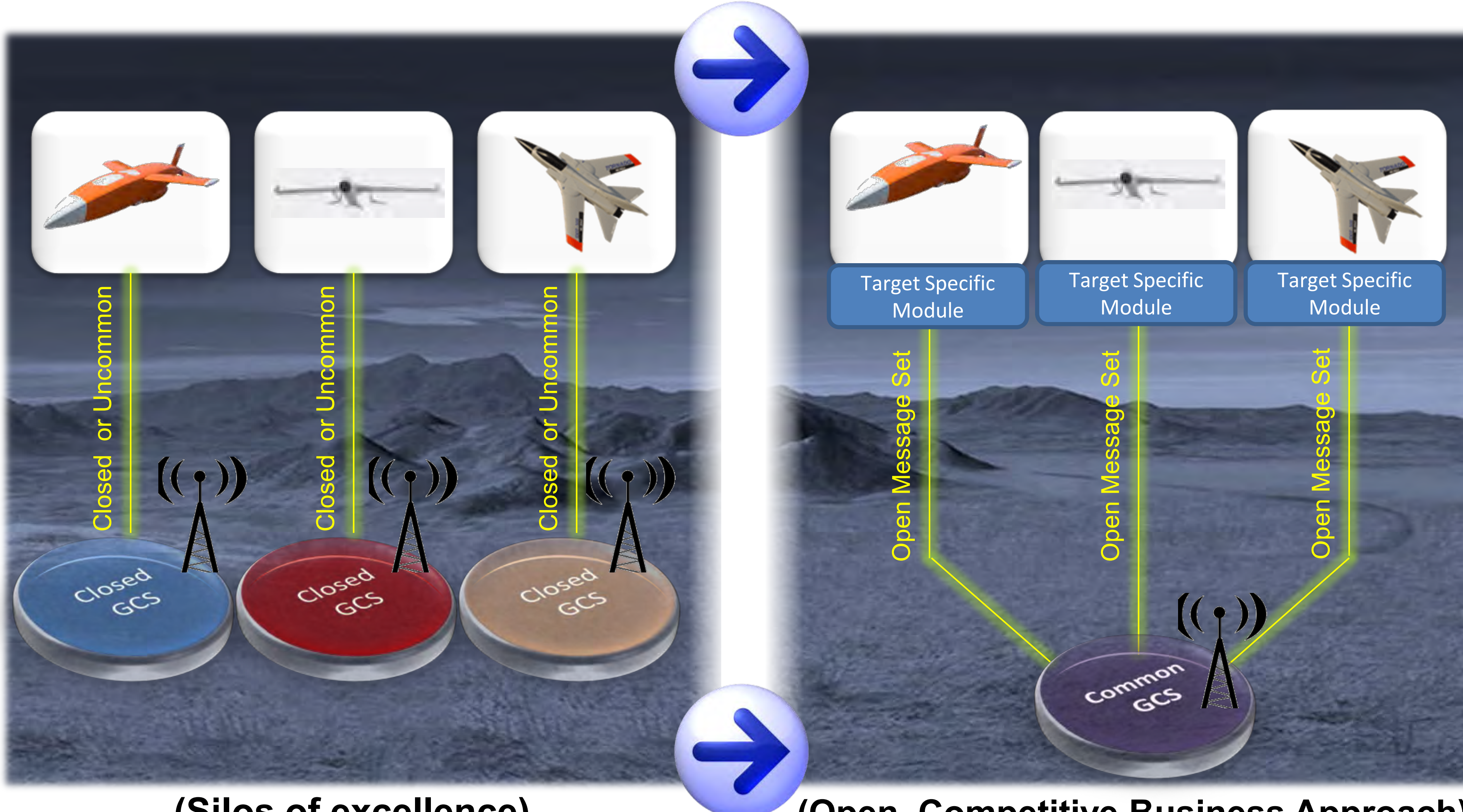
UCS Vision



OSD (AT&L)
Functional Service Decomposition
Army
Navy
Air Force
Industry
Interfaces, Data Models, and Documentation
UNMANNED AIRCRAFT SYSTEMS CONTROL SEGMENT
Governance Process
Best-of-Breed GCS with competed services and maintainability
Chartered by Joint UAS Task Force Interoperability IPT Technical Society
SAE Operating Rules per Public Law 104-113 (NTTAA) and MB Circular A-119
Program of Work and Operating Rules in DoDAF AV-1
UCS WG includes all PoR Use Cases for development of UAS Standard

Acquisition Opportunities

Standards-based Interconnection..

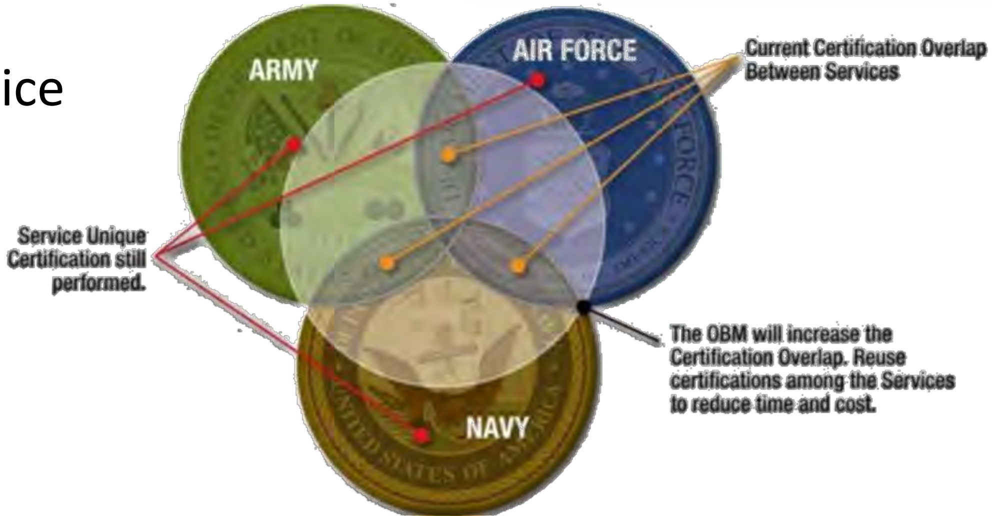


(Silos of excellence) **(Open, Competitive Business Approach)**

Summary

- Unmanned Warfare has had continuous scrutiny for portfolio efficiencies
  - Congress/GAO
  - USD(AT&L)
  - UAS Task Force

- Significant efforts is underway within OSD, AT&L focusing on affordability
  - "Should Cost" "Will Cost" of UAS systems
  - Open Business Model (OBM) vision for UAS GCSs
  - Open Architecture – Reuse
  - Remove Redundancy across Service Certification
  - **Reuse verse Start New**



Backups

DoD Unmanned Systems Roadmap

Coordinated 2011-2036 Vision for Services and Industry

- Interoperability
- Autonomy
- Airspace Integration
- Communications
- Training Standardization
- Propulsion and Power
- Manned-unmanned (MUM) Teaming

Increased Affordability

2011-2036 Edition planned for 3rd Qtr FY11

Airspace Integration

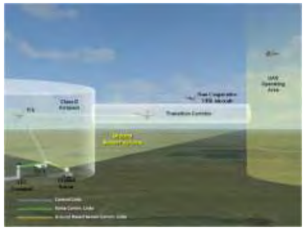
• **Methodology**: incremental approach to providing critical access to a given operations profile prior to implementing a full dynamic operations solution.

• **Immediate focus**: Near-term mission-critical access while simultaneously working toward far-term routine NAS access

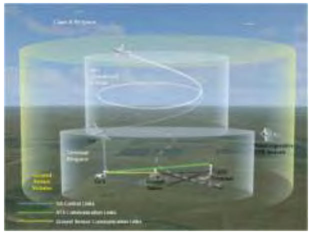
Line-of-Sight Operations

Terminal Area Operations

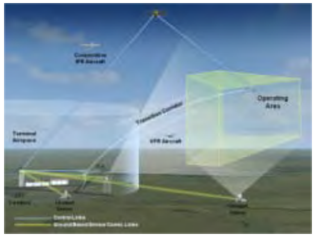
Lateral Transit Operations



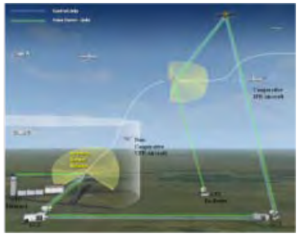
Vertical Transit Operations



Operating Areas



Dynamic Operations

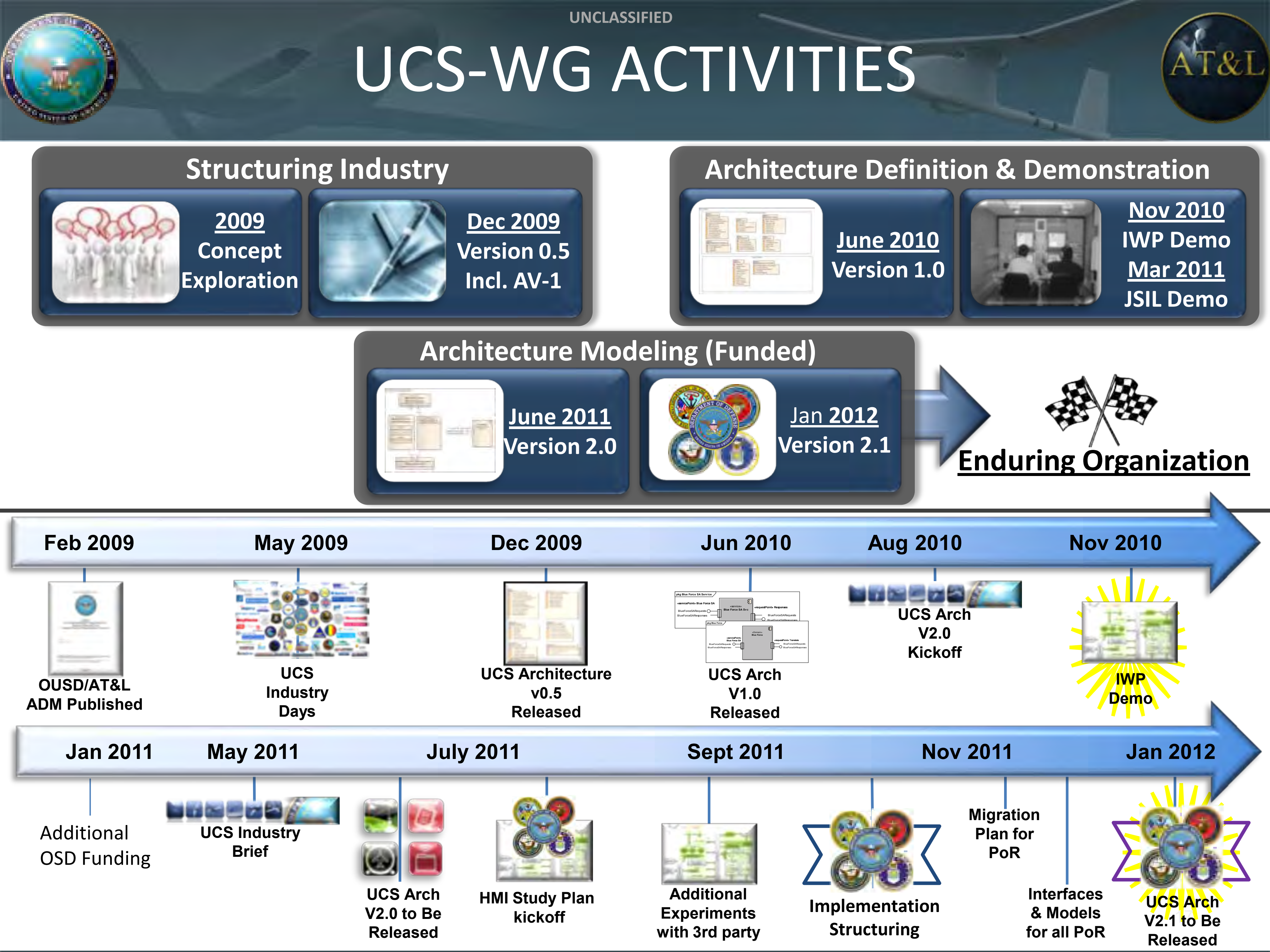


NAS Access Requirements

- Aircraft must be Airworthy
- Must be operated by a Qualified Pilot / Operator
- Compliant with Operating Rules, Standards, and Procedures

Vision: Ensure unmanned aircraft have routine access to the appropriate airspace necessary to meet mission requirements

UCS Reference Architecture


UNCLASSIFIED
UCS-WG ACTIVITIES
AT&L
Structuring Industry
2009
Concept
Exploration
Dec 2009
Version 0.5
Incl. AV-1
Architecture Definition & Demonstration
June 2010
Version 1.0
Nov 2010
IWP Demo
Mar 2011
JSIL Demo
Architecture Modeling (Funded)
June 2011
Version 2.0
Jan 2012
Version 2.1
Enduring Organization
Feb 2009
May 2009
Dec 2009
Jun 2010
Aug 2010
Nov 2010
OUSD/AT&L
ADM Published
UCS
Industry
Days
UCS Architecture
v0.5
Released
UCS Arch
V1.0
Released
UCS Arch
V2.0
Kickoff
IWP
Demo
Jan 2011
May 2011
July 2011
Sept 2011
Nov 2011
Jan 2012
Additional
OSD Funding
UCS Industry
Brief
UCS Arch
V2.0 to Be
Released
HMI Study Plan
kickoff
Additional
Experiments
with 3rd party
Implementation
Structuring
Migration
Plan for
PoR
Interfaces
& Models
for all PoR
UCS Arch
V2.1 to Be
Released

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BOEING

49th Annual NDIA Conference
Targets, UAVs & Range Operations Symposium & Exhibition

Boeing QF-16 Program – Ready for Test

QF-16 Full Scale Aerial Target
Boeing Global Services and Support
Maintenance, Modifications, & Upgrades
Aircraft Sustainment & Maintenance

Dr. Kevin A. Wise
Senior Technical Fellow
QF-16 Chief Architect
October 26, 2011

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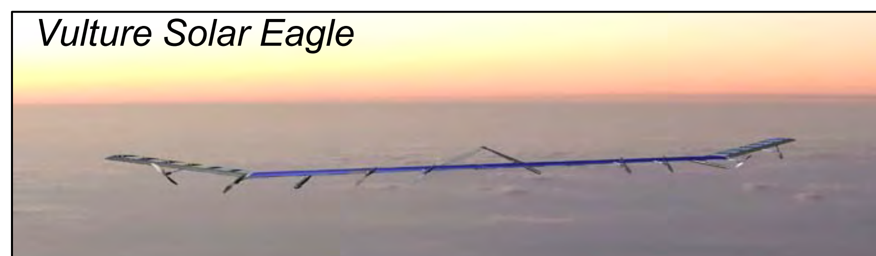
Boeing Targets / Decoys / UAS

BOEING

- **Cost Effectively Converting Highly Reliable, NDI Air Vehicles**
- **Providing Foundation for New Development Programs**
- **Boeing's Systems Integration Expertise and Teaming**
- **Application of Boeing Critical Technologies**
- **Synergy Among Our Targets, Unmanned Systems, and Weapons Programs**



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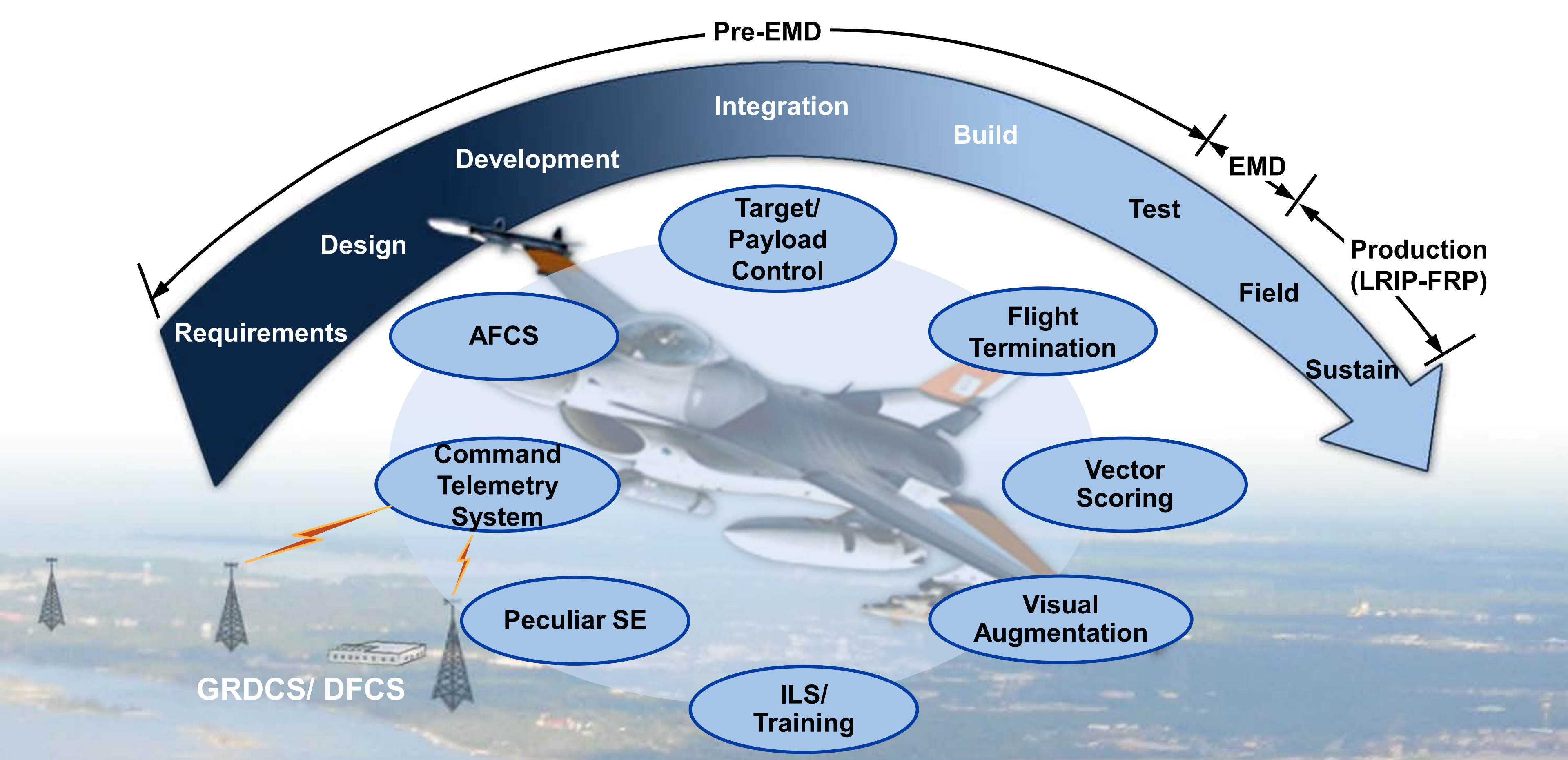
QF-16 Overview



Key Features

- Follow on for QF-4 Program: Supersonic, High-G, Heavy Payload Capability
- Satisfies Title 10 "Live Fire/Lethality"
- Provides 4th Generation Threat Representation

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QF-16 FSAT Roadmap Meets All Government Milestones

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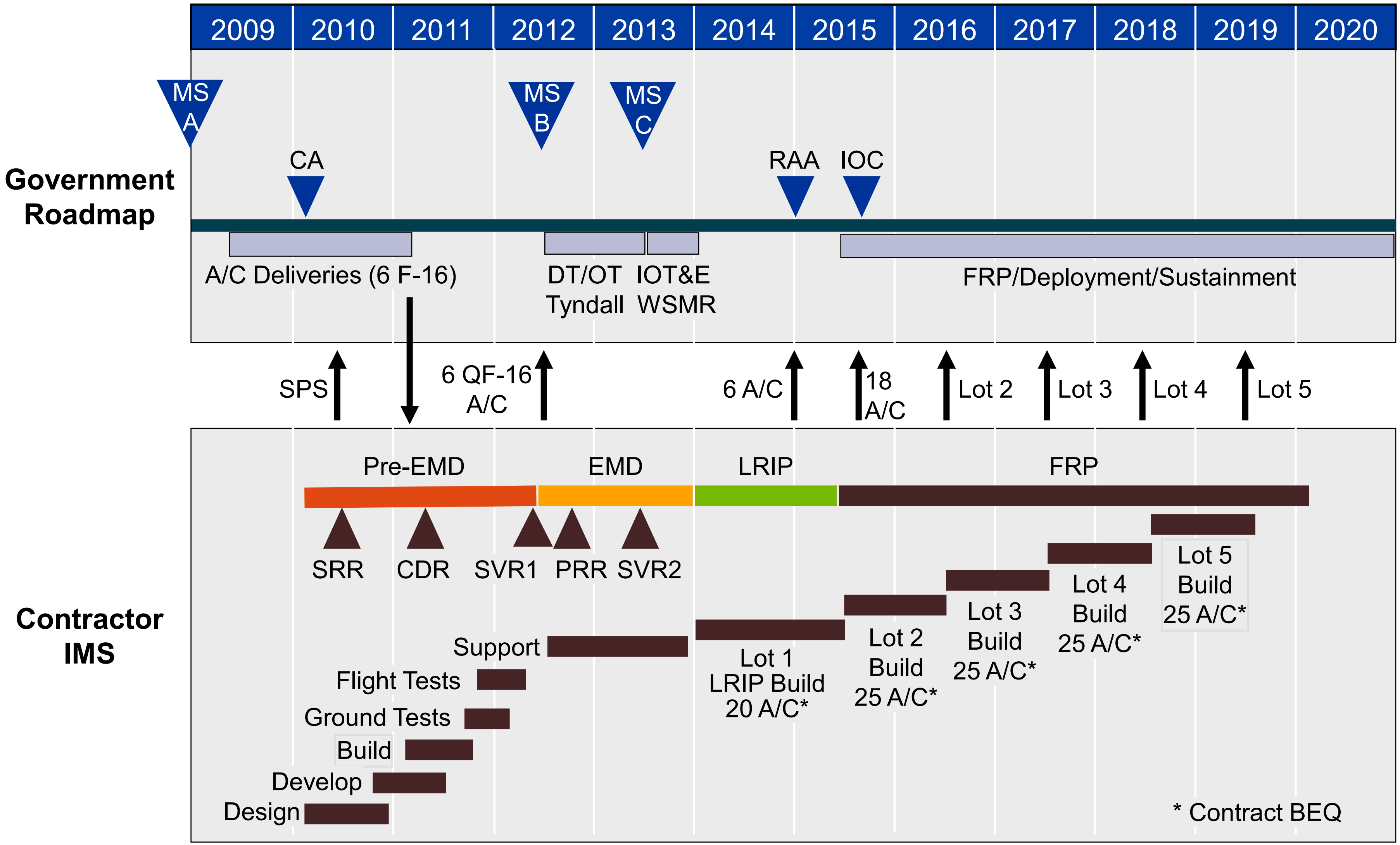

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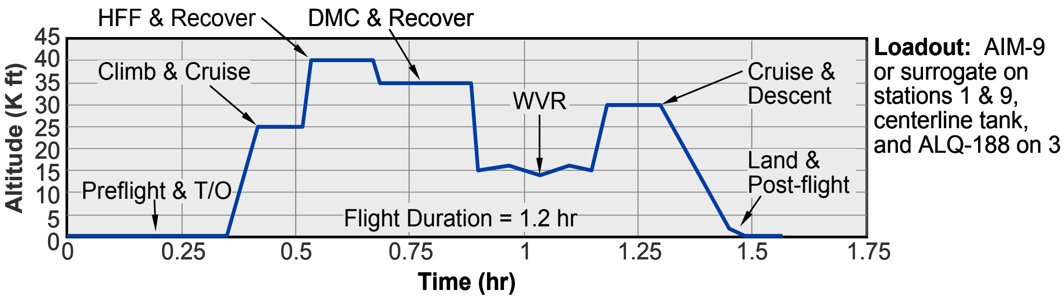
Mission Requirements

QF-16 Design meets Mission Requirements

- 4th Gen Threat
- F-16 Maneuverability
- Minimized impact to RCS
- Countermeasures
- 120nm GRDCS datalink
- Weapon accuracy scoring
- Range Safety – Flt Termination
- Piloted & Unmanned
- Reliable
- Supportable – Test Equipment
- Growth – Phase II Air Superiority Target (AST)



The QF-16 is designed for Mission Success

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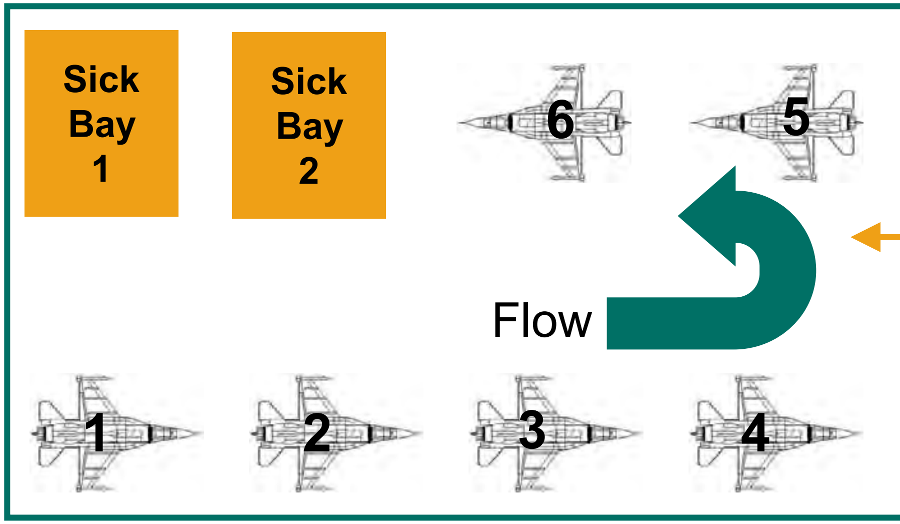
Overview of DPE Installations

Drone Conversions Underway at Cecil



- **Cecil Field Recovery of first F-16**
  - **On time readiness**
  - **Trained and experienced support personnel**

Lean cellular production supports affordable, high quality, on time performance

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Exceeding Expectations

Product Improvements

- CTS:
  - Improved TVI clock/position
  - Improved data latency
  - Improved frequency stability
  - Antenna switch feedback
  - Surge suppression
- Payloads:
  - Increased payloads power
  - All 8 wing stations active
  - Pre-wired spare payload discretes
  - Modular payload design for easy programmability
- Vector Scoring:
  - Improved scoring coverage
  - Shock isolated TRIM units for improved scoring accuracy
- Low profile antennas for RCS
- URAP available for improved navigation accuracy & GPS/TCS growth path
- More than double reliability
- Spare I/O available for growth
- Improved BIT and fault isolation/detection
- RCC-319 compliant Flight Termination System

The current QF-16 design improves on a successful QF-4 design

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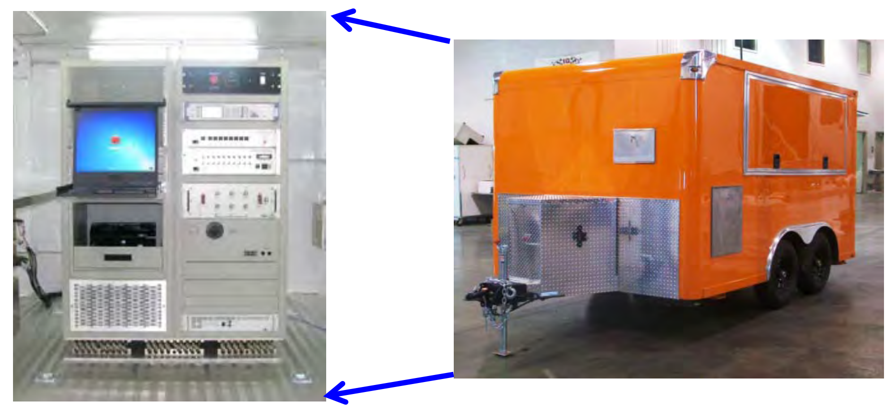
QF-16 Peculiar Support Equipment (PSE)

Ground Servicing Screen with B1 stand for safe cockpit exit after engine start

PSE Communicates with QF-16 through dedicated maintenance connectors and RF

Portable Flight Line Tester for OFP load, system initialization, and diagnostics



Trailer-mounted Automated System Test Set for Acceptance and Pre-Mission Testing

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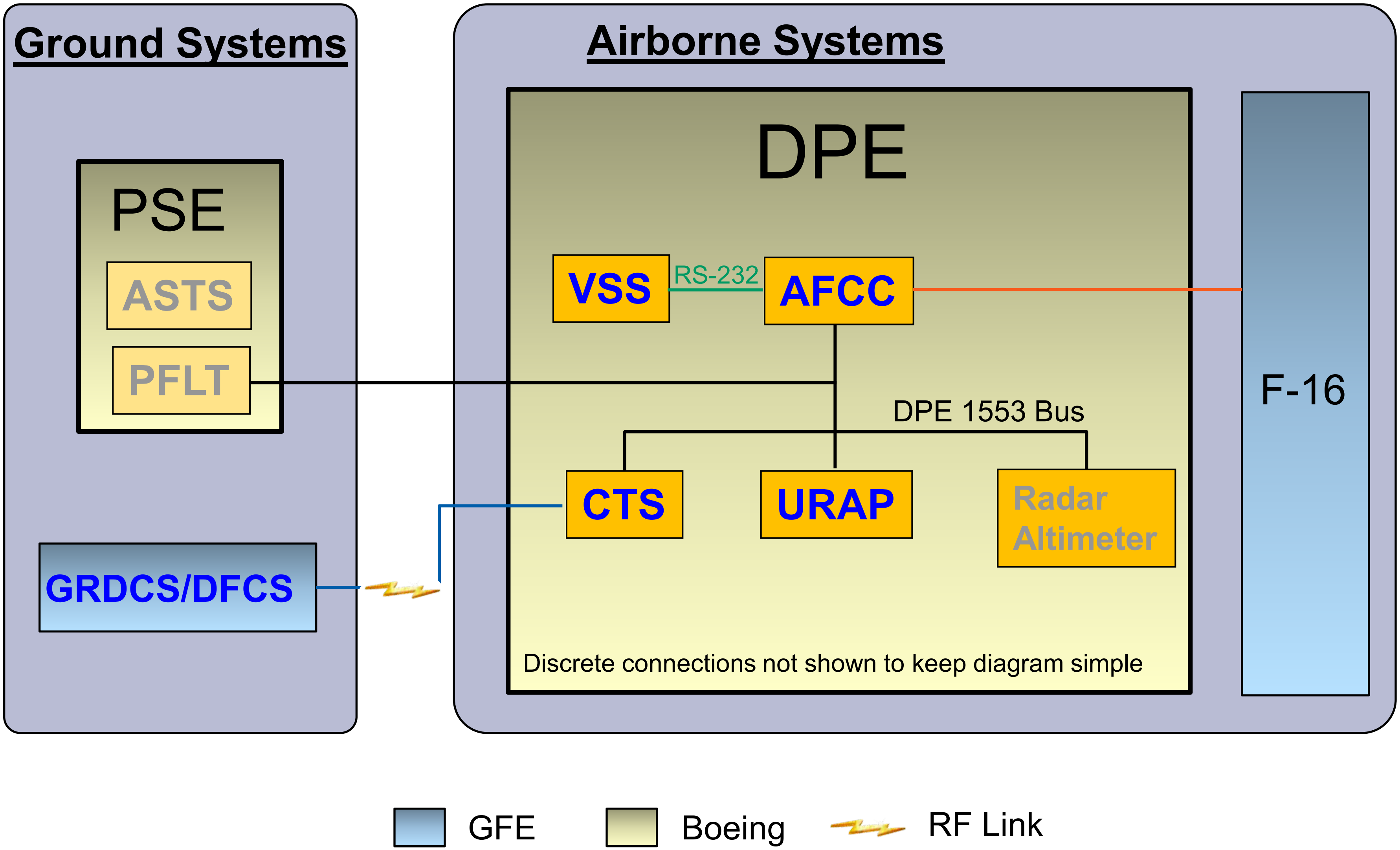
Airborne System Architecture (Software View)

Systems With Major Airborne Software Components Highlighted in **Blue**



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System Verification Flow

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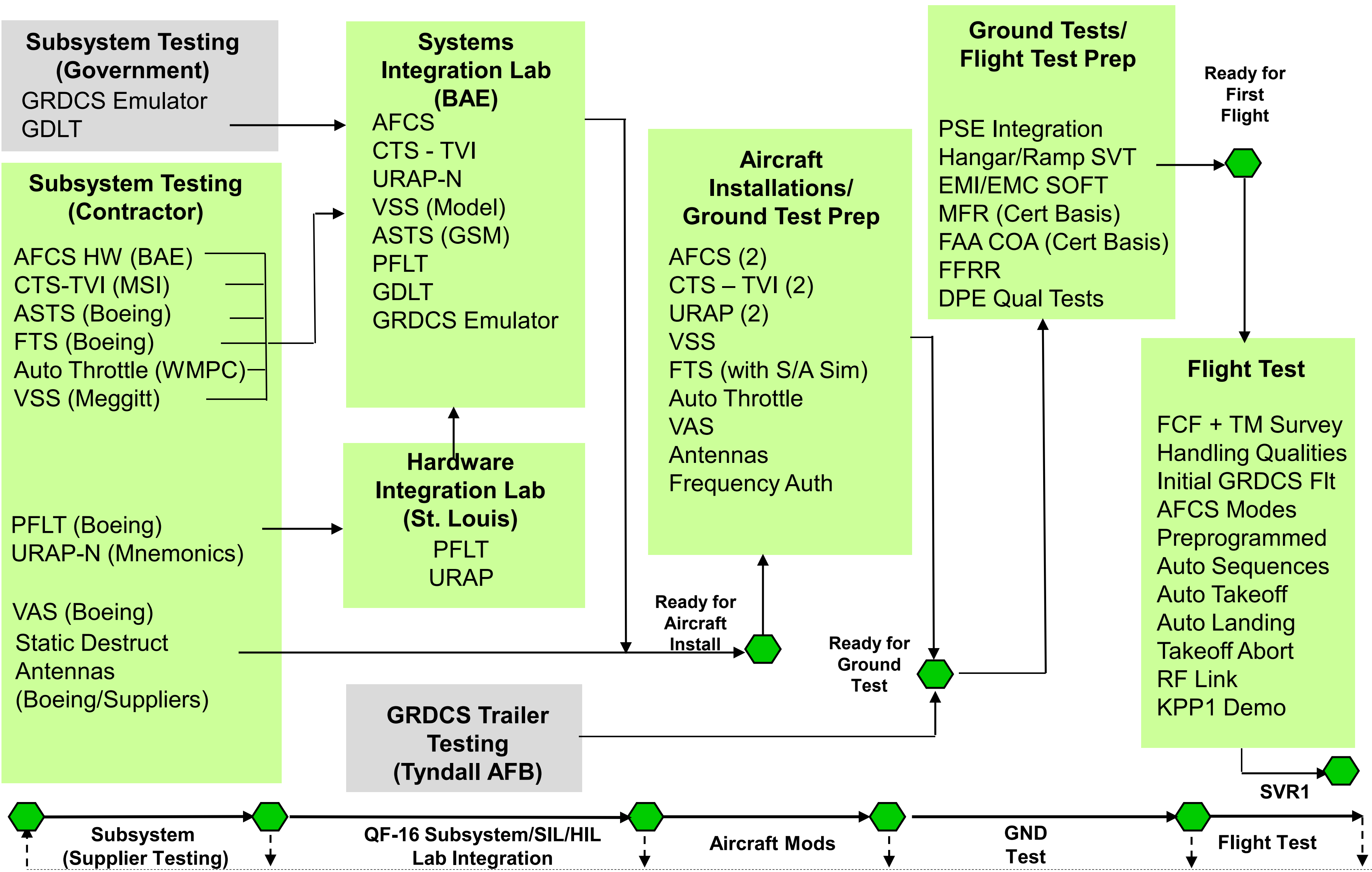

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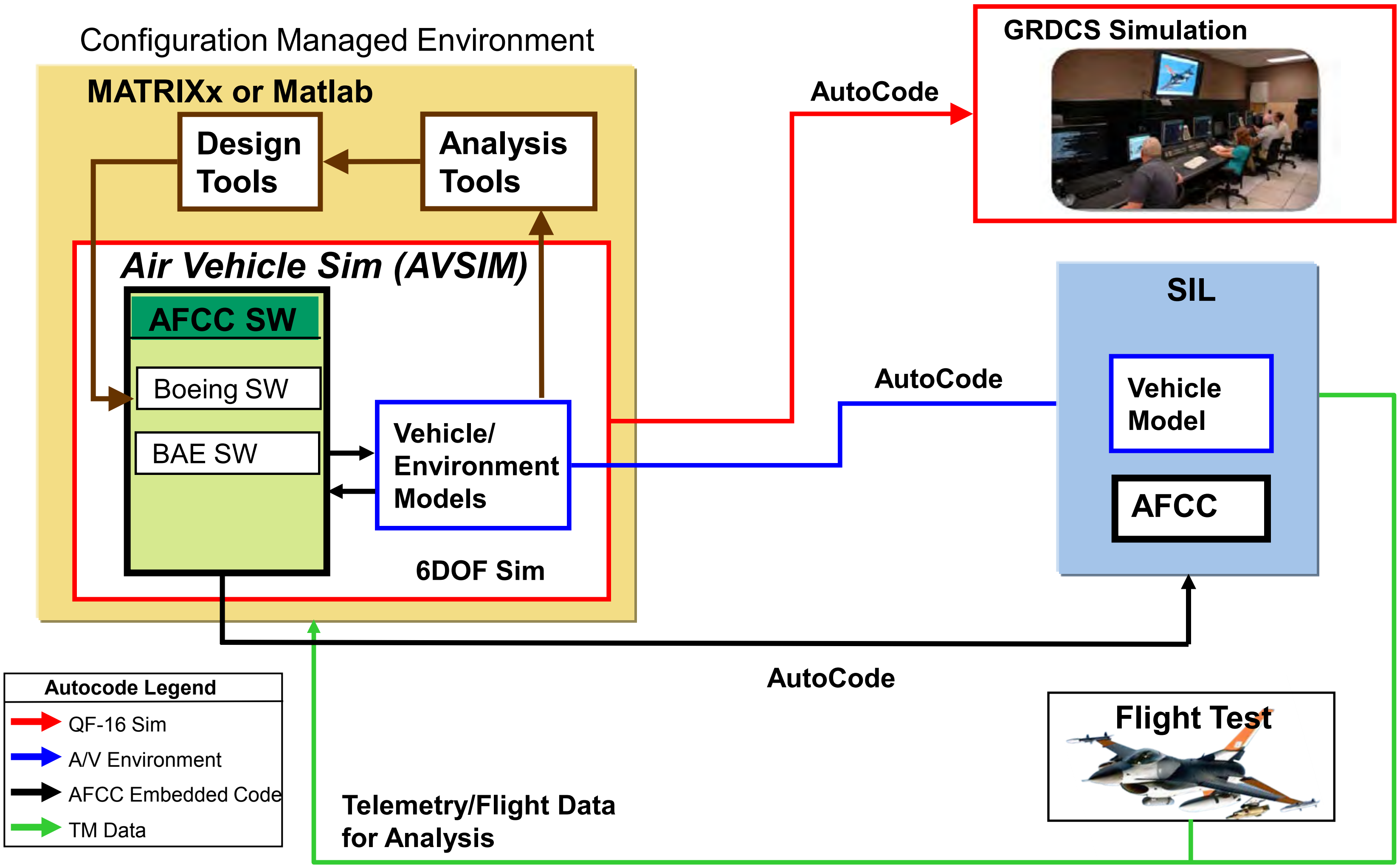
All QF-16 Sim Models and Products Autocoded From Central Simulation



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GRDCS Operations

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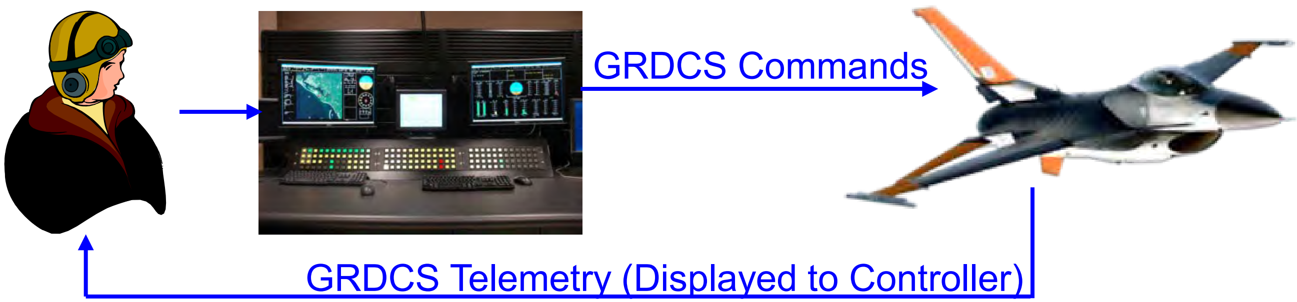
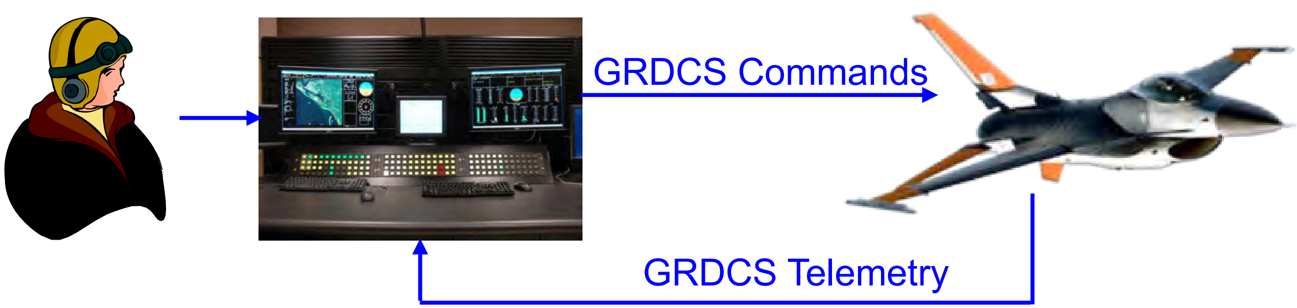
GRDCS Manual Mode



- Controller inputs manual command (e.g. stick, throttle)
- Controller flies autopilot modes (e.g. altitude hold, speed hold)
- Controller initiates maneuvering

GRDCS Auto Mode



- GRDCS computes required commands (e.g. stick, throttle)
- GRDCS is controlling aircraft flight path
- Controller still initiates maneuvering (breaks Auto mode)
- Onboard software behaves the same whether in auto or manual mode

Onboard Auto Sequences

- All Attitude Recovery (AAR)
- Automatic Takeoff (ATO)
- Takeoff Abort (TOA)
- Escapes
- Autonomous (e.g. Loss of Comm)

Verifying Integration of GRDCS and DPE Software is an Important Development & Risk Reduction Activity

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SIL Lab Layout Diagram – Pilot Station

- Cockpit View
- Observer View
- CsGTI PC
- COTS Stick
- COTS Throttle
- COTS Pedals

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QF-16 Levels of Vehicle Control and General Control Law (CLAW) Architecture

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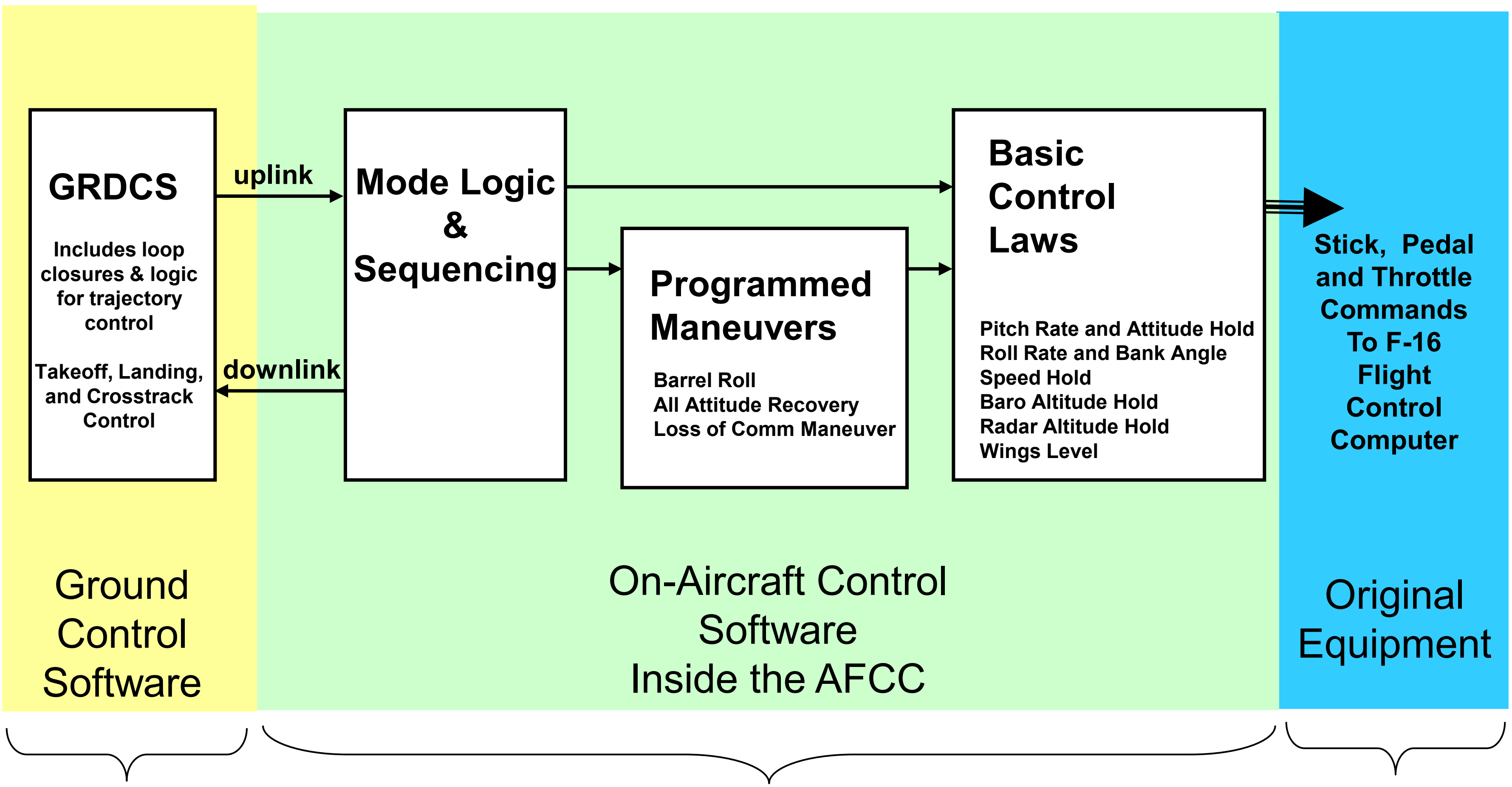

Government Furnished Equipment

Boeing Application Software

Safety Pilot (Optional)

Three Levels of Controlling the QF-16

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FQT Test Definition Process

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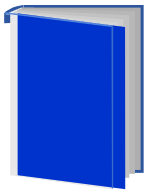
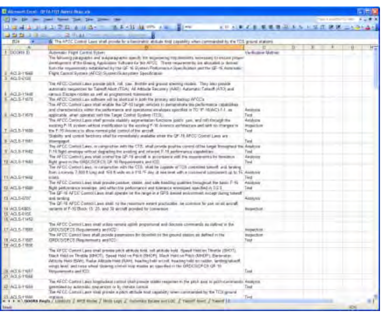
Requirements ⟵ **Traceability** ⟶ **Test**

DOORS QF-16 Software Requirements





Block Diagrams

Cmd_Mixer

Throttle

Roll/Yaw

Pitch

All Software Components

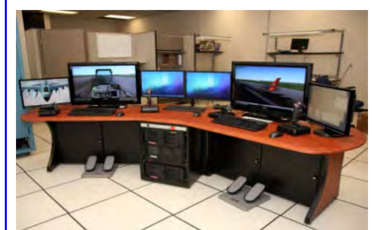
Verification Testing

Test Matrix DB

FQT Test Definitions

Test Allocation To Test Environment

AVSIM & BAE Desktop



SIL

Flt Test

Component and System Level Tests

All Aspects Are Under Configuration Controlled

Requirements Verified In:
- ***Verification Tests***
- ***System Level Tests***

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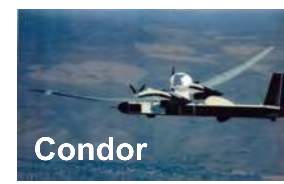
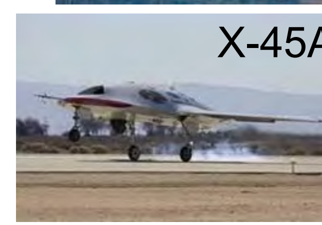
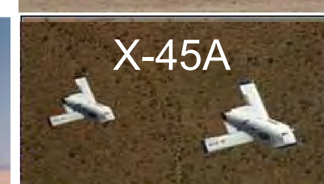
Growth Potential

- **GPS Navigation -**
  - Accurate aircraft state estimation during all flight phases
  - Accurate heading and gyro bias estimation reduces risk
  - Mature navigator used on X-45, Phantom Eye, JDAM, SDB, others
- **Leverages Boeing's experience and proven autonomous system software**
  - Guidance, Navigation, and Control Software
    - Autocode development process improves quality, reduces costs and schedule
  - Autonomous System Operation
    - Reduced manpower costs in support of QF-16 FSAT CONOPS
    - Improved mission assurance and first time quality
    - Improved safety, accuracy, and repeatability
    - GRDCS controlled autonomous system operation
- **QF-16 Operation at Alternate Test Ranges**







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Program Summary

- The Boeing QF-16 Program leverages QF-4 supply base and maximizes the use of existing hardware and software capabilities to provide a low risk drone peculiar equipment solution.
- QF-16 Equipment in qualification testing. Software progressing towards Formal Qualification Testing. Aircraft Integration and Checkout beginning at Cecil Field. First Flight planned for Feb 2012

Non-OEM Experience

System Integration Experience

Unmanned Experience

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Electronic Combat Range

10/26/2011

Presented to:

NDIA

Targets, UAVs & Range Operations Symposium

Presented by:

Joseph R. Albert

Test Management Branch, Section Head

NAVAIR RANGES

Electronic Combat Range

Robert Jensen

Test Management Branch Head

robert.b.jensen@navy.mil

760.939.6807

Joseph R. Albert

Test Management Section Head ECR

joseph.r.albert@navy.mil

760 939-9125

History

The Electronic Combat Range (ECR) was established in 1967 and originally known as the Electronic Warfare Threat Environment Simulation (EWTES). It was established in a response to an urgent Vietnam wartime need for realistic pilot training.

Electronic Combat Range

ECR is the Navy's principle open-air range for the test and evaluation of airborne electronic combat systems. ECR supports a combination of land and naval systems (littoral threat). The ECR provides engineering support, developmental and operational testing, analysis and training resources for users of systems that counter or penetrate air defenses.

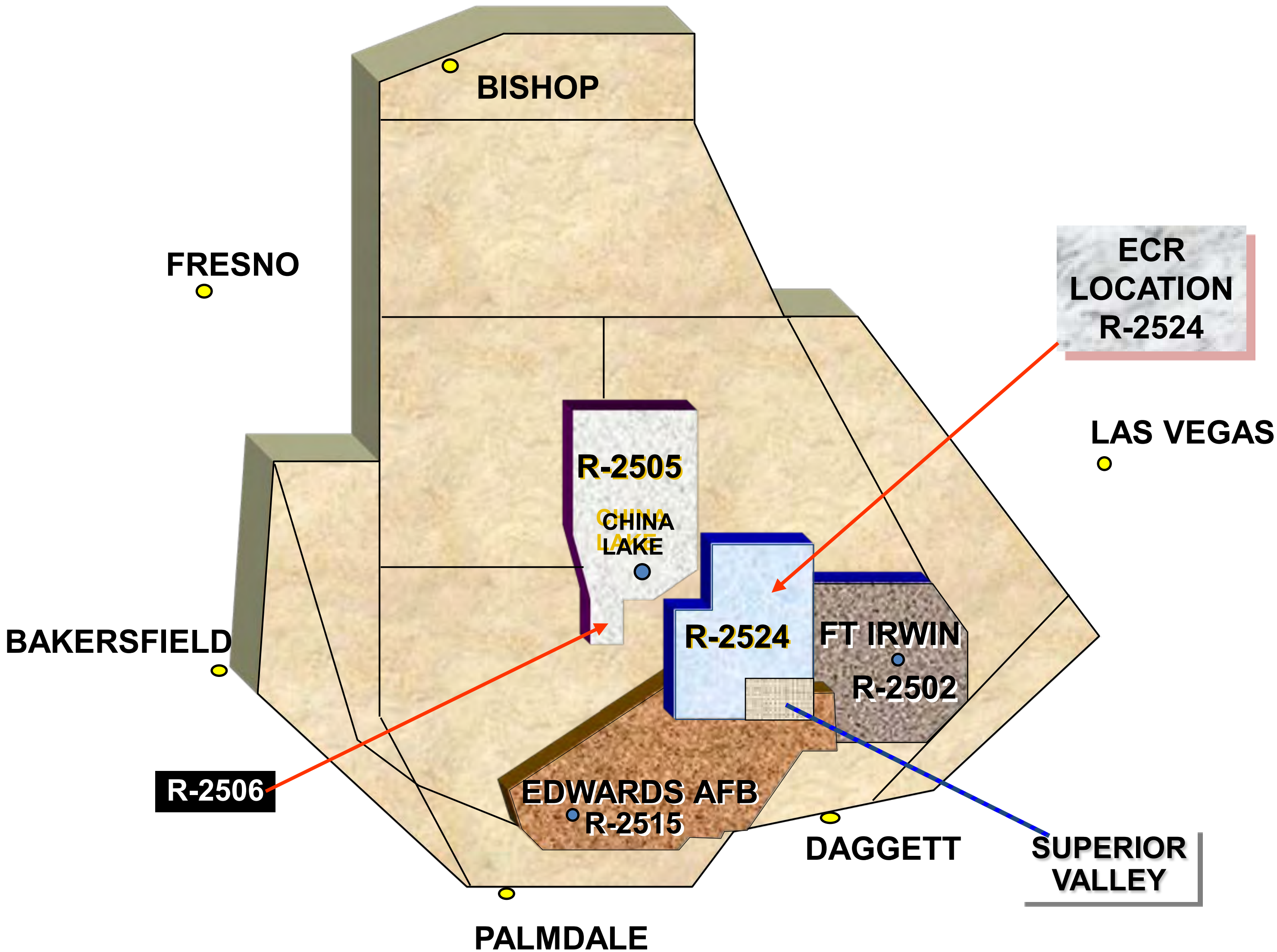
ECR has the capability to support Top secret and special-access level security missions with minimum electromagnetic interference.

Location

ECR is part of the NAVAIR Land Ranges and is physically located in California at China Lake's South Range.

It is comprised of 1,200 square miles of restricted airspace overlying 900 square miles of Navy land which offers ample room for either single or multiplatform events.

R-2508 Airspace



Mission

Provide a realistic electronic combat environment including threat systems; operations and range control; instrumentation; Time, Space, Position Information (TSPI), telemetry, optical and communications; data processing and display systems; signal monitoring, calibration of systems and threat assessment.

Developmental Test & Evaluation

ECR offers a wide variety of threats, to include simulators, surrogates and actual systems all providing a threat-rich environment. Open-air hardware-in-the-loop testing at the ECR helps bridge the gap between laboratory and open-air testing.

A broad range of EW technologies are offered: pulse, continuous wave, Doppler and multispectral. Test emitter spectrums include infrared, radio frequency, electro-optical, and millimeter wave.

Types Of Testing

Electronic countermeasures (ECM) effectiveness, Radar Warning Receiver (RWR), Unmanned Aerial Systems (UAS), expendables – chaff and flare effectiveness, towed and air launch decoy testing, Anti-radiation missile (ARM) flight testing to evaluate seekers and avionics, tactics development, training.

Equipment / Instrumentation / Data

Scope video, boresight video, display video, radio recordings, crew hot mike recordings, digital data, raw unprocessed data, sorted corrected data (wild point flags and sorted by time).

Slate Range Facility (SRF)

Located on the Slate mountain range overlooking most ECR sites at 4,700 feet. The site aligns threat radars to a single point, and is an important element in the certification of ECR systems. SRF includes a static target performance exerciser (STARPEX), which provides beacon and radar calibration support for daily operational readiness exercises in test preparation. SRF also provides moving targets that simulates aircraft motion for electronic countermeasure devices.

UAS Facility

Working towards bringing more UAS work to ECR with a new facility and adding the capability of launch and recovery. Concurrent operations are possible with other Electronic Warfare (EW) missions via altitude separation.

Test Management Function

- Initial contact with the range
- Help design Test Plan if unknown
- Set up test and introduce you to the range and how it works to include data products

- Help put together runsheets
- With you until completion of your program

Planning Time Line

- -6-12 Months
  - Customer/ECR Planning
    - Radar/System Requirements, SRF (Slate Range Facility) Requirements, Data Requirements, Number of Flights and Flight hours
    - Network Connectivity Issues, IT Assets require planning
    - Ordnance: Chaff, Flares, Weapons, etc.
  - Long Range Schedule Input
- -3 Months
  - Formal Estimate
    - Current Year $$$
  - Frequency Authorization Submittal (if required)
    - New emitters
    - Telemetry Frequencies
    - Change in the EA Approval
- -3 Weeks
  - Funding on Station
  - Test Plan on Station
    - 3960.4B if Developmental Testing
    - Operational Testing does not require test plan
    - ROEs (Rules of Engagement) established for radars

Time Line (continued)

- -2 Weeks or more
  - Test Plan Approval
- -1 Week
  - Firm Schedule
- -2 Days
  - Run Sheets / Scripts
- 0 Day
  - Test Conduct
  - DVD Videos available 15 minutes after completion of test
- +1 Working Days (Dependent on Amount of Data)
  - Quick Look Data (Non QA'd) may help make decisions for customers flying more then once a week
- +5 Working Days (As Negotiated)
  - QA'd Data Products Delivery

Questions?

INTRODUCING OUTLAW ER

OUTLAW

- Affordable
- Easily Deployable
- Manual Or Auto Piloted
- Numerous Payload Options
- Expandable Capabilities

49th TARGETS, UAVS & RANGE OPS

Fort Walton Beach, FL, February 2011

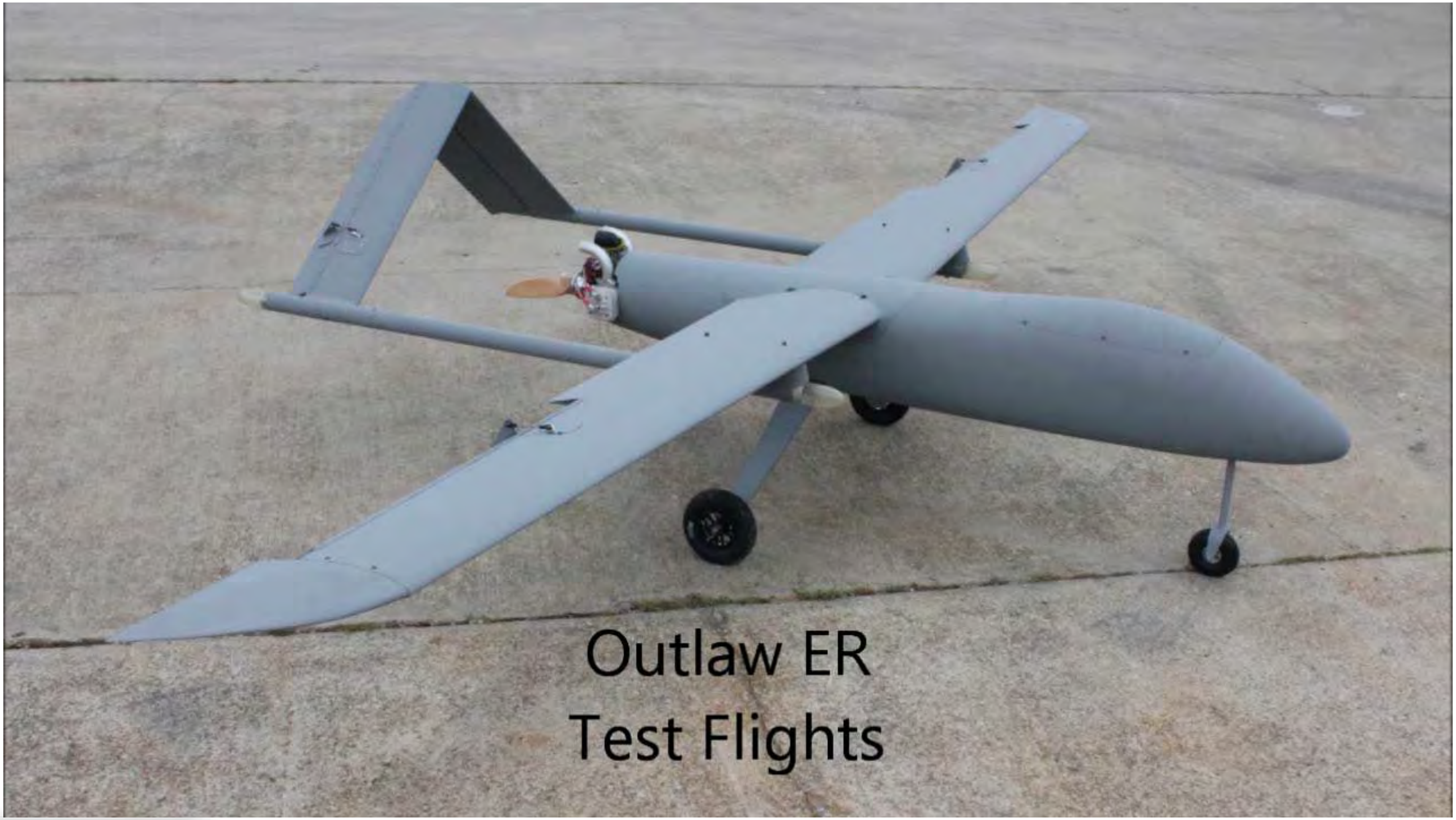
Presented By: Greg Chando

Systems Engineer

GRIFFON AEROSPACE

Outlaw ER First Flight

September 27, 2011



Why Outlaw ER?

OUTLAW

- Griffon's customers need:
  - Much longer endurance…..
    (Extended Range – "ER")
  - More payload weight/volume
  - Easier payload access/integration
  - Power generation
  - Expand the proven and qualified MQM-170A Outlaw systems and certifications
- Offer range and endurance to fully utilize the Outlaw's satellite Command and Control (C2) link
- Offer more capability without disrupting Environmental, Safety, Frequency, and Reliability documentation in place at test and training ranges.
- Continue to offer the industry's most cost effective unmanned aircraft systems and Flight Services.

Boomer… Step to ER

OUTLAW

Outlaw Boomer

Outlaw ER

What is Outlaw ER?

OUTLAW

- ✓ A flight-proven unmanned aircraft / surrogate UAV target based on proven systems that have flown thousands of air defense training and payload test missions.
- ✓ Low-cost, tactical size, payload flexibility, 6-9 hour endurance, and multi-mission flexibility make it an extremely versatile tool for Test and Evaluation.
- ✓ Multi-mission solution for gun/missile tracking and live fire, payload test /development, ISR training, sensor and weapon development, and UAV system research and development.
- ✓ Griffon Aerospace is the U.S. Army's Target Management Office and the U.S. Navy's Prime Contractor for Outlaw design, production, and flight operations.

Missions Commonly Supported

OUTLAW

- ✓ Systems/Subsystem Research and Development
- ✓ Systems Test and Evaluation
- ✓ Surrogate UAS Training
- ✓ Tracking and Engagement
- ✓ Range Surveillance / Debris Observation
- ✓ UAV Payload Development Flight Ops
- ✓ Long Endurance Shipboard Defense Engagements

Design

OUTLAW

AIRCRAFT CONFIGURATION: High wing, boomed V-tail monoplane, pusher engine configuration

FUSELAGE LENGTH: 9.18 ft / 2.8 m

WING SPAN: 15.1 ft / 4.84 m

PAYLOAD BAY VOLUME: 1.9 ft^3 / .054 m^3

MAX HEIGHT IN PAYLOAD BAY: 1 ft / .3 m

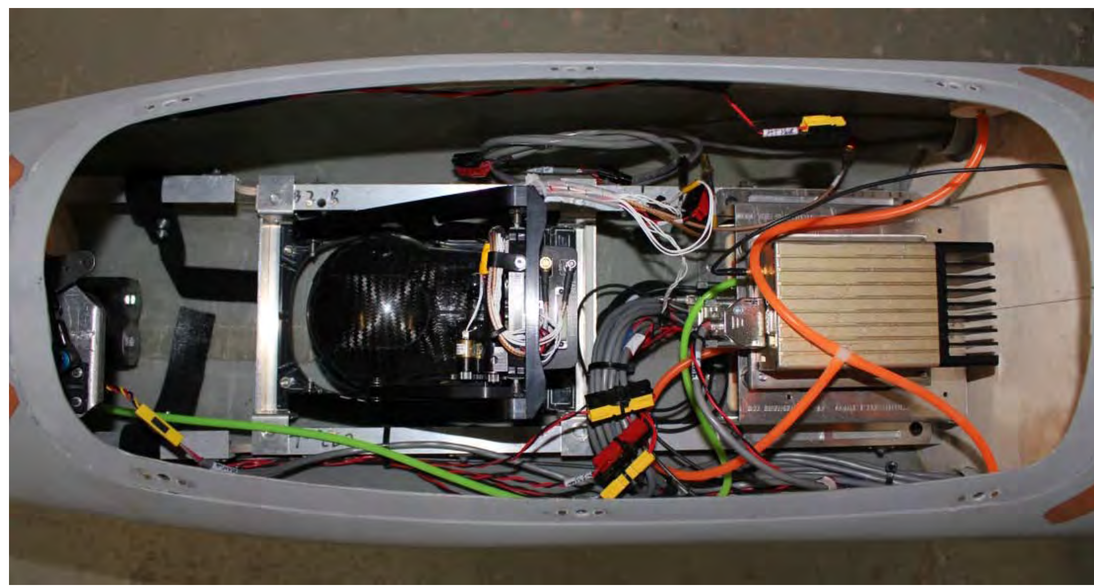
GROSS WEIGHT: 175 lbs / 79 kg

EMPTY WEIGHT: 98 lbs / 34.5 kg

STRUCTURAL LIMIT LOADS: +/- 8 g's

STRUCTURAL LIMIT VELOCITY: 150 mph

POWERPLANT: 16 HP, 2 cylinder 2-stroke, air-cooled engine



Performance

OUTLAW

Parameter	Standard Outlaw	ER
Gross T.O. Weight (lb/kg)…………………………………	120/54.4	175/79
Empty Weight (lb/kg)………………………………………	76/34.5	98/34.5
Max Fuel Weight (lb/kg)……..…………………………….	19/8.6 (3 gal)	56/25.4 (9 gal)
Payload at Max Fuel (lb/kg………………………………...	25/11.3	21/9.5
Cruise Speed 75% power (knts)……………………...........	80	75
Max Speed 100% power (knts)…………………………...	108	98
Controllable Slow Flight (1.15 Stall) (knts)…………………	52	60
Stall Speed (knts)………………………………………..	45	48
Speed for Max Endurance (knts)……………………….....	64	68
Maximum Endurance (hrs)…………………………………...	2.5	6-9
Maximum Range (nautical miles)……………………………	160	594

Control System

OUTLAW

BEYOND VISUAL RANGE (BVR) AUTOPILOT SYSTEM

- Autonomous execution of pre-planned missions through waypoints and altitudes.
- State-of-the-art solid state acceleration and GPS position sensors and works with a laptop based ground station to provide mission execution and aircraft health and status data.
- Real-time waypoint and mission redirects are performed via the RF data link
- A 225 to 400 Mhz UHF transceiver C2 link with a transmit power adequate for 25-30 kilometer missions.
- Low cost satellite C2 link for very long range missions.

Mechanical Data

Dimensions: 4.8 inches (“) x 2.4” x 1.5”
Weight: 7.5 ounces
Power: 8 to 20 VDC; 3.6 watts at 12 VDC nominal

Capabilities

- Multiple Waypoints (100) Capable
- Integrated 6-axis IMU
- 6DOF Simulation Support
- Integrated GPS Receiver
- PWM-Based Servo Command Outputs
- Real-Time Waypoint Route Editing

BVR Ground Station

OUTLAW

BVR GCS

- BVR ground control station consists of a laptop, a communications control module, and a UHF transceiver.
- Provides pre-mission planning, mission monitoring, and real-time mission redirects.
- Mission waypoints are displayed and edited. The real-time mission data is stored and available for post-mission display and processing.
- BVR flights out to a range of 25 KM assuming minimal ground obstructions.
- Outlaw ground station is easy to use, compact, and extensively used by other UAVs.

Standard ISR Payloads

EO/IR GIMBALED SENSORS

- Piccolo autopilots offer standard interfaces to a variety of gimbaled camera systems.
- Griffon owns and operates TASE retract gimbals.
- Outlaw supported Marine VideoScout training by serving as a surrogate Shadow UAV.
- Stabilized and target tracking.
- JF-12 video downlinks available.

Standard ISR Payloads

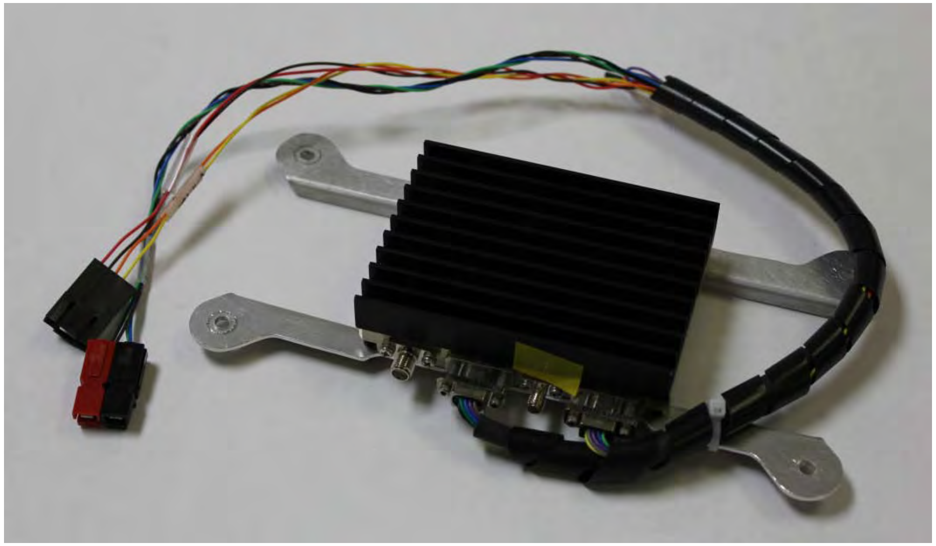
OUTLAW

Onboard Video Processing

- Provides onboard gimbal processing and pointing.
- Superimposes metadata on video feed.
- Image stabilization.
- Provides feed to video downlink transmitter.

Video Downlink

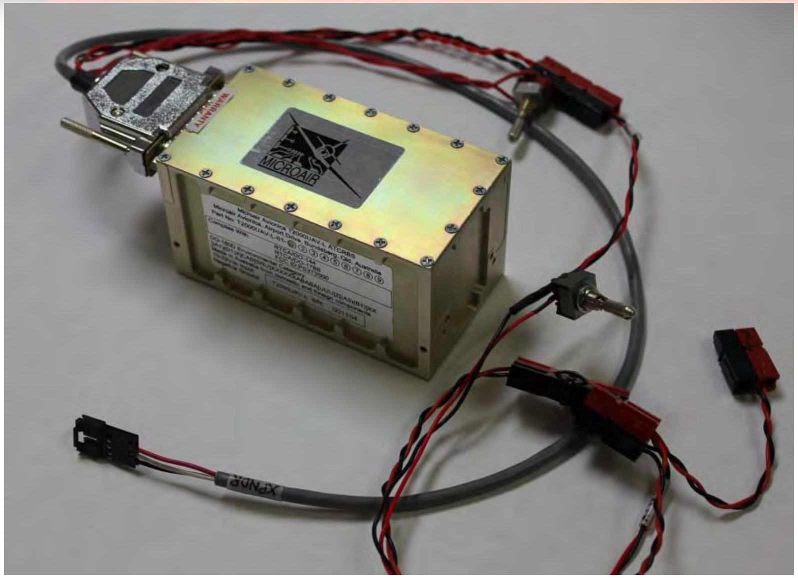
- Analog video transmitters (L, S, and C).
- Different transmit power levels.
- Digital video downlinks available.



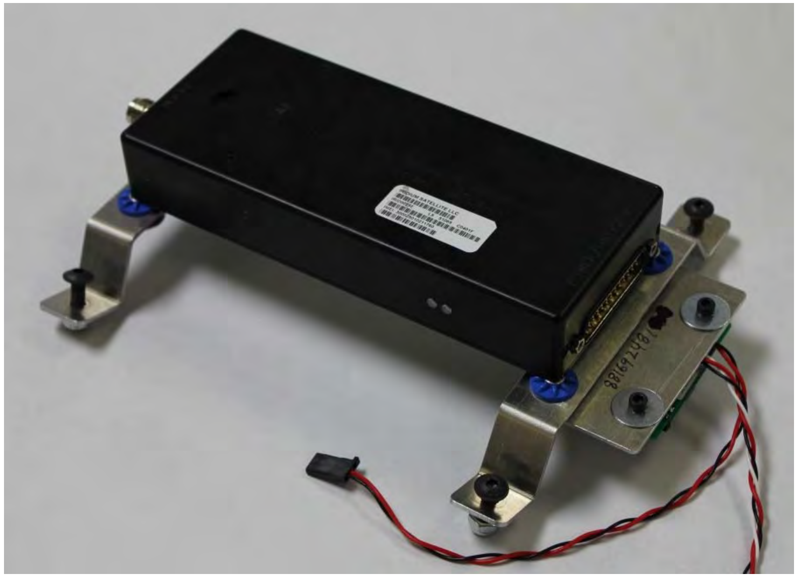
Standard Payloads

OUTLAW

Transponders
- Standard Mode C IFF.
- 150 Watt pulse.
- Squawk code changeable in flight.



Satellite C2 Datalink Modem
- Offers unlimited range for control link.
- Low speed command link.



Standard RPVT Payloads

OUTLAW

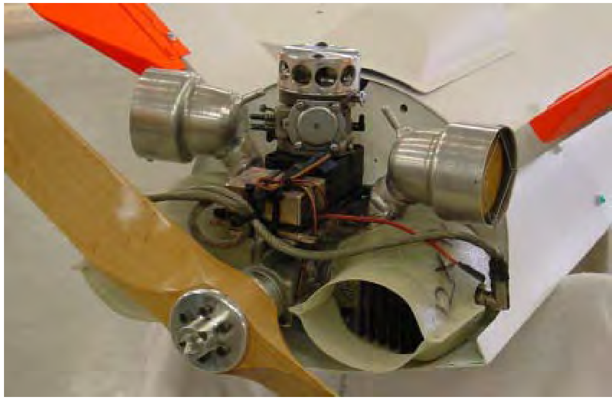
INFRARED (IR) ENHANCER
- Generates IR signature per STINGER/U.S. Army requirements.
- Engagements from directly aft to nearly nose on (~300 degree).

RADAR AND ACCOUSTIC SCORING
- Realtime round or missile scoring. Radar Scalar or Acoustic Vector

MULTIPLE INTEGRATED LASER ENGAGEMENT SYSTEM (MILES)
- Eight (8) state of the art laser sensors
- Optimally located for reliable detection from laser training weapons.
- Functions with on-board smoke system to provide visual hit or miss.

SMOKE GENERATOR
- Interfaces with the transmitter to provide smoke when commanded.
- Interfaces with the MILES laser training system.
- Provides a minimum of 10 minutes of smoke visible to 3000 meters.

RADAR REFLECTOR CORNER CUBES
- Metal corner cubes added to enhance RF signature.
- Cubes of different sizes to provide desired radar signature.



Ground Support Equipment

OUTLAW

PNEUMATIC LAUNCHER

- Zero Length Pneumatic Launcher
- High pressure air storage bottles provide launch energy
- Reliably supports high density altitude operations
- Can be towed behind commercial or military vehicles
- Designed to provide easy access to the engine and vital aircraft system
- Designed to accommodate optional landing gear equipped RPVTs

SHIPBOARD LAUNCH AND RECOVERY IN DEVELOPMENT

Flight Operations

OUTLAW

MISSION OPS TEAMS

- Mission Lead works directly with the field commander to achieve training objectives.
- Pilots present the aircraft to assure maximum probability of engagement success.
- 3 people – for 1 target in the air at a time.
- 4 people – for 2 targets flying simultaneously.
- 5-6 people – for 24 hour operations.
- All pilots experienced flying RPVTs, UAVs, and RC aircraft with a minimum of 2-5 years experience.

Ready to Serve

OUTLAW

Serving You… Anywhere, Anytime

- The equipment and pilots are prepared for the conditions.
- Outlaw pilots are certified in night flight and high altitude operations to offer realistic threat engagements - anywhere, anytime.

Surrogate UAV Services Now….

OUTLAW

- **UAV Threat Simulation**
- **Low Cost Sensor Development**
- **ISR Training Surrogate**
- **Range Debris Inspection**
- **UAV Fire Support Training**
- **What's your problem?**

Closing Video

GRIFFON AEROSPACE

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AF OPERATIONAL TEST & EVALUATION CENTER
AFOTEC
AIR FORCE OPERATIONAL TEST AND EVALUATION CENTER

Budget cuts:
Cutting test increases bleeding
-- Exponentially!

Major General David J. Eichhorn
Commander, AFOTEC

49th Annual Targets, UAVs, & Range Operations Symposium
Fort Walton Beach, FL

26 October 2011

Distribution A: Approved for public release; distribution unlimited.
(Approval given by AFOTEC Public Affairs Office)

Timeless Message

- "With regard to the cost, difficulty, and time required for tests, there is mounting evidence. . .that agencies can no longer afford ***not*** to spend the money, take the time, and go to the trouble of performing sufficient tests. Such an investment may be ***the only way*** that total cost can be kept within limits of a system's operational worth to an agency."
  – Report of the Commission on Government Procurement, *Acquisition of Major Systems*, December 1972, p. 157

Adm. Mike Mullen,
Chairman of the Joint Chiefs of Staff

"The budget has basically doubled in the last decade. And my own experience here is that in doubling, we've lost our ability to prioritize, to make hard decisions, to do tough analysis, to make trades."

Our culture needs to change back

Healthy Tension

"Testing is the conscience of acquisition"

William Perry

If two people agree on everything,
then only one of them is doing the thinking.

Phases of a Program

1. Enthusiasm
2. Panic
3. Search for the Guilty
4. Punishment of the Innocent
5. Rewards for Non-Participants

Best Practice: A More Constructive Test Approach is Key to Better Weapon Systems (GAO Report - July 2000)

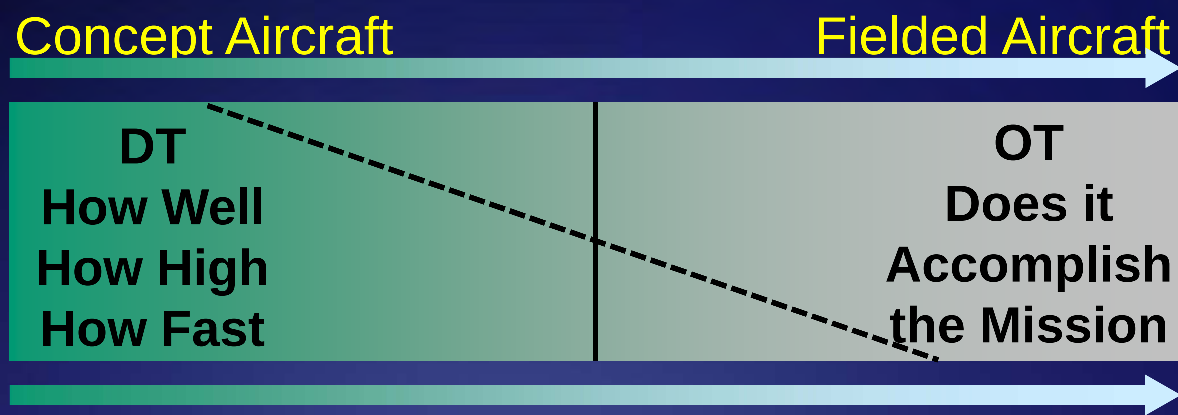
- **"The [program] also constructed its test plan using optimistic assumptions. For example, program officials assumed that no hardware or software problems would be encountered during ground or taxi tests. They also assumed that one aircraft would be available for flight testing at all times and that all flights would be productive."**
  - **Assumed software error rate of 15% despite 100% on B-2 and 60% on C-17**

"In addition, planned testing was curtailed to accommodate cost constraints on the overall program."

$ $

Development and Ops Test

An Opportunity to Save Time & Money



Increasing cost to fix problems

The faded line--less differences today…

- Use of Simulation for Ops Test
- Involvement of contractors in Ops Test
- More systems testing
  - Automatic systems
  - Effects analysis
- Decision systems--requirements matter far more than the operator

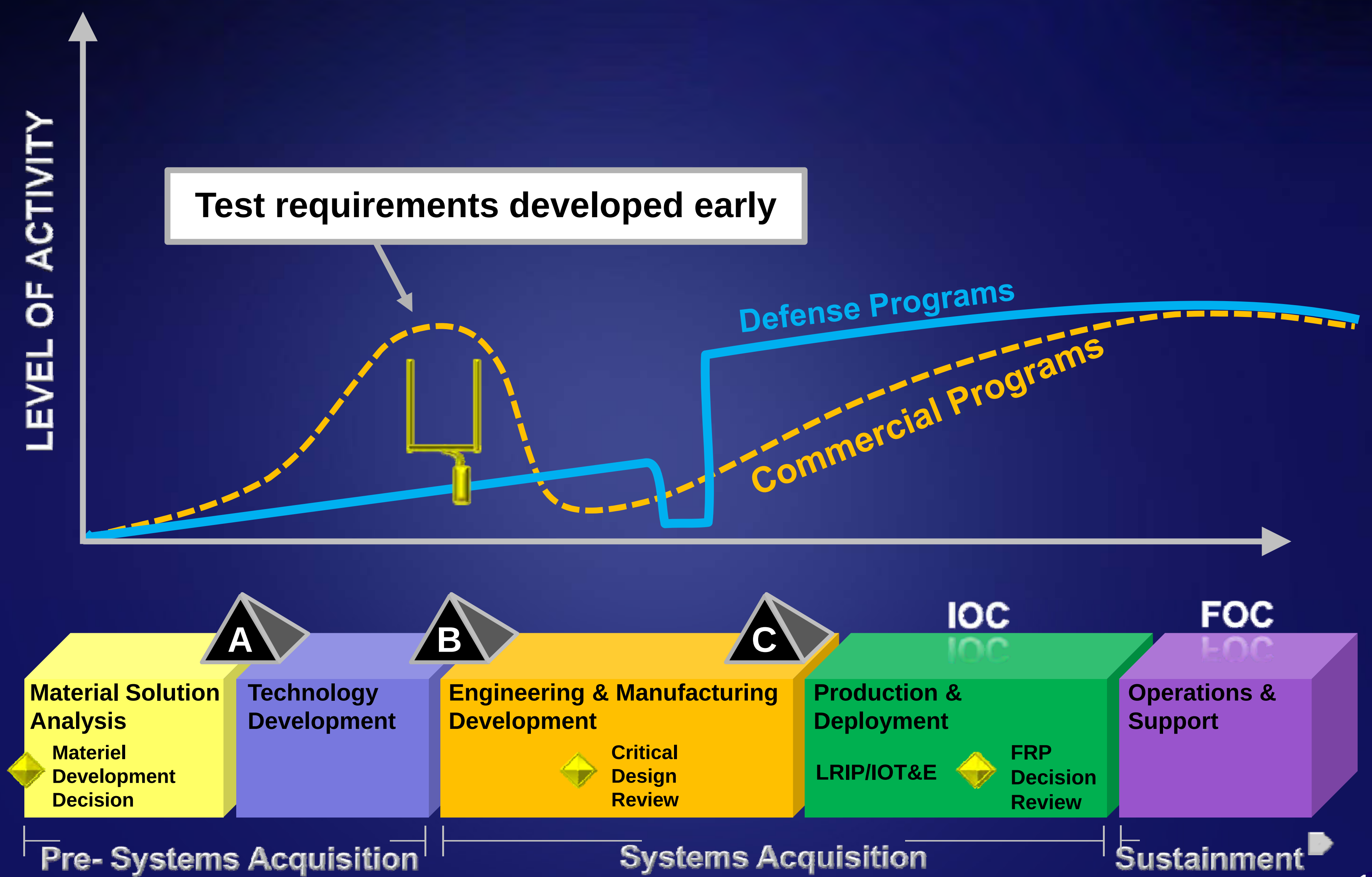
Integrated Test, that melds all requirements, will save

Launching a New Program

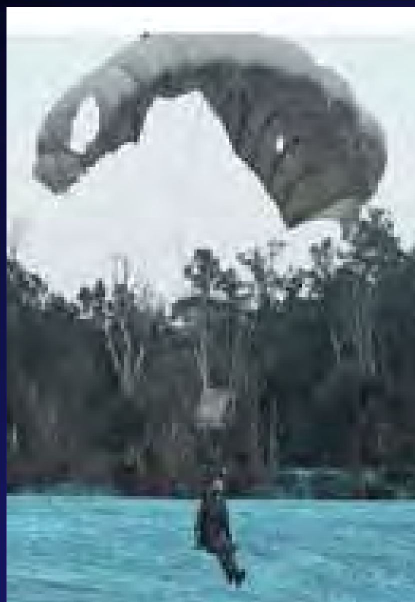
Set Goal Posts Early

- **Contract Specifications**
  - **Ensure accountability**
  - **Encourage true partnering with government as lead**
  - **Ensures Open Book test**

Setting the Right Goals



Early Defect Discovery is Key



- **Sooner a problem is discovered, the less it costs to**
  - **Fix**
  - **Develop work arounds**
  - **Cancel program**

Speaking Truth to Power

We test to find / solve problems!

Early Program Optimism Is Natural

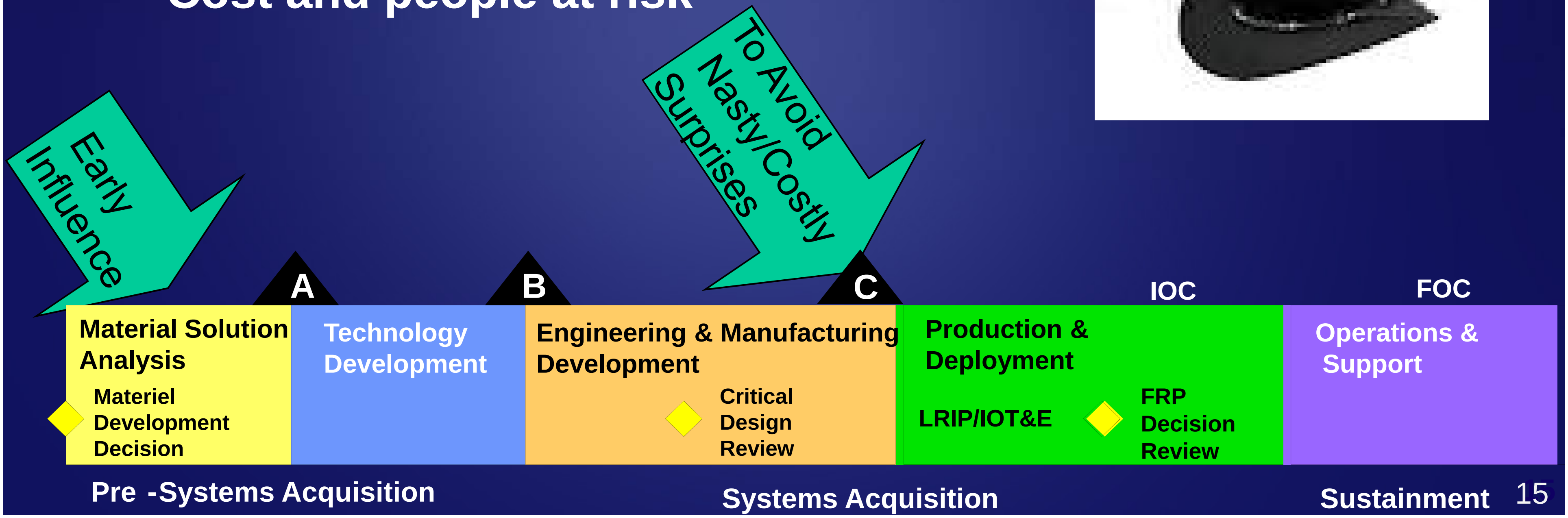
- Marketing
- “Operationally Acceptable”
- Little bit pregnant
- No deferred requirements
- “Solution Shops”

Realism has to set in…sooner or later

Schedule behind you is like runway behind you…
Test Early and Often to minimize risk

Test Early…Test Often

- Concurrency is more curse than blessing
  - Stems from Rosy assumptions to save $
  - Denial of problems
  - Over reliance on Modeling & Simulation / design tools
- Risk Management
  - Software vs hardware
  - Cost and people at risk



Test: Your Partner in Successful System Development

- Over-reliance on Modeling & Simulation
  - Garbage in – garbage out
  - Models only as good as ***known*** information
  - Circular logic when model is used to design the product and then used to test the product w/o actual test results
  - Won't find problems early – i.e. no big savings

- Test and evaluation: integral to the development process
  - Verifies and validates models
  - Measures actual system performance during development
  - Analytic (e.g. 5 test configurations versus 720)
  - Builds a robust, exploitable model

Requirements vs Reality

Test as Part of Development

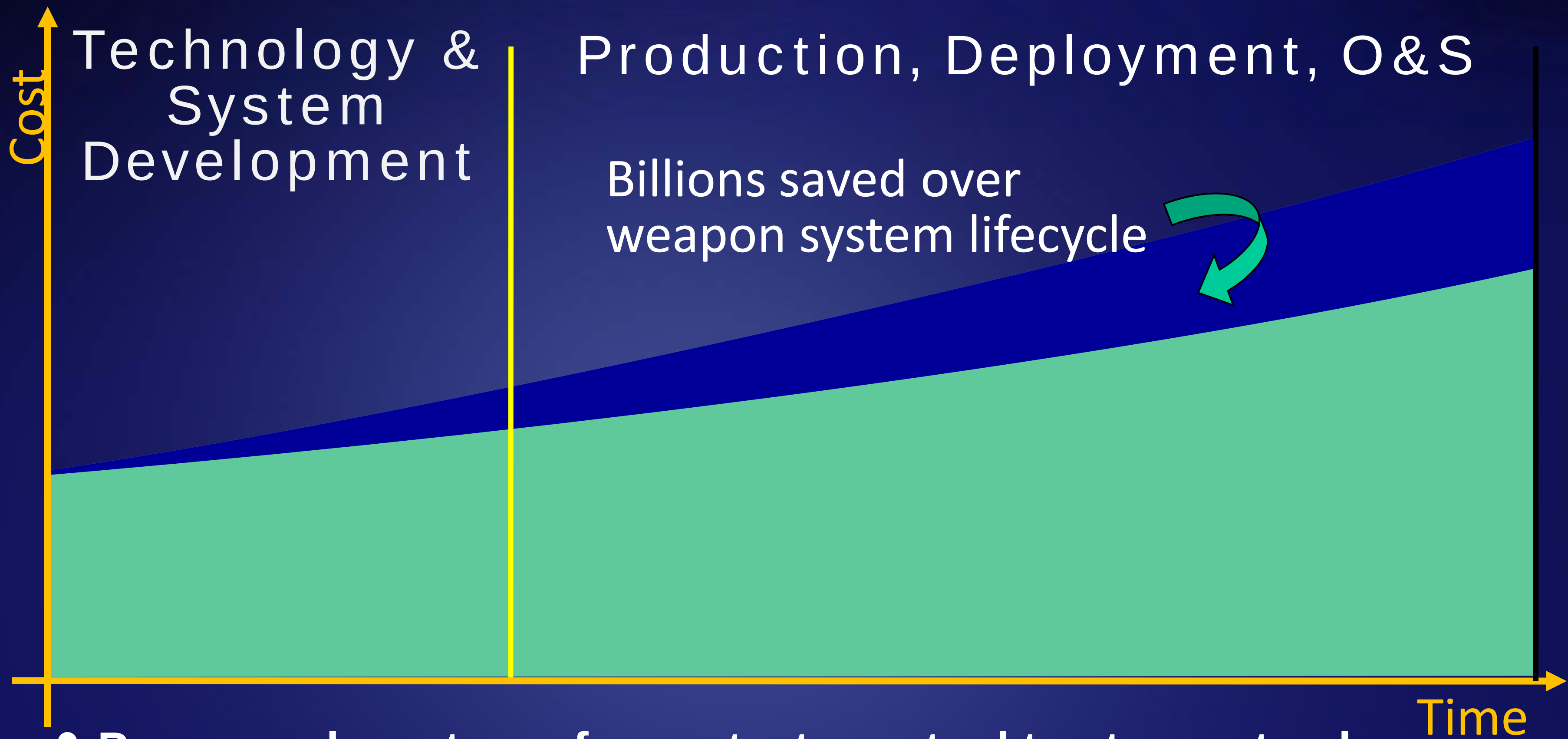
- **The target / weapon combination is dominant**
- **Weapons / systems have incredible autonomy**

- ***Test to Integrate***
- ***Test to Develop***

Typical Program Cost Pie

- **Decision Systems/Displays must be deemed user friendly or *hostile* – *Task Friendly <u>Not</u> Just Adequate***
  - ***Defined task and Actionable Displays***
  - ***"Unique training" closely scrutinized***
- **The need for Truth – *<u>Fair and Balanced</u>***
  - ***Tedious is tedious while agile is agile (esp. with s/w)***
  - ***Easy, precise and timely is the minimum today***

Early Test >>> Later Test Return on Investment



- **Programs have to perform – test as a tool to stay on track**
  - **Either cost avoidance (prevent the overrun) or pure cost savings**

Perspective:

Evils (Costs) of Concurrency
(i.e. Rushing It to the Field)

- 64 aircraft built early in the aircraft's production run will require modification to achieve their full flight-hour design lives
  - Engineers identified a shortfall with a structural component in their wings
  - During recent full-scale durability testing, a crack emerged that was consistent with the analytical predictions
  - Must retrofit plans 64 early aircraft
  - Durability testing helps identify structural issues early on "to avoid costly sustainment issues later in the life of the aircraft."

“It was fine…until we got into test.”

Cost of OT is a relatively small portion (~1%) of the overall program budget, it is a large portion of the budget in the year it occurs. By virtue of being at the end of the development process, testing occurs when the program has few degrees of freedom left to work issues, including a checkbook with little reserve

Design (test)…Build(test)

Versus

Buy…Fly…Fix

Development / Fielding Problems

- Unless your "child" is fully grown, he/she has a lot to learn
- As members of the system acquisition team, problems are expected – nothing is perfect
  - Hardware will fall short
  - Software will glitch

"Why man, I have gotten a lot of results. I know several thousand things that won't work." Thomas Edison

j3

Testing Concerns

- **Independent team assessed concern:**
  testing drives undue requirements, excessive cost and added schedule
  - **Examined 40 programs with significant delays**

    - **7 experienced some delay (not primary) due to testing**
    - **37 programs: problems discovered during test caused much longer program delays than test itself**
- **DOT&E review of 76 programs**
  - **cost of OT&E ~1% of total acquisition cost**

Result: Testing alone does not cause major program delays or cost increases

j3 Another idea for "37" bullet:

-37 progams: problems discovered during test caused much longer program delays than testing itself
jeffrey.olinger, 6/8/2011

Paradigm:
Quickly to the Warfighter!

- Just get it to the user (*sometimes* absolutely necessary)
- Regardless of specification shortfalls – “the contractor did their best”
- The User will determine what system can be used for
  - creating the need for user testers
- Late identification of deficiencies
  - Difficult holding the contractor accountable
- Generates new requirements
  - Fix this and that
- Increases program life cycle cost

“Just because a thing doesn’t do what you expected, it doesn’t mean it’s worthless.” Thomas Edison

But can we afford it?

Hmmmmm

- Program is declared "ready for OT"
  - Contractor test data insufficient to determine spec compliance
  - Developmental testing was incomplete <u>and resource limited</u>
    - Insufficient time to complete data analysis
    - Limited database lowered RM&A prediction confidence
  - Open Cat 1 DRs
- OT performance concludes <u>*Not Effective / Not Suitable*</u>

Is DoD asking for what it really needs?

Relevancy with Politics
(Fixes Come Late, thus Cost More)

Global Hawk Block 20/30 Initial Operational Test and Evaluation (IOT&E)

- IOT&E Findings are Generating Multiple Program Improvements
  - NGC is working with USAF to ***proactively address*** findings
  - ASIP and Reliability & Maintainability key areas of focus...Planning USAF/NGC ASIP Technical Meetings
  - Generator solution indicative of positive teamwork

- Improvements Already Evident
  - Deployed Block 20/30s are performing quite well ahead of IOC declaration...90% Mission Effectiveness 225 Missions with over 4,300 hours
  - Expect DoD Full Rate Production and IOC in Sept 2011

Deficiency	Corrective Action Initiated
Clickbond Nutplates	√
25 kVA Generator Failures	√
Kearfott Navigator Issues	√
Sensor Management Unit (SMU)	√
Integrated Sensor Processor (ISP)	√
Common Airborne Modem Assembly	√
GMS Control Panel (GCP)	√
Main Landing Gear (MLG) Wheels/brakes/tires	√
Engine Fuel Nozzles	√

- These nine deficiencies comprise 81% of all failures during IOT&E
- Several of deficiencies have been completed

Team Proactively Addressing IOT&E Findings with USAF
Results evident in Real World Operations

Objectivity and Accountability

- Objectivity is #1 goal
  - Credibility comes from Objectivity
  - Objectivity (generally) comes from Independence
  - Developing / fielding capability is the priority
  - Technological success is a precursor
- Accountability is critical
  - Government sets expectations
  - Contractor needs clear direction
  - Nothing is perfect and what gets fixed versus what gets lived with is a government decision
- <u>Resolution is a total team effort</u>

Best Practice: A More Constructive Test Approach is Key to Better Weapon Systems (GAO Report - July 2000)

– "Commercial firms have found constructive ways of conducting testing and evaluation to help them avoid being surprised by problems late in a product's development."

– "However, the pressures of successfully competing for [government] funds to start and sustain a weapon system program create incentives for launching programs that <u>embody more technical unknowns and less knowledge about the performance and production risks they entail</u>…**a new program will not be approved unless its costs fall within forecasts of available funds.**"

$ $

Best Practice: A More Constructive Test Approach is Key to Better Weapon Systems (GAO Report - July 2000)

– "These Pressures and incentives explain why the behavior of [government] weapon system managers differs from commercial managers. Rewards for discovering and recognizing potential problems early in a DoD program are few. In contrast with leading commercial firms, <u>not having attained knowledge</u> – such as on the performance of a key technology – can be perceived as better than knowing the problems exist. When valid test results are not available, program sponsors can assert projected performance."

"Accordingly, DoD testers are often seen as *<u>adversaries</u>* to the program."

$ $

DoD's High Risk Areas

GAO Report, 12 Mar 09

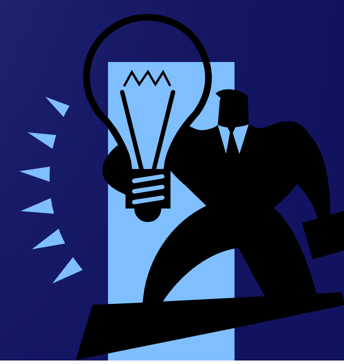
"Ultimately, the process produces more demand for new programs than available resources can support, promoting an unhealthy competition for funds that encourages programs to pursue overly ambitious capabilities, develop unrealistically low cost estimates and optimistic schedules, and suppress bad news."

Proper DoD leadership to offset this pressure is essential

Testing doesn't cost, it pays!

Mission, Business, Politics

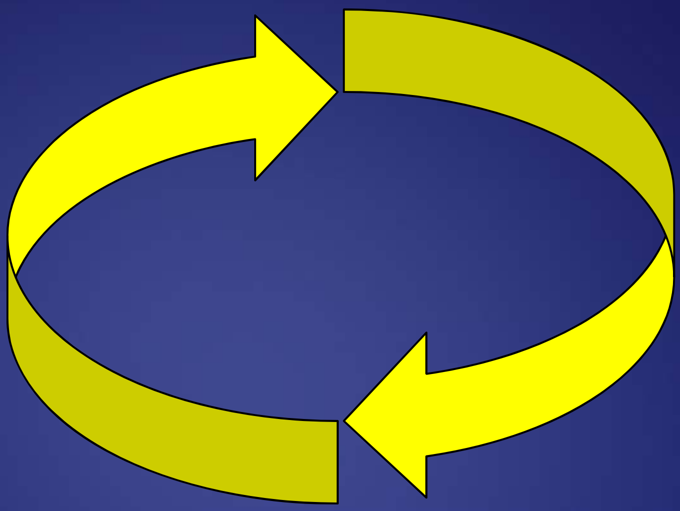
- **Government must integrate**
- **We need capabilities to execute our mission**
- **Getting those capabilities to execute our mission is business; industry has to make a profit**
- **Politics trumps mission <u>and</u> business**
  - **every dime comes from Congress**
- **As budgets shrink drastically, we need to shift the paradigm to better "inside the box" thinking**



Summary

- The value in test is its potential to reduce bad decisions
- If bad news is avoided – bad decisions will follow
- Relationships are key to savings and success
- Government & Industry both need to insist on clear executable specs/standards
- The government has to lead/direct as the buyer / user
- Need to get Back to Basics
  - Write contracts with enforceable specs (not a bad thing)
  - Stop systems going to the field before they are ready
- Don't marginalize the Acquisition and Test Community –Critical role and mission to perform ($ to be saved)

Testing doesn't cost, it pays!



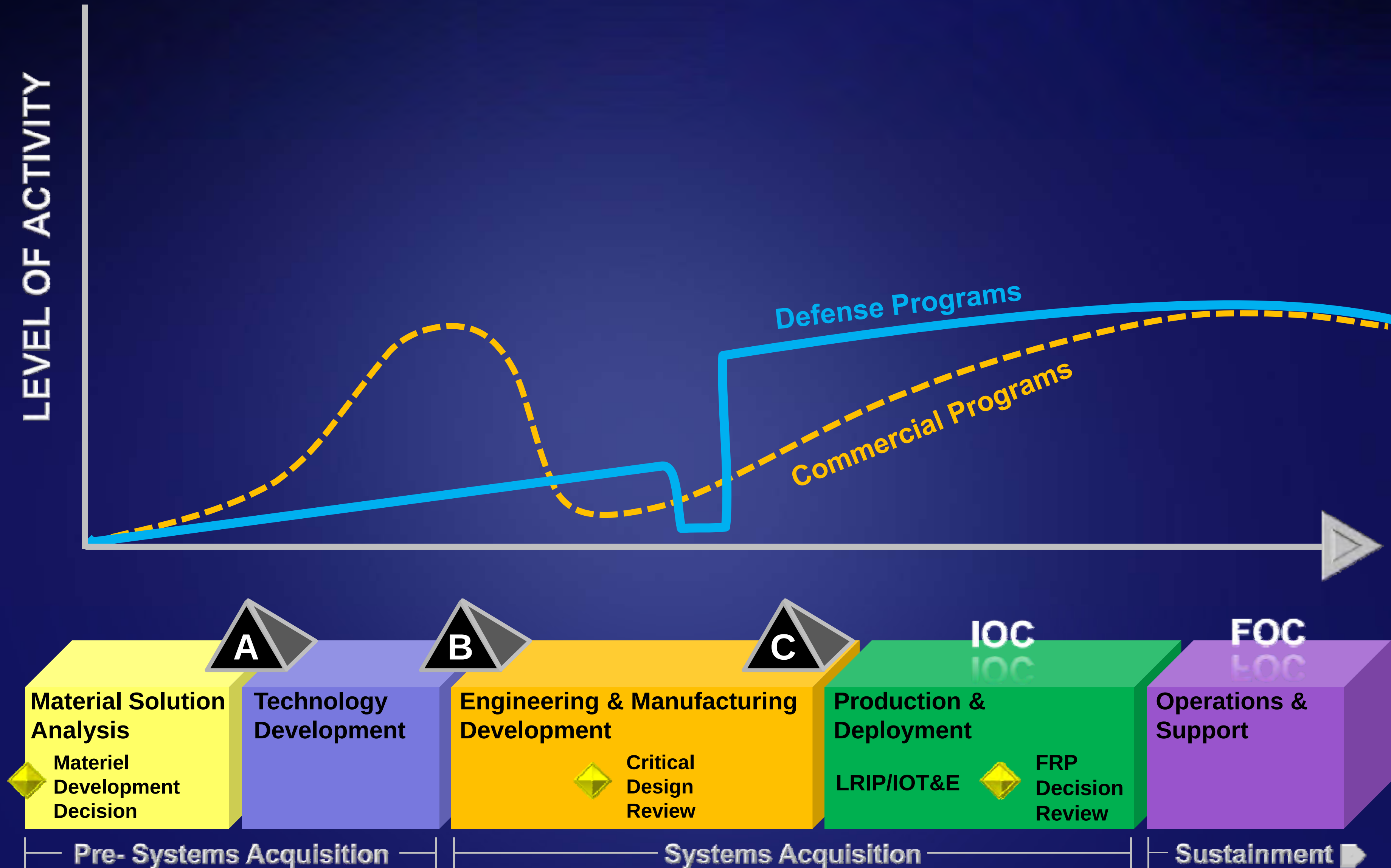
Testing doesn’t cost, it pays!

Punish the Innocent

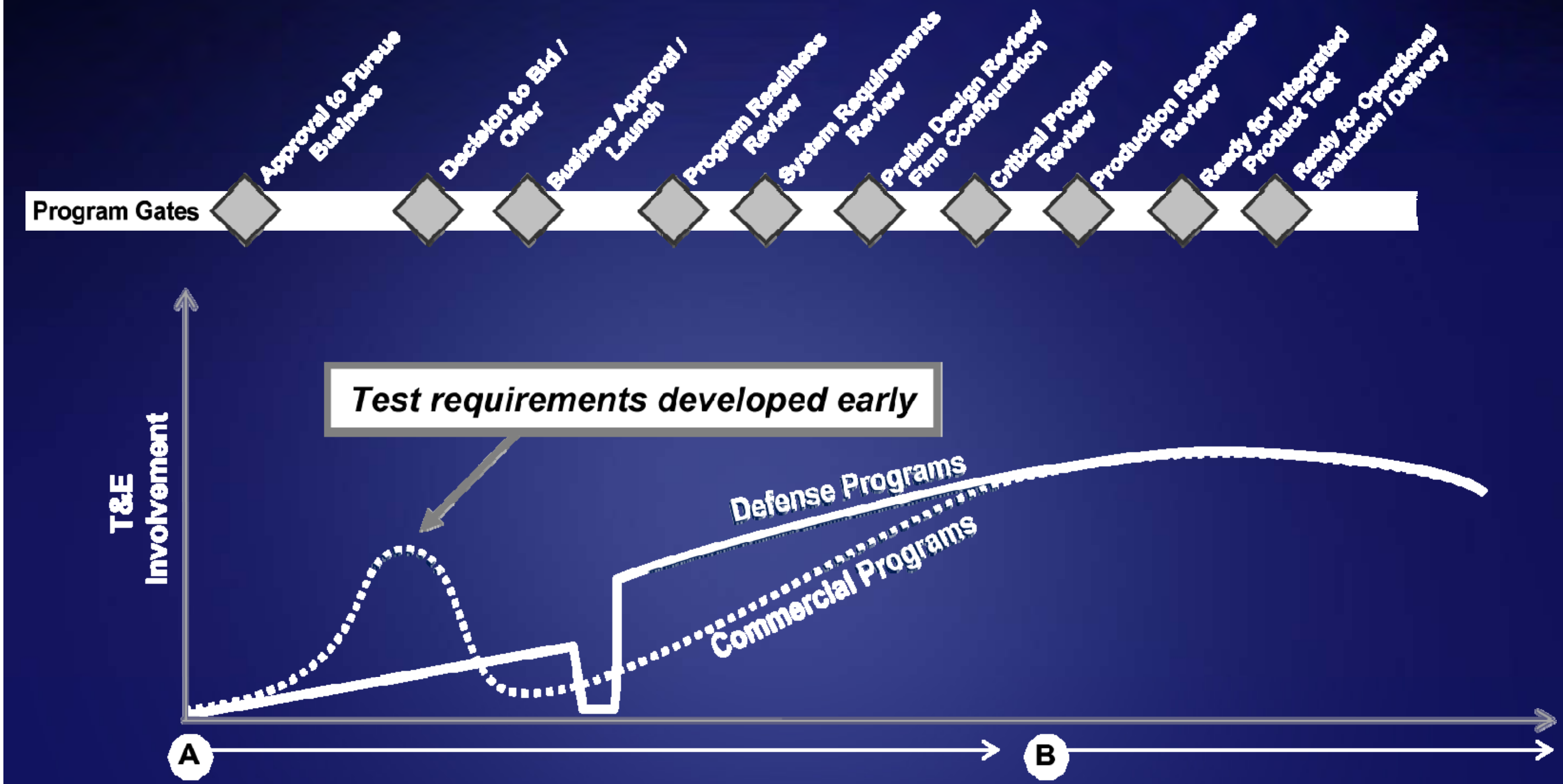
Dilbert

www.dilbert.com scottadams@aol.com

Setting the Right Goals



Test Requirements and Program Lifecycles



Test Requirements development effort and influence varies Between Commercial and Military programs.

Slide content courtesy of Boeing, Copyright © 2011

Hope versus Reality
Time for Defect Discovery and Solution

- F-22
  - 4 year program
  - took ~8 years
- B-2
  - 4.5 years, 3,000 hrs, program
  - Took 8 years, 5,000 hrs
- F-35 (15 a/c, 7 ground test articles)
  - 7 year, 11,000 hrs, 6,000 flights
  - 22M LOC
  - Schedule to complete development?

Draft GAO Report: *JSF: Progress made and Challenges Remain Jan 07*

Bureaucratic or Effective?

- Ben Rich, Skunk Works
- CIA Agent's View
- Contractor versus Government Test
  - Interviewing lawyers
  - Message management & the B-1B, etc.
- 2000 GAO View

JOINT STRIKE FIGHTER

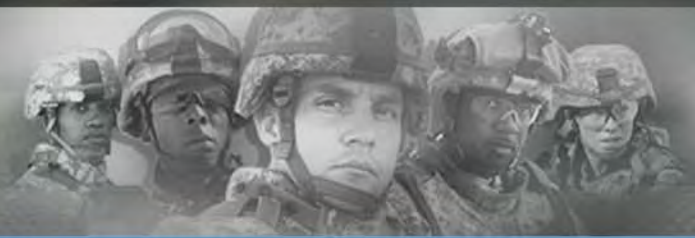
Restructuring Places Program on Firmer Footing, but Progress is Still Lagging Overall

"After more than 9 years in development and 4 in production, the JSF program has not fully demonstrated that the aircraft design is stable, manufacturing processes are mature, and the system is reliable."

"Engineering drawings are still being released to the manufacturing floor and design changes continue at higher rates than desired. More changes are expected as testing accelerates."

GAO March 2011

Test budgets are puny.
Schedule slips and design changes cost big bucks.



Introduction to the Army Common Control System (ACCS)

Barry Hatchett
Lead Project Director
Targets Management Office (TMO)
COM 256-842-6797,
DSN 788-6797
Barry.Hatchett@us.army.mil

26 October 2011

Outline

- Overview
- Transition
- Capabilities
- Schedule
- Teaming Efforts
- Summary

ACCS Overview

• Army target control system for TMO aerial and ground targets

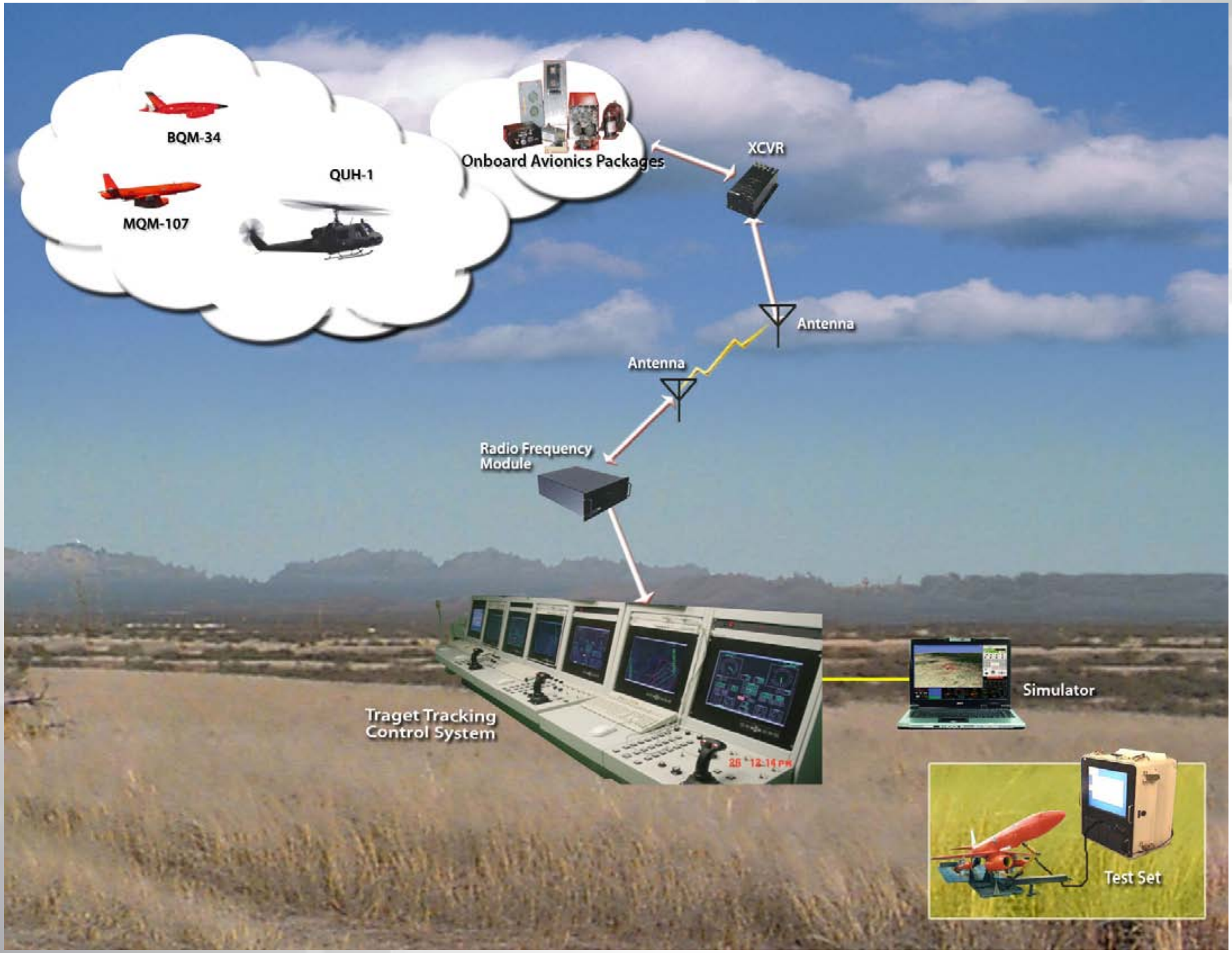
• Leverage the current Target Tracking Control System (TTCS), vehicle avionics, and test set technology

•Meets DoD Information Assurance Certification and Accreditation Process (DIACAP)

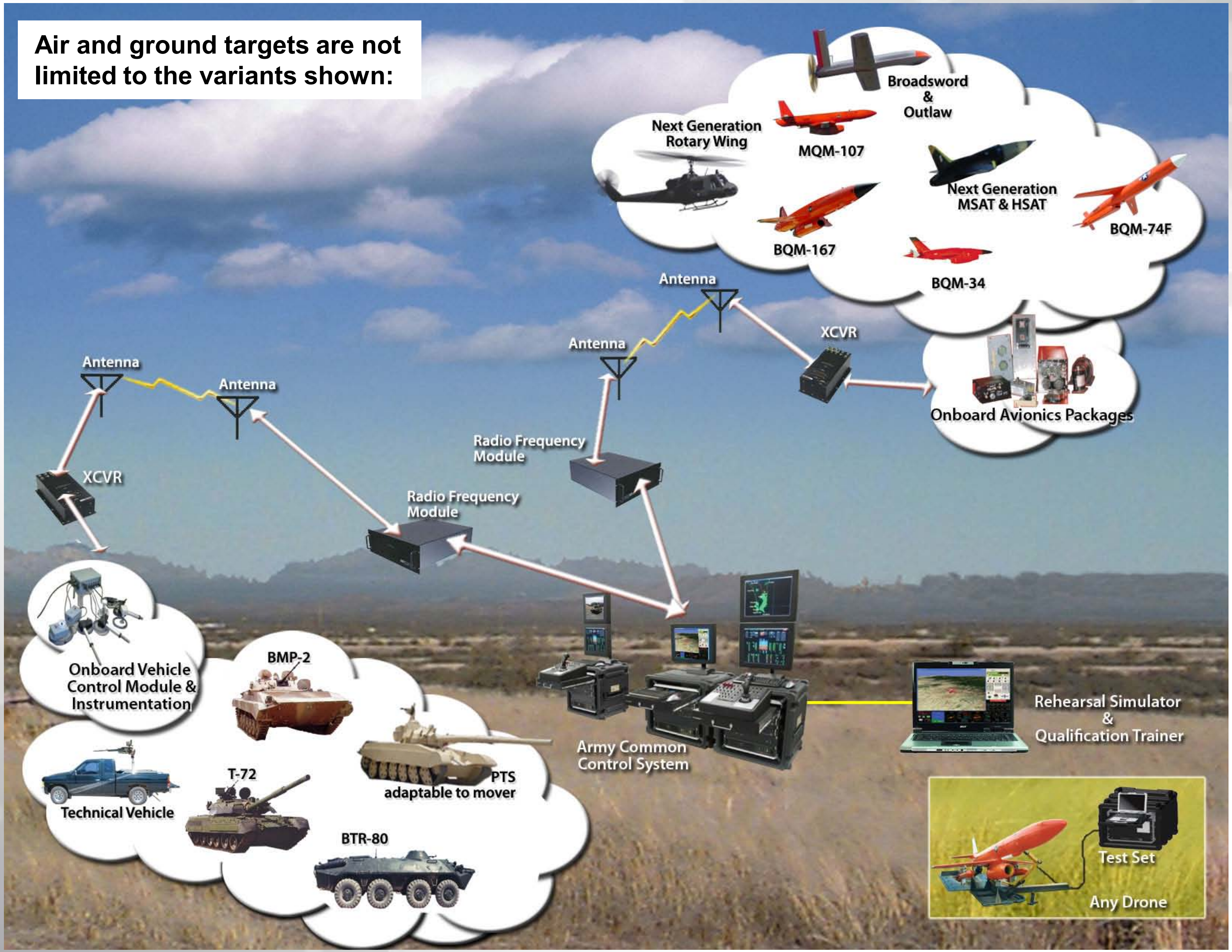
• ACCS will be the primary rotary wing, ground target, and subscale aerial target control system for Army

ACCS Concept

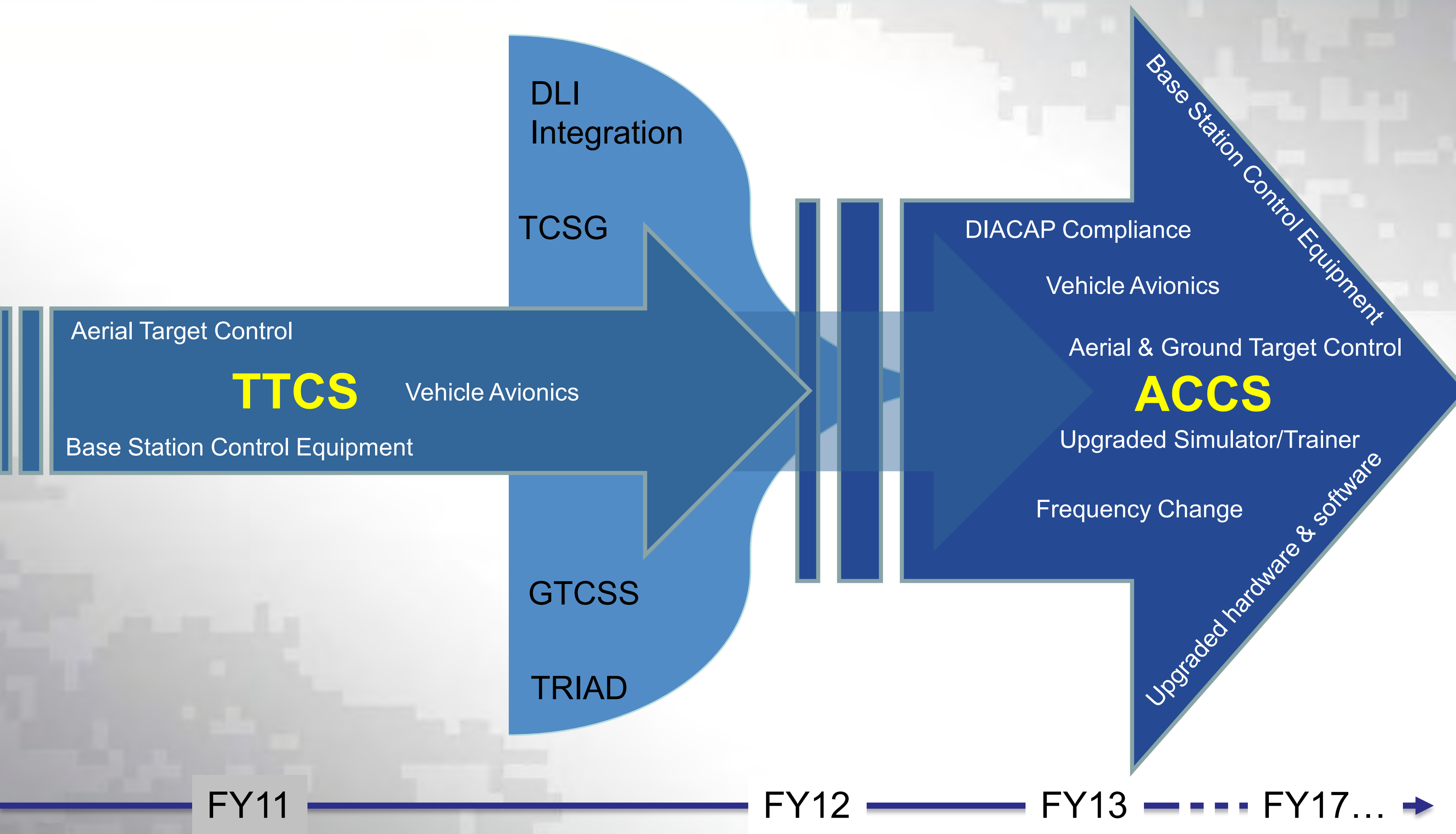
Existing Target Tracking Control System (TTCS) OV-1



ACCS OV-1


Air and ground targets are not limited to the variants shown:
Broadsword & Outlaw
Next Generation Rotary Wing
MQM-107
Next Generation MSAT & HSAT
BQM-74F
BQM-167
BQM-34
Antenna
Antenna
XCVR
Onboard Avionics Packages
Antenna
Antenna
Radio Frequency Module
XCVR
Radio Frequency Module
Onboard Vehicle Control Module & Instrumentation
BMP-2
PTS adaptable to mover
T-72
Technical Vehicle
BTR-80
Army Common Control System
Rehearsal Simulator & Qualification Trainer
Test Set
Any Drone

Way Ahead



DLI
Integration
TCSG
GTCSS
TRIAD
Aerial Target Control
TTCS
Vehicle Avionics
Base Station Control Equipment
DIACAP Compliance
Vehicle Avionics
Aerial & Ground Target Control
ACCS
Upgraded Simulator/Trainer
Frequency Change
Base Station Control Equipment
Upgraded hardware & software
FY11
FY12
FY13
FY17…

ACCS Capabilities

Aerial Target Control

- Provide control of up to 8 airborne targets simultaneously
- Support 2 targets on a single Data Link frequency
- Direct mode (1 target @ 10 Hz or 2 targets @ 7 Hz)
- Target Relay mode (1 target @ 6.5 Hz or 2 targets 4.5 Hz)
- Dedicated Relay mode (1 target @ 5 Hz or 2 targets @ 3.7 Hz)
- Provide GPS differential corrections to the targets (target dependent)

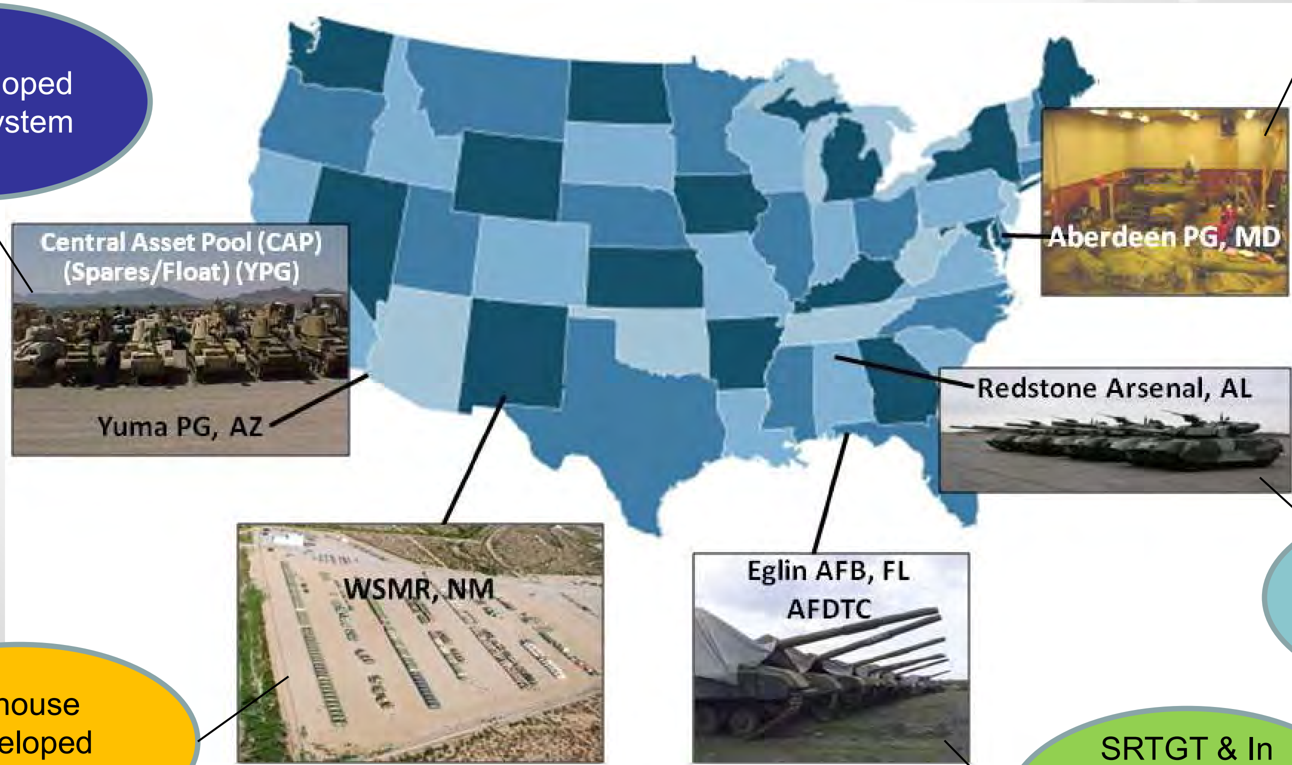
Ground Target Control

- Control of tracked and wheeled vehicles
- Waypoint movement, GPS guidance
- Collision avoidance
- Control of vehicles in formation

Existing Ground Target Locations and Control Systems

ITT developed control system

Kairos Autonomi developed control system



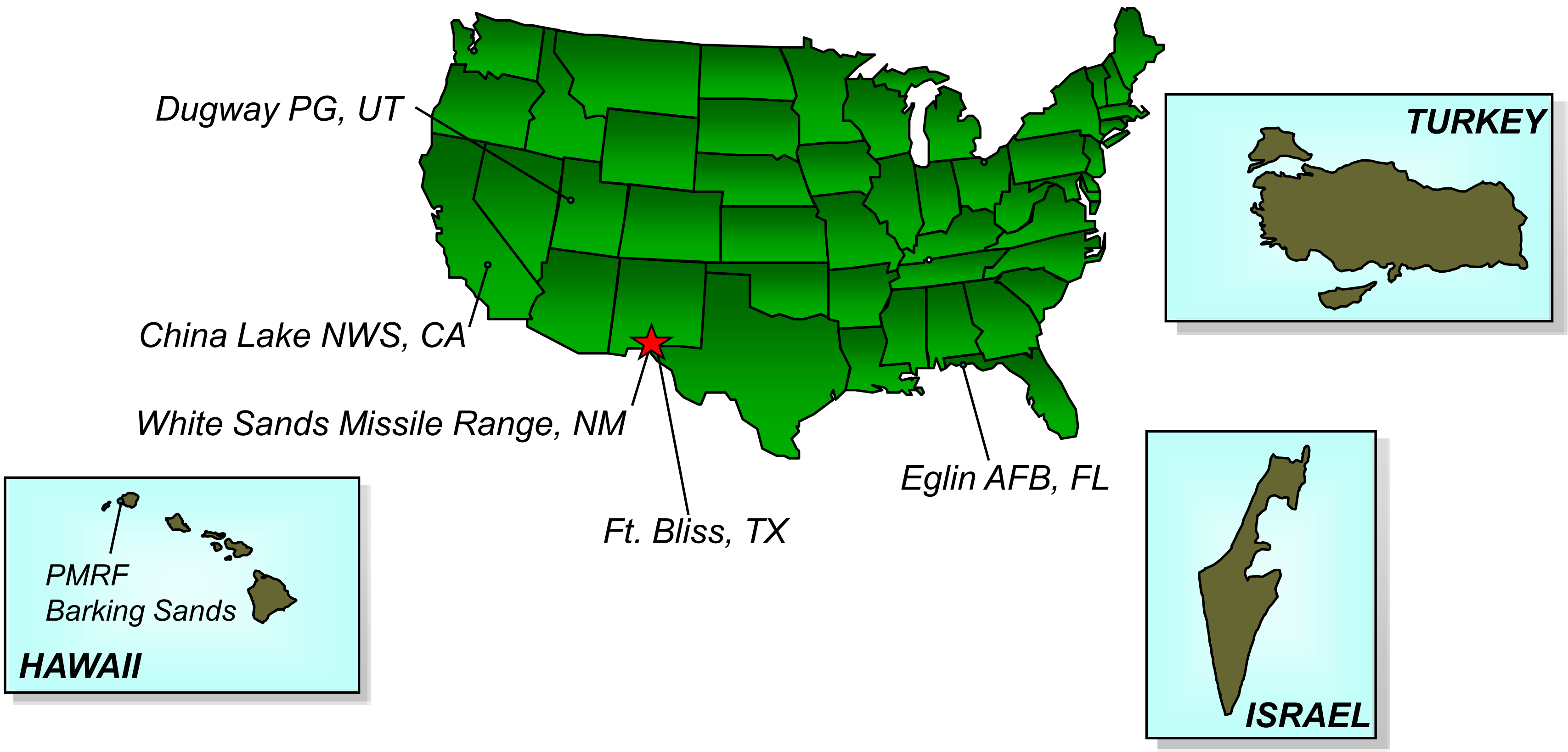
In house developed control system

In house developed control system

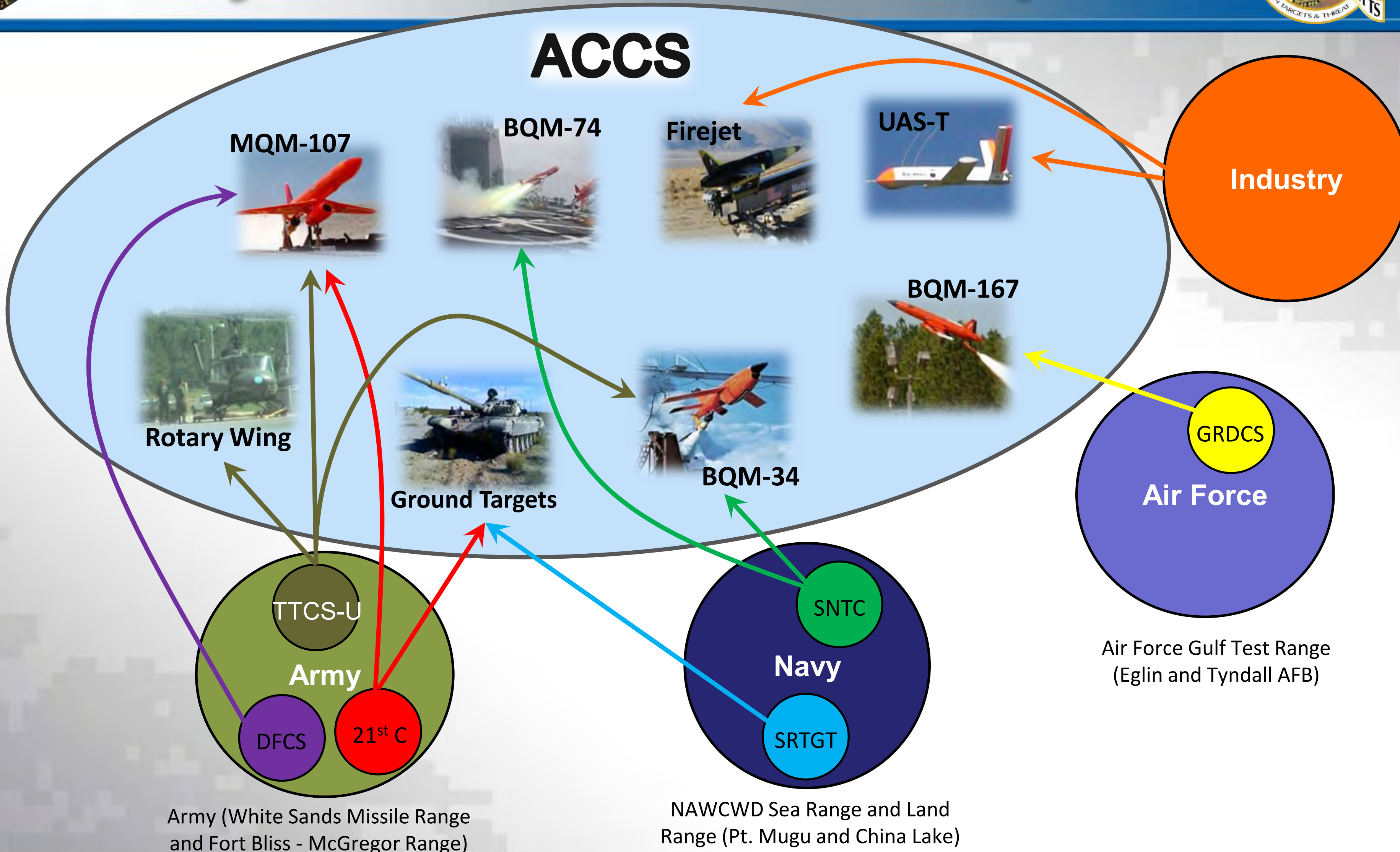
SRTGT & In house developed control system

Each system is independently developed and operated

TMO Aerial Target Operating Locations

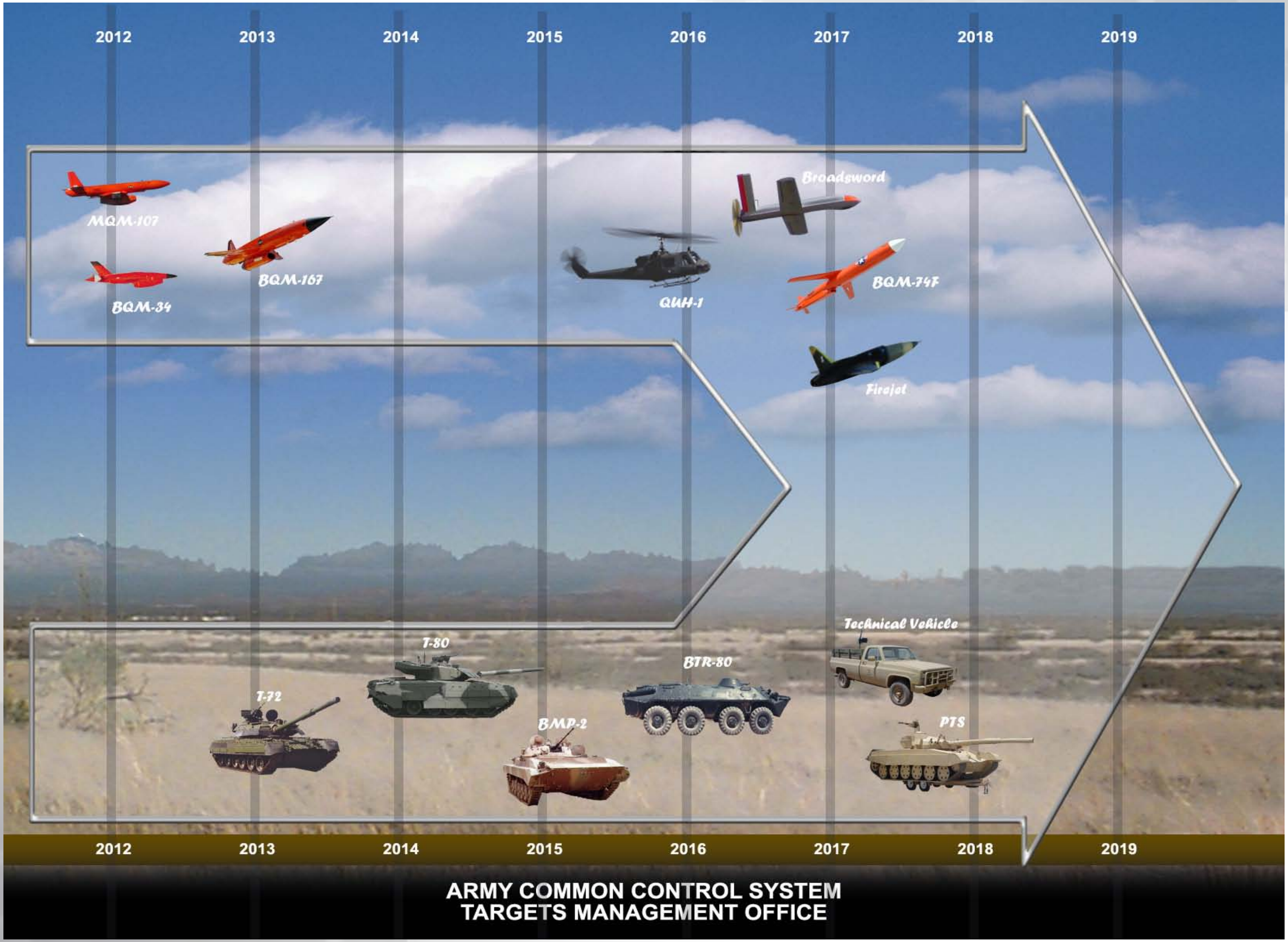


Army Common Control System



Leveraging existing technology to develop the control system for targets of the future

ACCS Schedule



Concepts

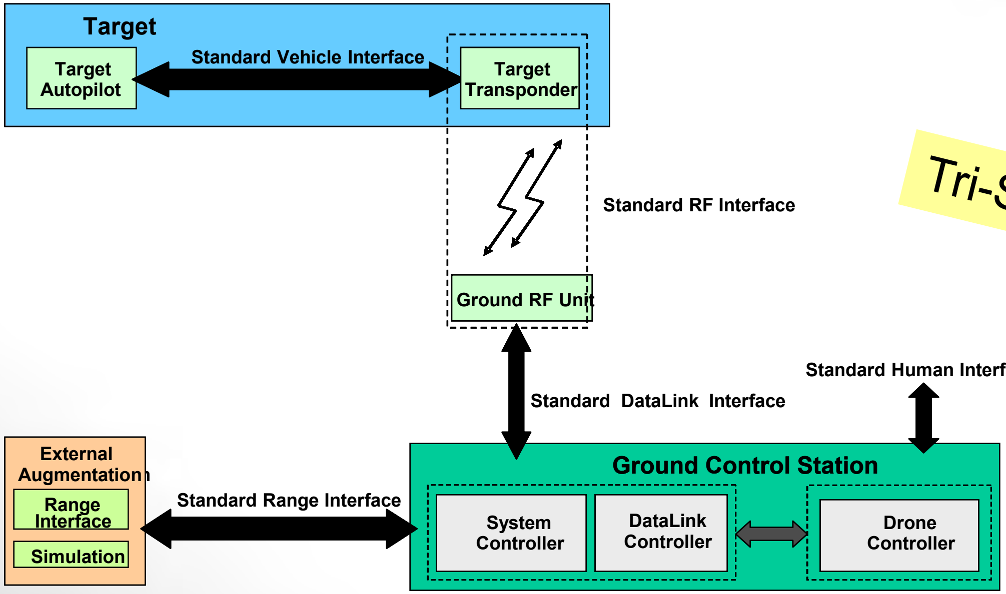
Fixed Site

Portable Test Set

Rack Mounted and Portable Hardware

Target Control Steering Group (TCSG)

- Navy lead Office of the Director, Operational Test and Evaluation (DOT&E) Target Management Initiative (TMI)
- Standardize data interfaces between ground control system, ground radio frequency unit, and target transponders

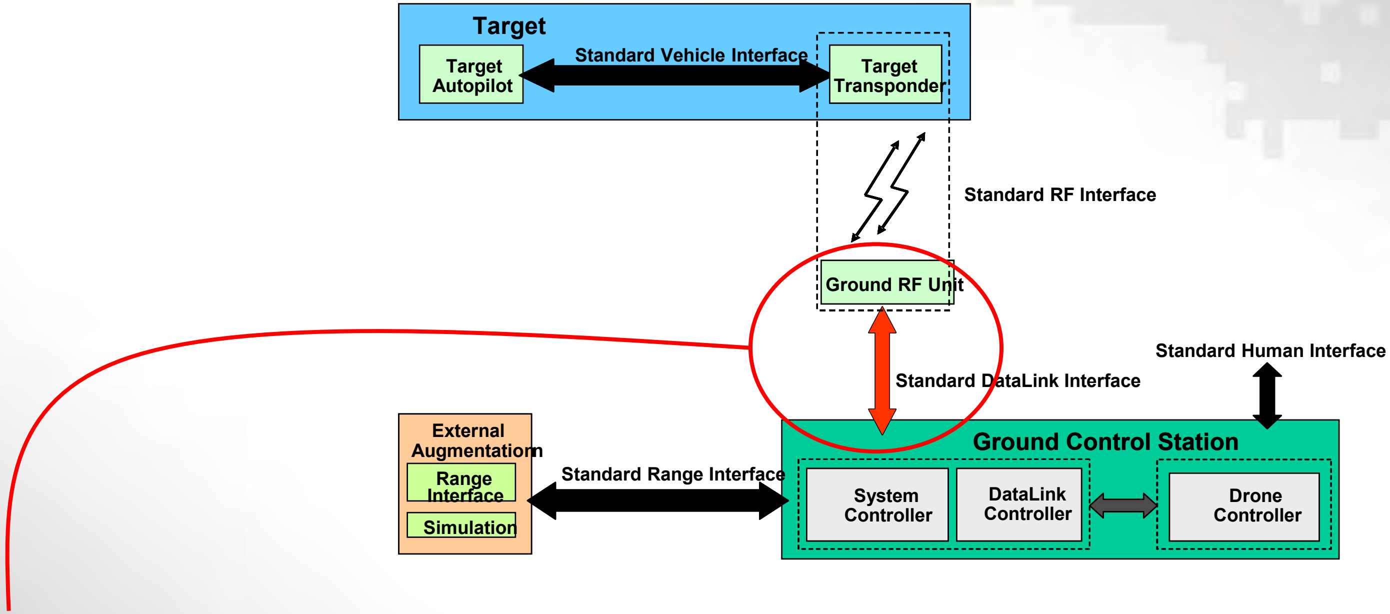


Tri-Service Initiative

- Increase interoperability between all services control systems

Goal : Control Any Target with Any Ground Station

TCSG Data Link Interface (DLI) Integration



- Review DLI for Integration into the Army control system
- Integrate the DLI natively into the control system
- Perform factory qualification tests to certify the DLI integration for field ground testing
- Update user manuals to support field tests
- Conduct required flight test

Summary

- ACCS starts in FY12
- ACCS will meet DIACAP
- Provides Aerial and Ground Target Control across multiple ranges
- Incorporates all TMO T&E Targets into a Single Control System
- Upgrades Hardware and Software for Avionics Packages, Test Sets, and Control System
- Incorporates the standard DataLink Interface developed as part of the TCSG TMI

OSD DOT&E Target Control Steering Group (TCSG)

Standard Target Control System Interfaces

26 October 2011

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NAWCWD 53100ME
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Outline

- Introduction
- Program Description
- Technical Status
- Standard Interface Demonstration
- TCSG Path-Ahead Summary

Joint Interoperable TCS Standard Interfaces

Introduction

The Army, Air Force and Navy have their ground control stations that operate on their Training and T&E Ranges.

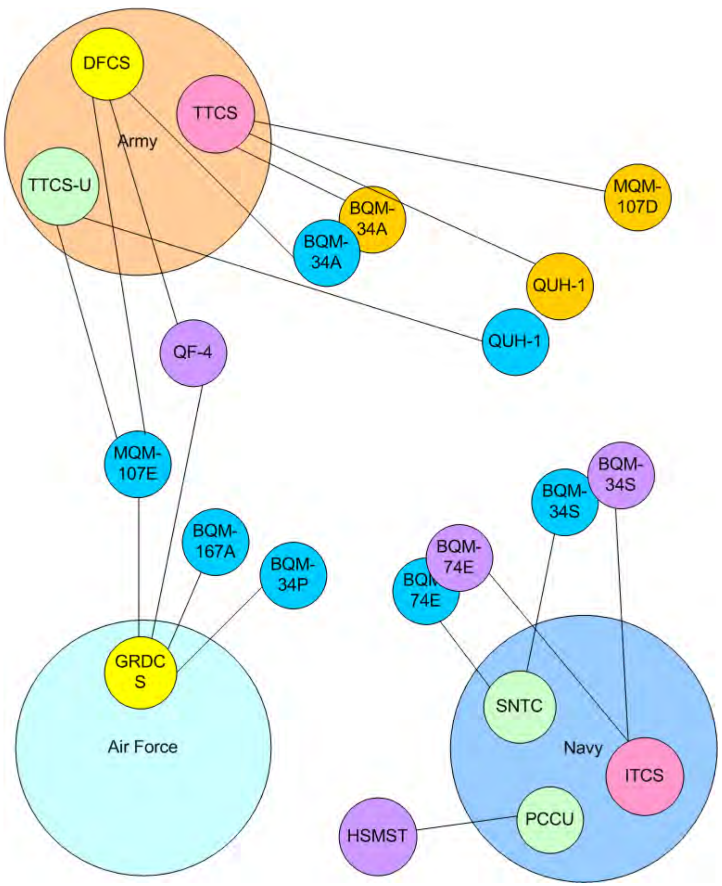
The data interfaces between the Ground Target Control System, Ground RF Unit, Target Transponder and Range infrastructure are different for each service.

This has created interoperability issues. Targets are closely coupled with the ground control system and the use of targets across ranges is limited.

This program is to develop Tri-Service Standard Interfaces to reach interoperability by developing hardware independent interfaces for the Ground Target Control System, Ground RF unit, Target Transponder and Range Infrastructure.

Introduction

Target Control Systems and Targets



Joint Interoperable TCS Standard Interfaces

Program Description

- Goal
  - Achieve the 2005 Defense Science Board Report's vision of "the gradual introduction of common control elements into each range to provide an increasing degree of interoperability, test flexibility, and lower operational costs."
  - **Control Any Target with Any Ground Station**
- Target Control Steering Group (TCSG)
  - TCSG is a tri-service group with the mission to identify common control elements at key points in the Target Control System (TCS) architecture
  - OSD/DOT&E Memorandum Chartered the TCSG through the Target Management Initiative (TMI) in August 2007.
    - Prior to that TMI received 21 requests in excess of $16M for stove-pipe TCS related enhancements
  - Held Regular Technical Interchange Meetings (TIMs) to discuss Interfaces, review Target Control Systems, and discuss Architectures (OSD, WSMR, NBVC-Pt. Mugu, Tyndall AFB, TRMC, DOT&E)
    - Held 11 TIMs to-date

Joint Interoperable TCS Standard Interfaces

Program Description

- Reviewed and evaluated industry existing standards for reuse and concepts
  - TENA
  - JAUS
  - STANAG 4586
  - CAN/CDA
- Services have Similar Target Control Architectures:
  - Generic PC H/W platform in most systems
  - H/W dependent Control panel and RF Radio
- Services are Evolving to be Platform Independent
  - All Services using PC platform
  - Industry Standard Interfaces for control panels and manual control
    - USB2
    - Ethernet

Joint Interoperable TCS Standard Interfaces

Program Description

- Standard Interfaces provide methods for target control systems to communicate together
  - Provides a path for commonality of message types and definitions to reduce redundant data type
  - As systems and targets evolve, standard interfaces provide a path for interoperability
- Joint Interoperable TCS Standard Developed
  - Identified Primary Interfaces
  - Agreed to Five Interfaces to be Addressed
  - Prioritized Interfaces for Standardization

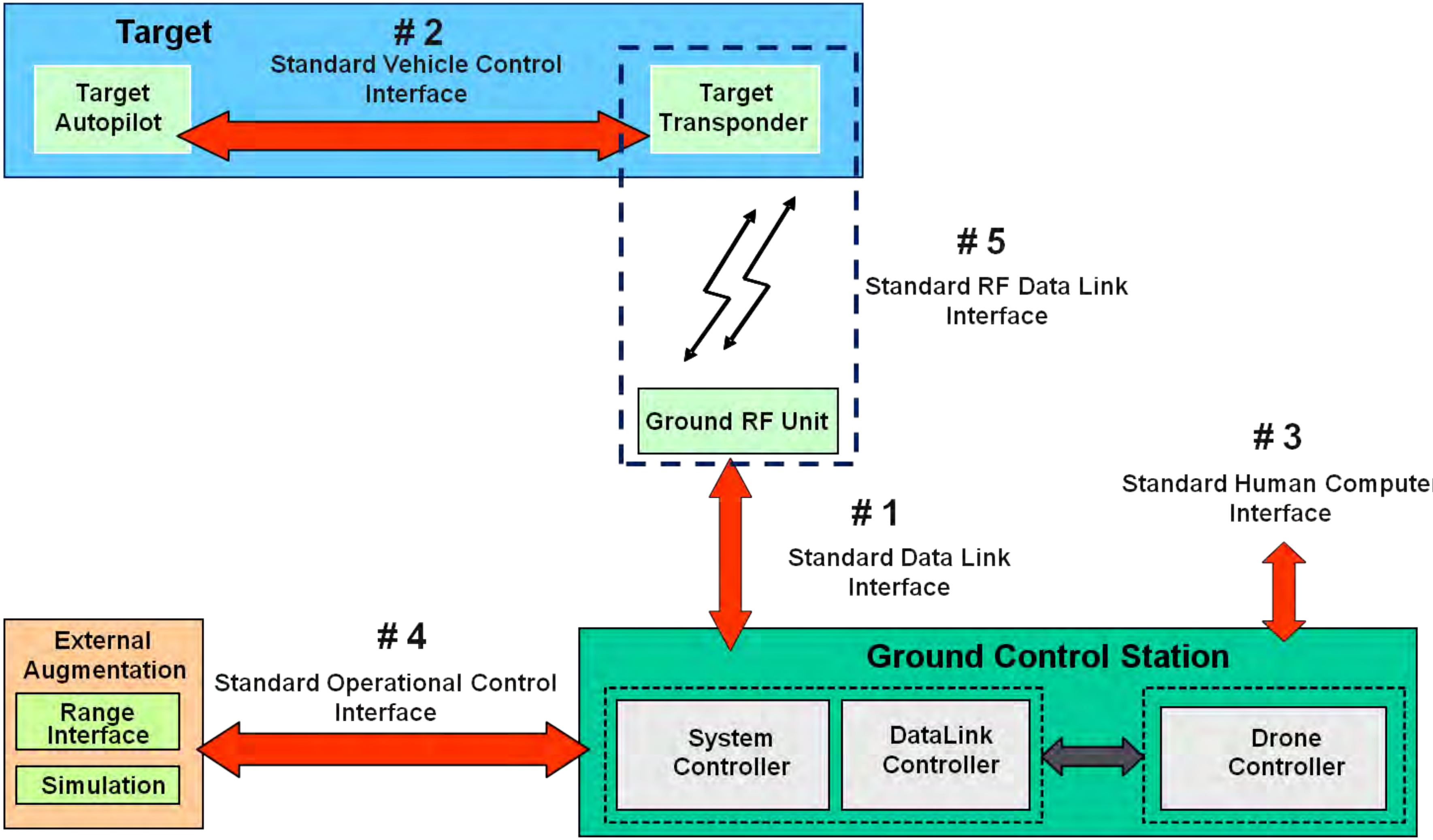
Joint Interoperable TCS Standard Interfaces

Program Description

- Target Control Steering Group (TCSG)
  - Identified common elements: five Independent Standard Interfaces in priority order
    1) Data Link Interface (DLI)
    2) Vehicle Control Interface (VCI)
    3) Human Computer Interface (HCI)
    4) Operational Control Interface (OCI)
    5) RF Datalink Interface (RF DLI)
  - Interoperable capabilities are achieved when Services implement one or more standard interfaces. i.e.
    - DLI Standard – interoperable Target Ground Control System and TCS ground RF units
    - VCI Standard – interoperable Target transponders
    - With each Standard Interface implemented, interoperability reached at the point of implementation
- Recommended Electrical Interfaces for QF-16 (Jan 2008)

Joint Interoperable TCS Standard Interfaces

Program Description



Joint Interoperable TCS Standard Interfaces

Technical Status

- Released Joint Interoperable TCS Standard Interfaces
  - Data Link Interface (DLI), V1.0
  - Vehicle Control Interface (VCI), V0.3
  - Human Computer Interface (HCI), V0.1
  - Operational Control Interface (OCI)
    - Investigating the use of TENA
  - RF Data Link Interface (RFDLI)
    - Investigating a Navy proposal
- Key Issues and Critical Actions Accomplished
  - All stakeholders briefed (June-August 2008)
    - Army, Navy, Air Force, TRMC, DT&E, and DOT&E
  - Flight Demonstration program for Standard DLI began in FY09
    - New Common Target Control System, CTCS, system was developed to demonstrate Standard Interface in native format
    - Army Target Tracking Control System, TTCS, was chosen to demonstrate interoperability of Standard and legacy interface

Joint Interoperable TCS Standard Interfaces

Standard Interface Demonstration

- Completed three successful DLI Demonstration flight tests
  - New Common TCS with Navy BQM-74E
    - ➢ Standard TCS Data Link Interface
    - ➢ Flight Test: 28 October 2009
  - New Common TCS with Navy BQM-74E
    - ➢ STANAG 4586 Data Link Interface
    - ➢ Flight Test: 15 December 2009
  - Army TTCS/U with Navy BQM-74E
    - ➢ Standard TCS Data Link Interface with middleware
    - ➢ Flight Test: 21 June 2010

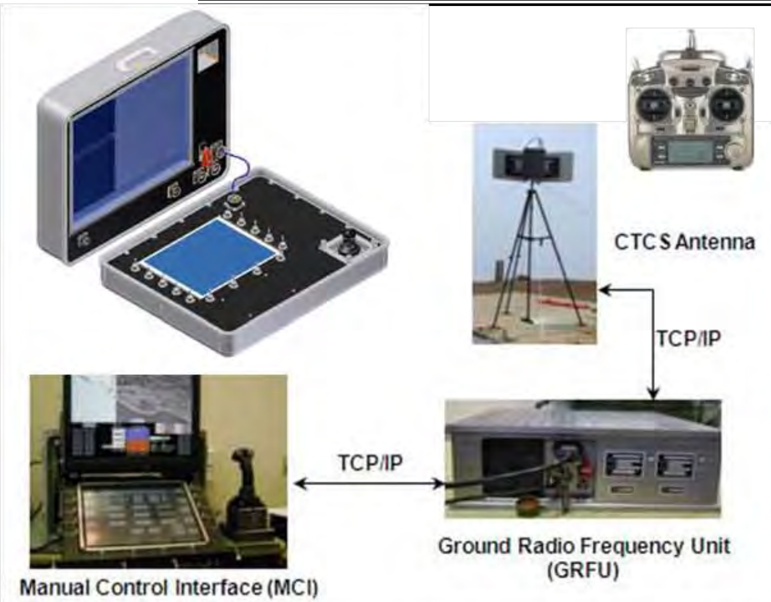
Joint Interoperable TCS Standard Interfaces

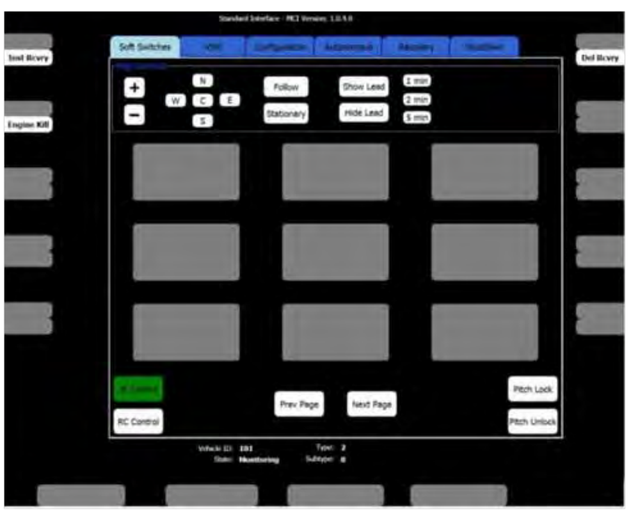
Standard Interface Demonstration

- Flight Test with Common Target Control System
  - Software and Hardware development and Ground Testing using the Navy BQM-74E Target, the Common Target Control System and the operational control room facilities has been satisfactorily completed.
  - The system successfully passed Environment and Electromagnetic Compatibility (EMC).
  - The Common Interface TCS was successfully demonstrated using the Standard Data Link Interface on 28 October 2009 at the Naval Air Warfare Center Point Mugu Sea Test Range.
  - A second flight demonstrating the STANAG 4586 data link was successfully flown on Tuesday 15 December 2009 at the Naval Air Warfare Center Point Mugu Sea Test Range.
  - There were no significant issues with the program.

Joint Interoperable TCS Standard Interfaces

Standard Interface Demonstration





Joint Interoperable TCS Standard Interfaces

Standard Interface Demonstration

- **Flight Test with Army Target Tracking Control System – Ultra High Frequency, TTCS/U**
  - Completed Design of Reusable Middleware Components Implementing Standard Data Link Interface
  - Completed Design of TTCS/U Modifications
  - Completed Design of TTCS/U to Navy Target
  - Completed Integration of TCS Modifications, Middleware, and Target
  - A third flight demonstrating the Standard Data Link Interface with middleware successfully flown on 21 June 2010 at the Naval Air Warfare Center Point Mugu Sea Test Range.

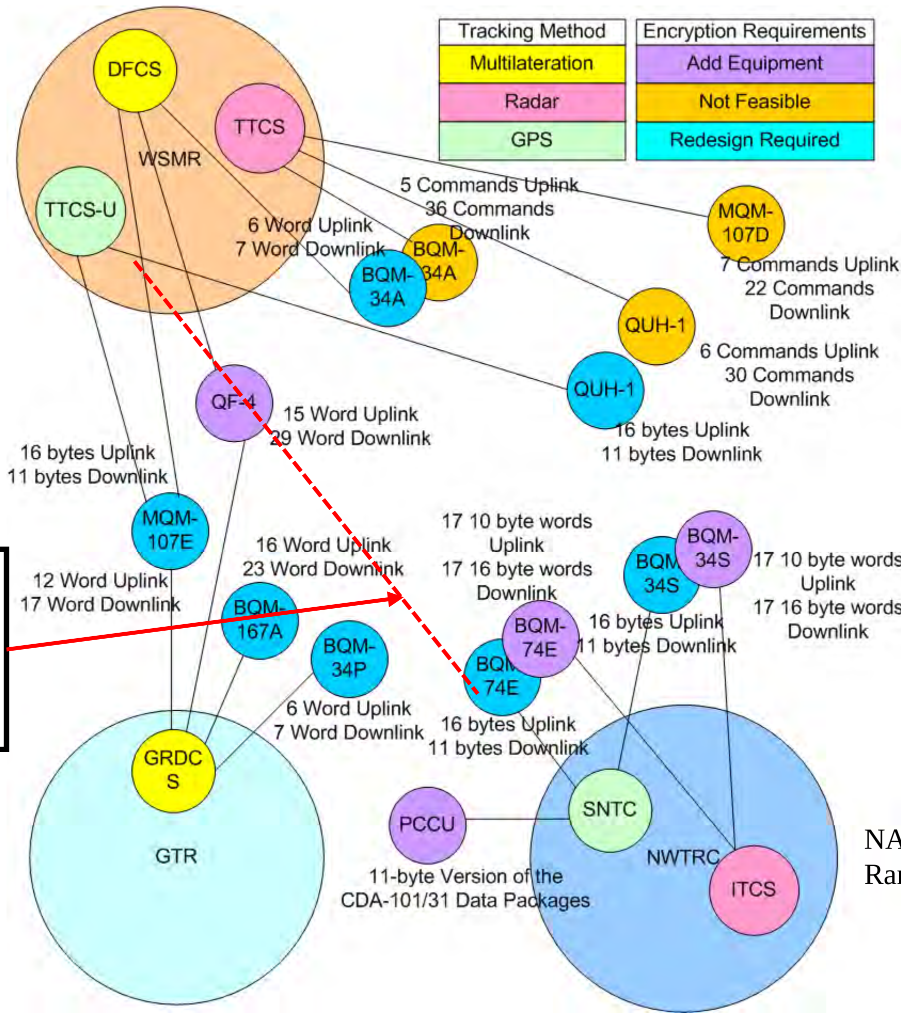
Joint Interoperable TCS Standard Interfaces

Standard Interface Demonstration

Joint Interoperable TCS Standard Interfaces

Standard Interface Demonstration

Army (White Sands Missile Range and McGregor Range)



The DLI Demonstration used the DLI Standard Interface to enable an Army TCS to control a Navy BQM-74E

Air Force Gulf Test Range (Eglin and Tyndall AFB)

NAWCWD Sea Range and Land Range (Pt. Mugu and China Lake)

** Diagram uses data taken from the 5D Systems "Interoperable Target control System Study" final report.

Joint Interoperable TCS Standard Interfaces

TCSG Path-Ahead Summary

- Current TCSG Primary Effort:
  - Integrate the Standard DLI into prototype Army ATCCS
    - SRR Approved, 26 July 2011
    - PDR Approved, 20 September 2011
    - CDR: 24 January 2012
    - TRR: 15 July 2012
  - Both the Navy and Air Force participating with the effort and plan to review the results for application to their systems.
- Demonstrate Standard Vehicle Control Interface (VCI)
  - NAWCWD UAV targets include Standard DLI and VCI
  - DOT&E 5th Gen Target initiative planning use of Standard DLI and VCI
- Develop Certification Program
  - VCI certification program in trial
  - DLI certification program in development

Air Combat Training Systems

Provided by
ACC/A3AR
AAC/EBYI
Mr. Randall S. King

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UNCLASSIFIED

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Overview

- P5CTS Overview
- Baseline Program Description
- Fielding Status
- Retired Systems
- Debriefing Capability

P5 Combat Training System

Specifications

Participant datalink:	*80 nm (Air to Air)*
	125 nm (Air to Grd)
Data Link Relay:	*200 nm*
Accuracy:	*10ft x 10ft x 15ft*

Performance

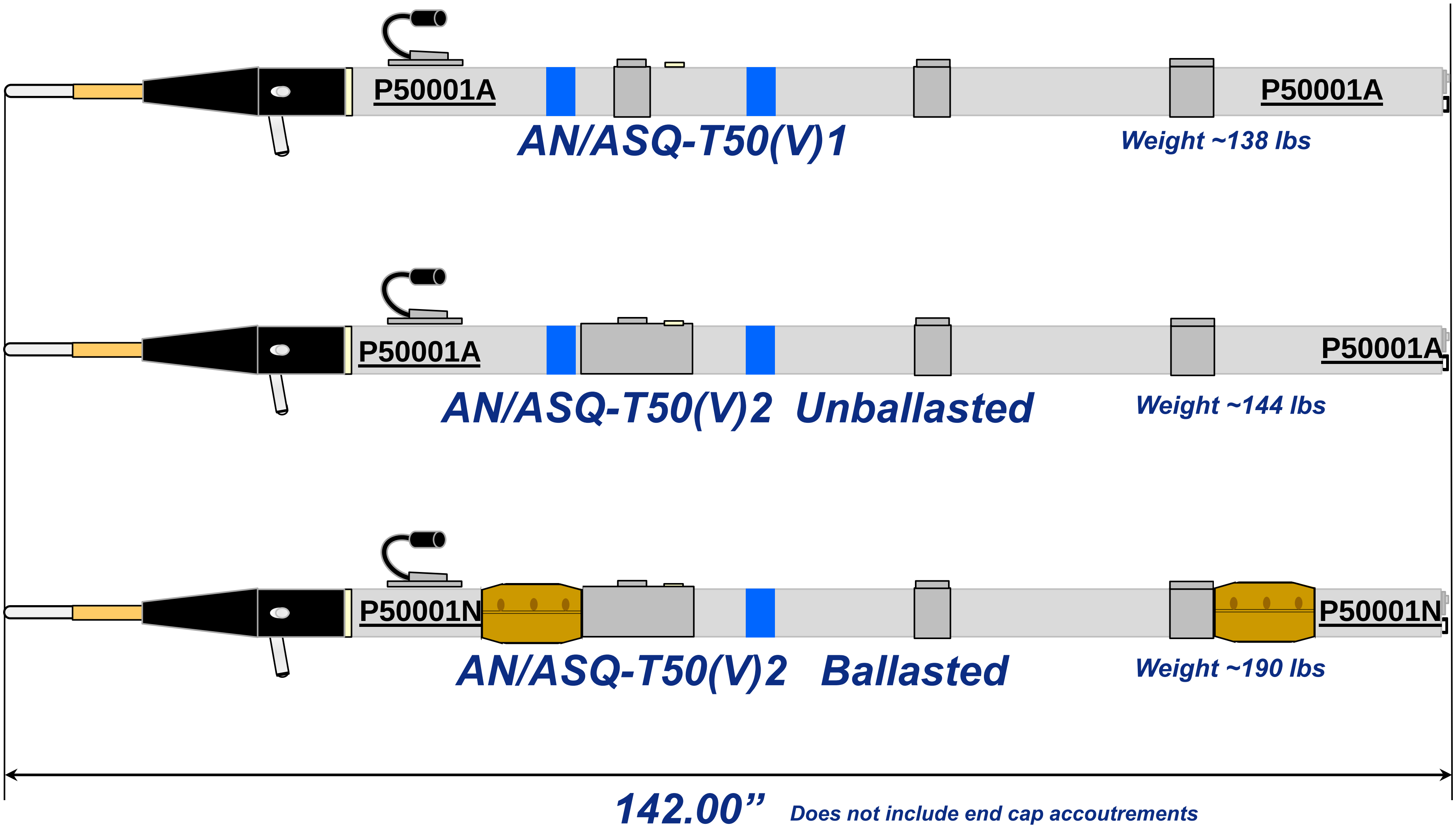
GPS based	*RTKN/Wpn Sims*
Rangeless	*Interoperable*
Live Monitoring	*- Link 16*
	- FAA

Aircraft

F-15	*Eurofighter*
F-16	*EPAF F-16s*
A-10C	*Mirage*
F-18	*Tornado*
AV-8	*SU-30*
EA-6B	*AH-1*
F-5	*UH-1*

Provides Realistic Air Combat Training to the Warfighter

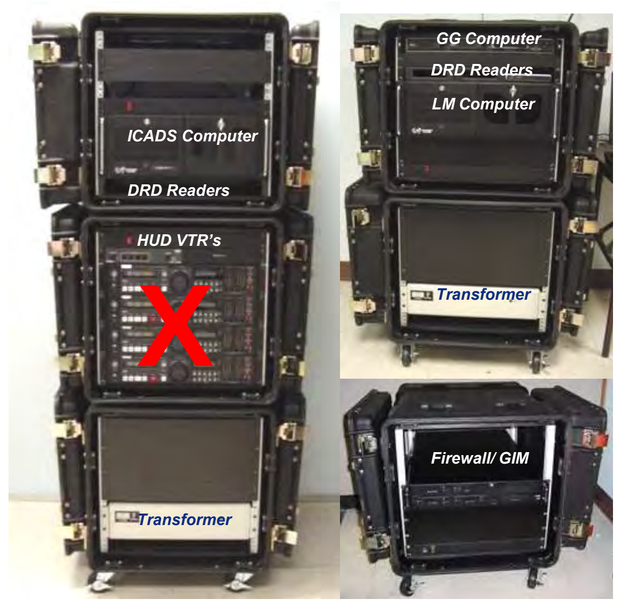
P5CTS/TCTS Pods



Ground Subsystem

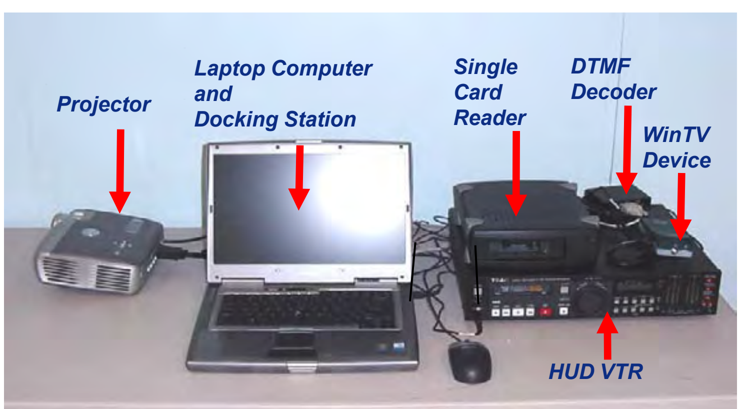
Transportable Ground Subsystem (TGS)

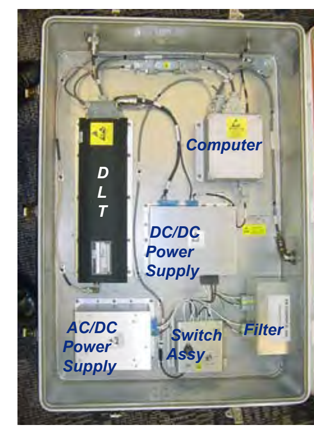
Transportable Ground Subsystem w/Live Monitor - TGS/LM



TGS w/ LM comes with 1 RRU however additional RRU's may be added

Portable Ground Subsystem (PGS)

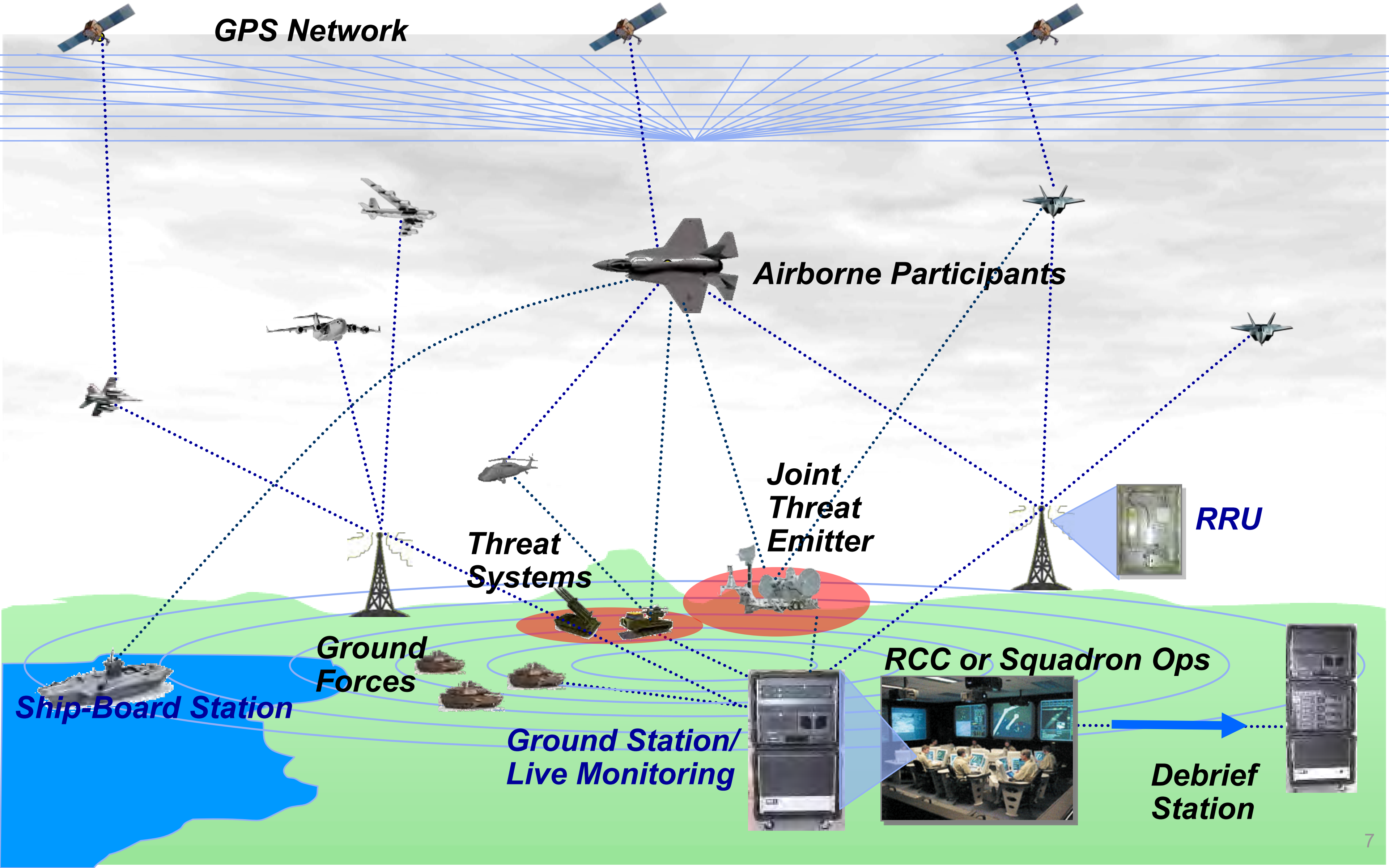




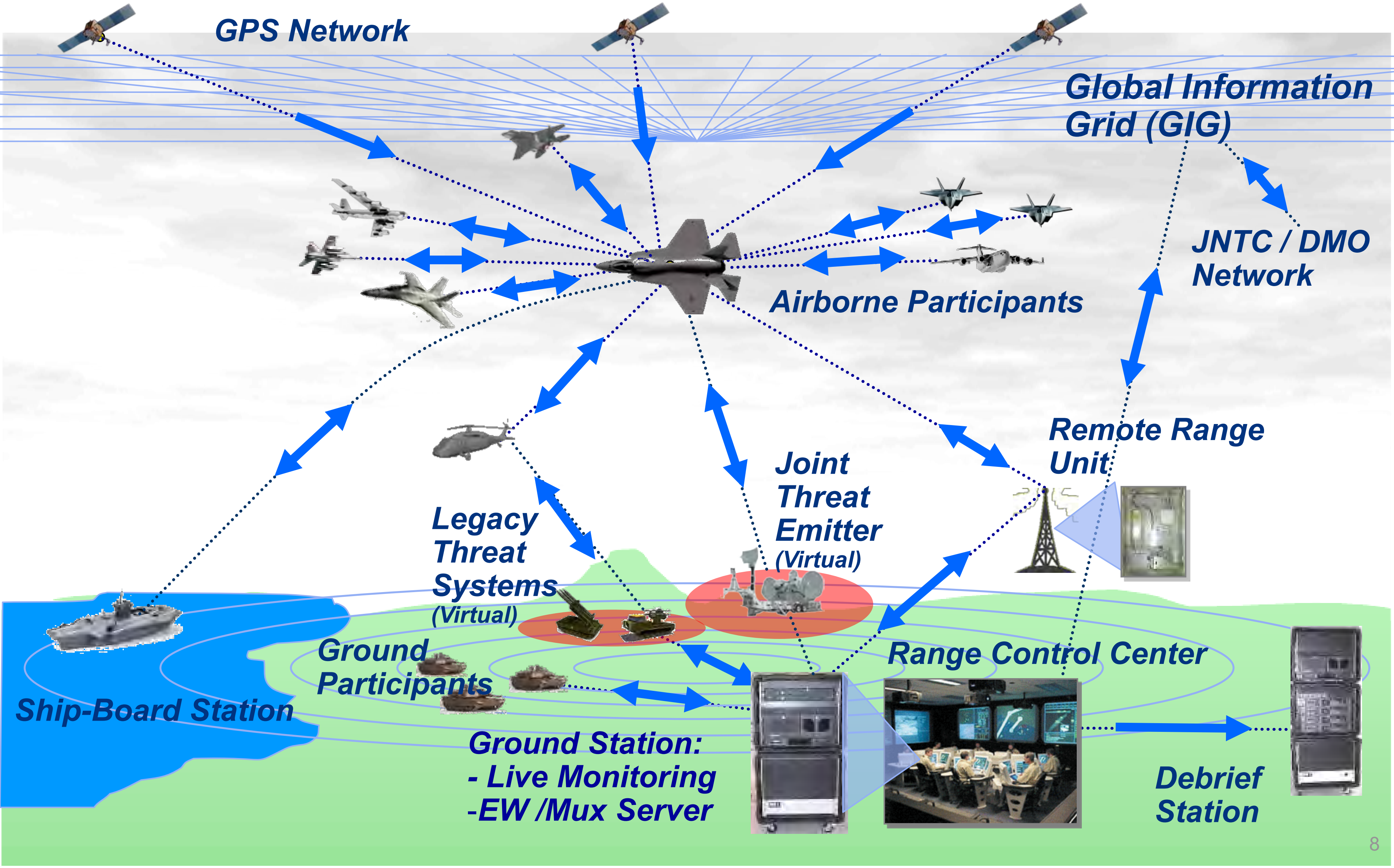
Remote Range Unit

Rangeless Operations
P5CTS

Integrated Operations



Integrated P5/LVC Operations



P5CTS Fielding Status – Oct 2011

- First Fielding at Luke AFB - Oct 2006
- Fielded Units:

ACC	
Eglin	COMP
Seymour-Johnson	COMP
Langley	COMP
Nellis/Ft Irwin (GF-W)	COMP
Mountain Home	COMP
Shaw	COMP
Barksdale	COMP
Hill	COMP
AFRC	
Homestead ARB	COMP
ANG	
Savannah CRTC	COMP
Gulfport CRTC	COMP
Alpena CRTC	COMP
Montana (Great Falls)	COMP
Volk Field CRTC	COMP
AETC	
Luke	COMP
Tyndall	COMP
USAFE	
RAF Lakenheath	COMP
Spangdahlem*	COMP
Aviano*	COMP

- On the Horizon:

2012 - Eielson 2013 - Holloman (F-16 move from Luke), Nellis (Red Flag-N) 2014/15 - PACAF	TBD

* Awaiting European frequency approval

P5CTS Air Force Fielding

AF TOTAL: 1464 Pods

Fielded: 779 Pods

Contracted: 152 pods delivered in FY11

Programmed: 165 Baseline Pods purchase in FY12 (del FY13)

Planned: 368 Encrypted Pods (required FY 12, delivery TBD)

Transition Update - Retirement

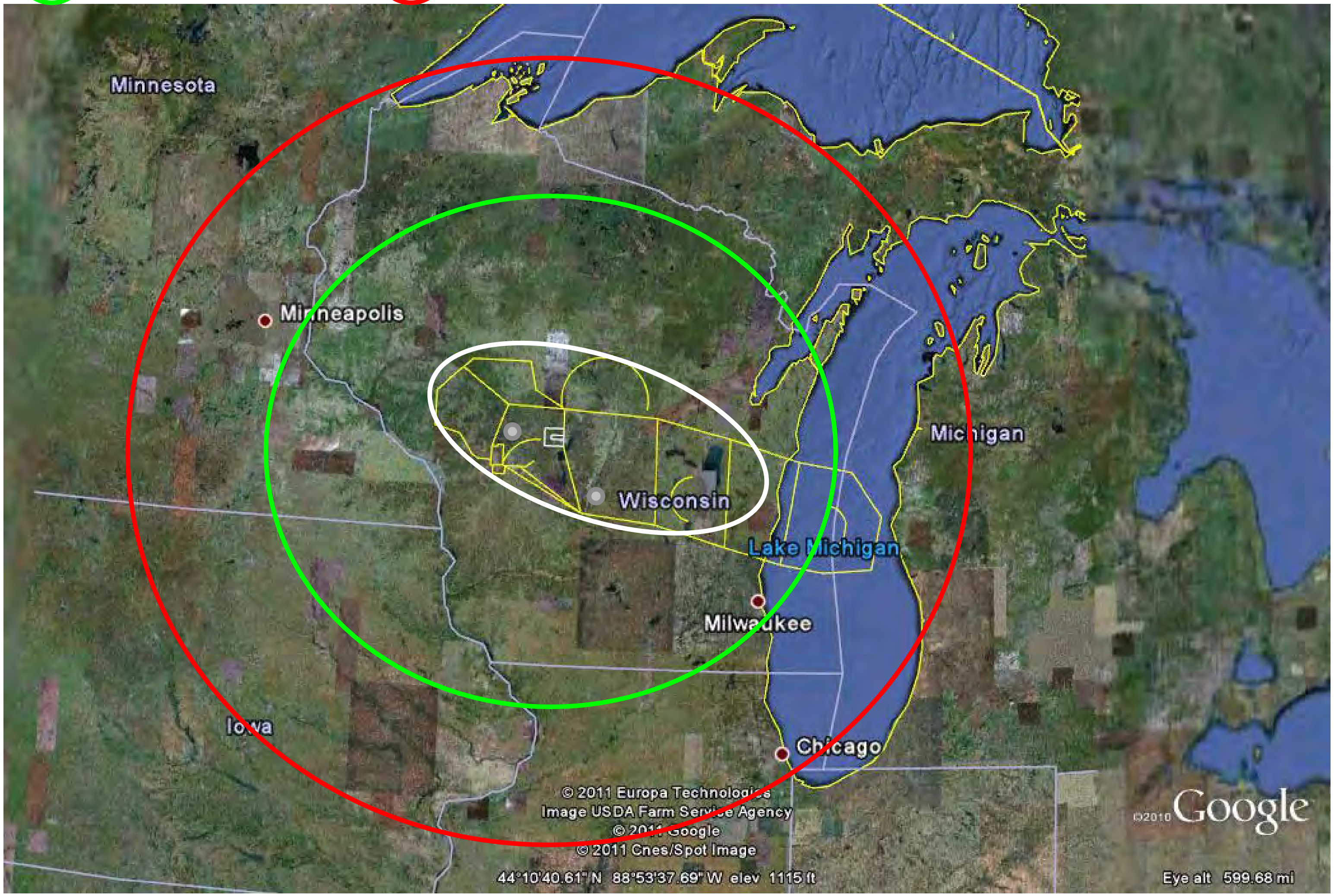
- **Retired Pods**
  - HAIS POD - Apr 06
  - P4A (TACTS) – retired 2010
  - P4AM – retired Jun 07
  - P4AW – retired Aug 07
  - P4BX – retired Dec 08
  - P4G – retired Jun 09

- **Retiring Pods**
  - URITS - NLT FY 12 (Projected to retire Jan 2012)
  - P4B - NLT FY12 (Projected to retire Jan 2012)
  - P4NS - NLT FY13/14
  - P4BE – NLT FY 14/15

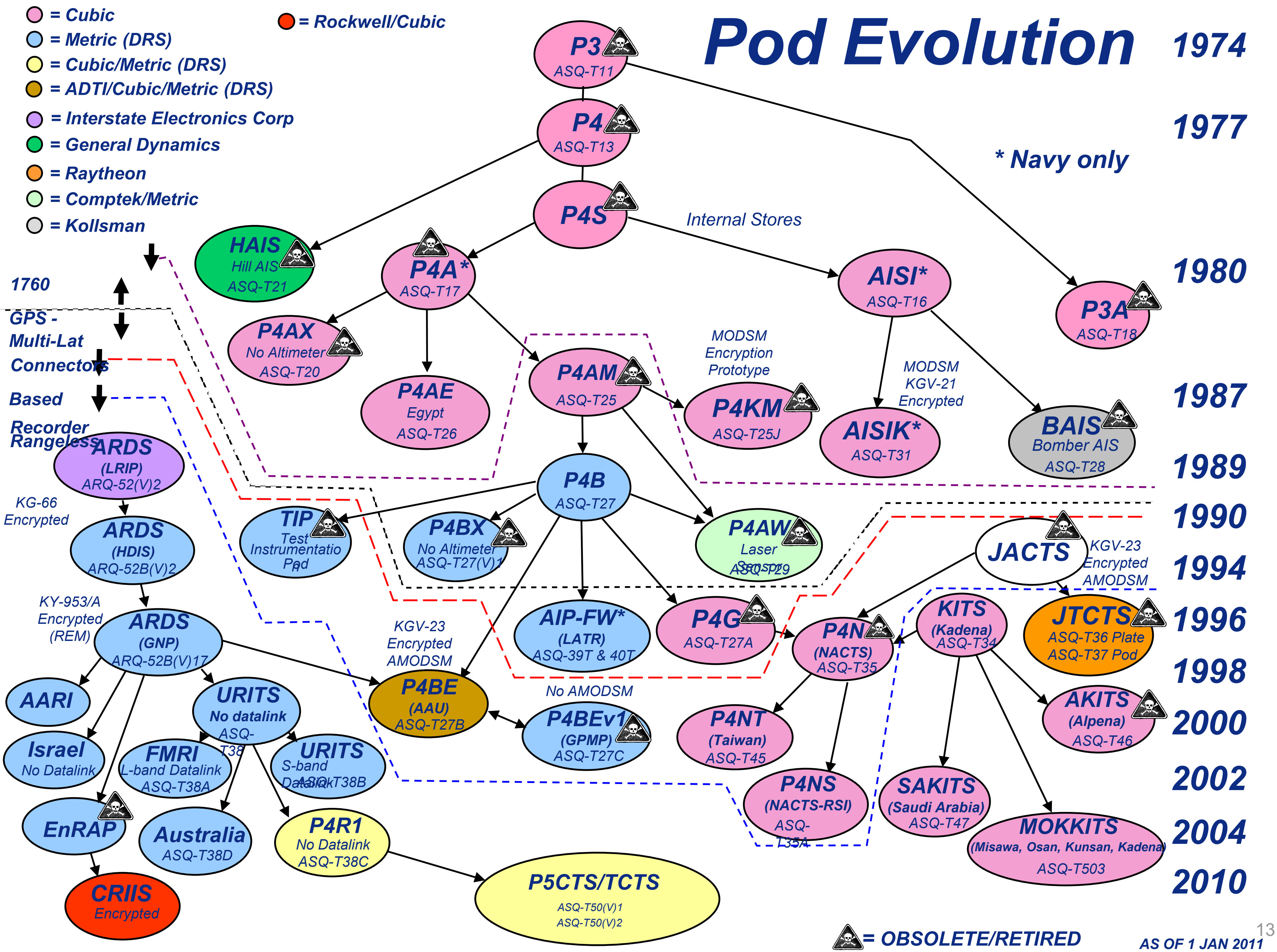
Down to 8 AF pod system baselines

Ground Infrastructure Reduction

= P5 no relay   = P5 with relay



Old tethered range needed 18 TIS towers to cover the area in white. P5 covers the area in red with only 2.

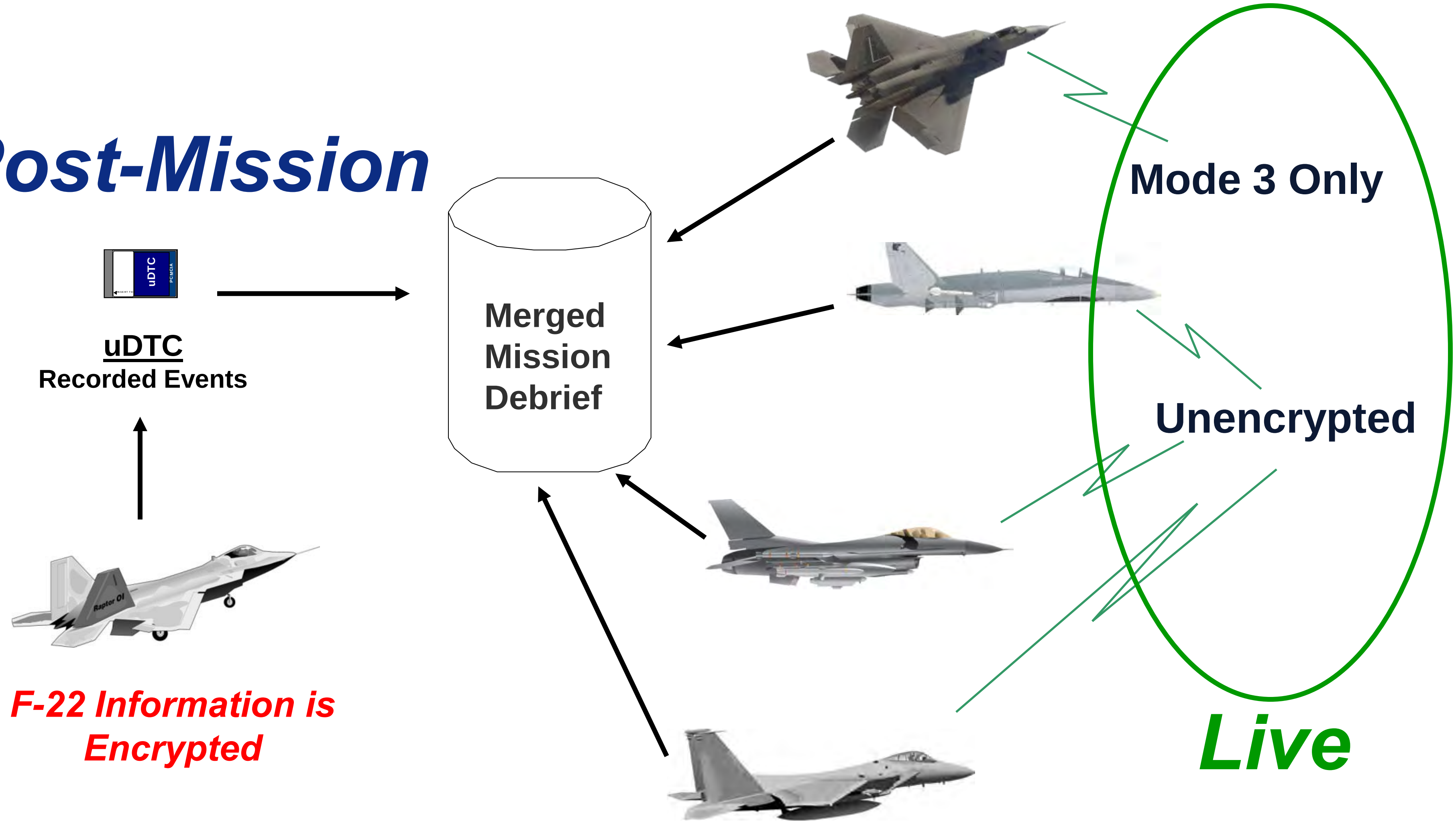


Pod Evolution
= Cubic
= Metric (DRS)
= Cubic/Metric (DRS)
= ADTI/Cubic/Metric (DRS)
= Interstate Electronics Corp
= General Dynamics
= Raytheon
= Comptek/Metric
= Kollsman
= Rockwell/Cubic
* Navy only
1974
1977
1980
1987
1989
1990
1994
1996
1998
2000
2002
2004
2010
P3 ASQ-T11
P4 ASQ-T13
P4S
Internal Stores
HAIS Hill AIS ASQ-T21
P4A* ASQ-T17
AISI* ASQ-T16
P3A ASQ-T18
1760
GPS - Multi-Lat
Connectors
Based
Recorder
Rangeless
P4AX No Altimeter ASQ-T20
P4AE Egypt ASQ-T26
P4AM ASQ-T25
MODSM Encryption Prototype
P4KM ASQ-T25J
MODSM KGV-21 Encrypted
AISIK* ASQ-T31
BAIS Bomber AIS ASQ-T28
ARDS (LRIP) ARQ-52(V)2
KG-66 Encrypted
ARDS (HDIS) ARQ-52B(V)2
P4B ASQ-T27
TIP Test Instrumentation Pod
P4BX No Altimeter ASQ-T27(V)1
P4AW Laser Sensor ASQ-T29
JACTS
KGV-23 Encrypted AMODSM
KY-953/A Encrypted (REM)
ARDS (GNP) ARQ-52B(V)17
KGV-23 Encrypted AMODSM
AIP-FW* (LATR) ASQ-39T & 40T
P4G ASQ-T27A
P4N (NACTS) ASQ-T35
KITS (Kadena) ASQ-T34
JTCTS ASQ-T36 Plate ASQ-T37 Pod
AARI
URITS No datalink ASQ-T38
P4BE (AAU) ASQ-T27B
No AMODSM
P4BEv1 (GPMP) ASQ-T27C
P4NT (Taiwan) ASQ-T45
AKITS (Alpena) ASQ-T46
Israel No Datalink
FMRI L-band Datalink ASQ-T38A
URITS S-band Datalink ASQ-T38B
P4NS (NACTS-RSI) ASQ-T35A
SAKITS (Saudi Arabia) ASQ-T47
EnRAP
Australia ASQ-T38D
P4R1 No Datalink ASQ-T38C
MOKKITS (Misawa, Osan, Kunsan, Kadena) ASQ-T503
CRIIS Encrypted
P5CTS/TCTS ASQ-T50(V)1 ASQ-T50(V)2
= OBSOLETE/RETIRED
AS OF 1 JAN 2011

F-22 ACTS Short-Term Solution

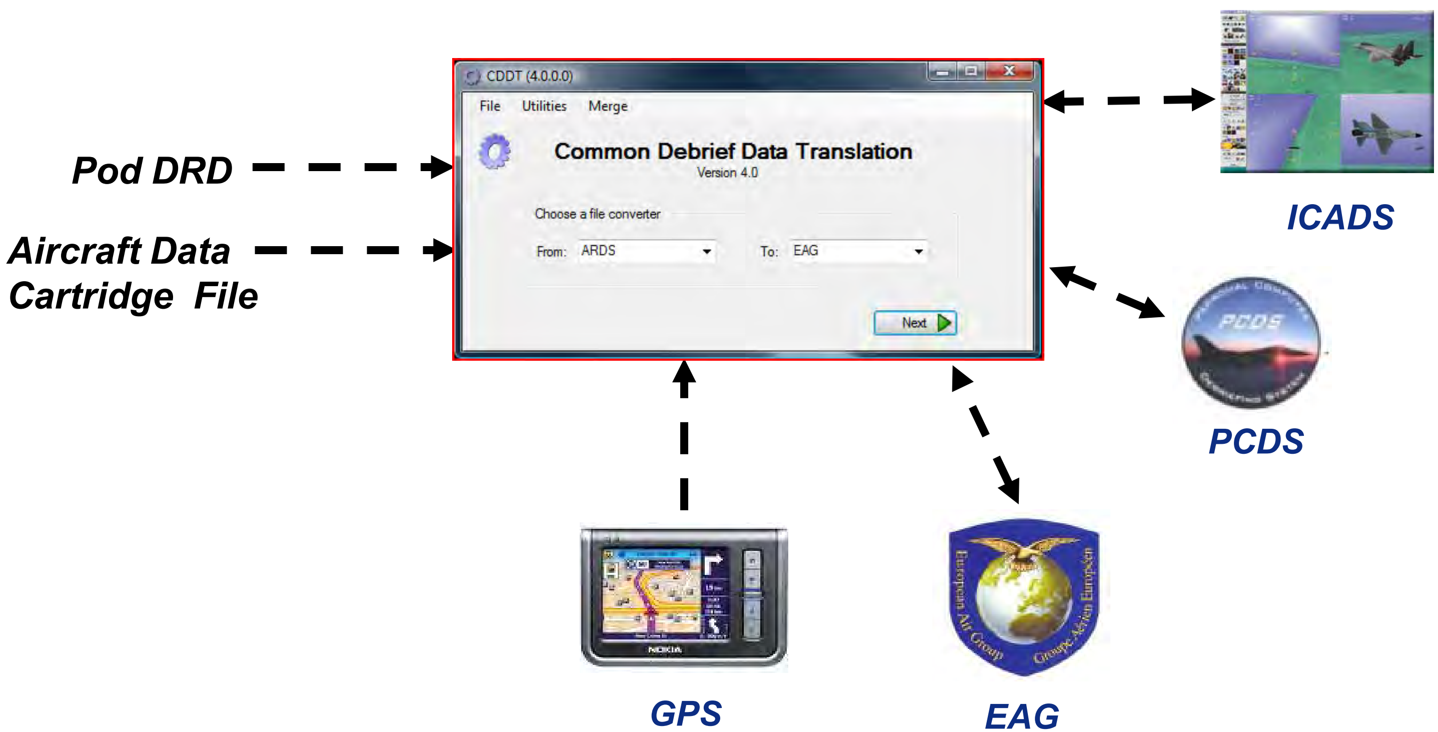
Post-Mission Merge Debrief – *Fall 08*

Post-Mission



F-22 long-term solution is an encrypted data link

CDDT System Overview



Plus one-way conversions for:
- ITAS
- JDS
- ARDS
- 4 GPS variants

Questions ?

Marine Corps Operational Test & Evaluation Activity

Kenneth R Lardie

Expeditionary Test Division

49th TARGETS, UAVS & RANGE OPERATIONS SYMPOSIUM & EXHIBITION

26 October 2011

Agenda

- Mission and Vision
- Organization
- Resources
- Programs
- Working Relationships
- Test and Evaluation Process
- Operational Testing Requirements and Objectives
- Budget Impacts on Test and Training
- Questions

Mission & Vision

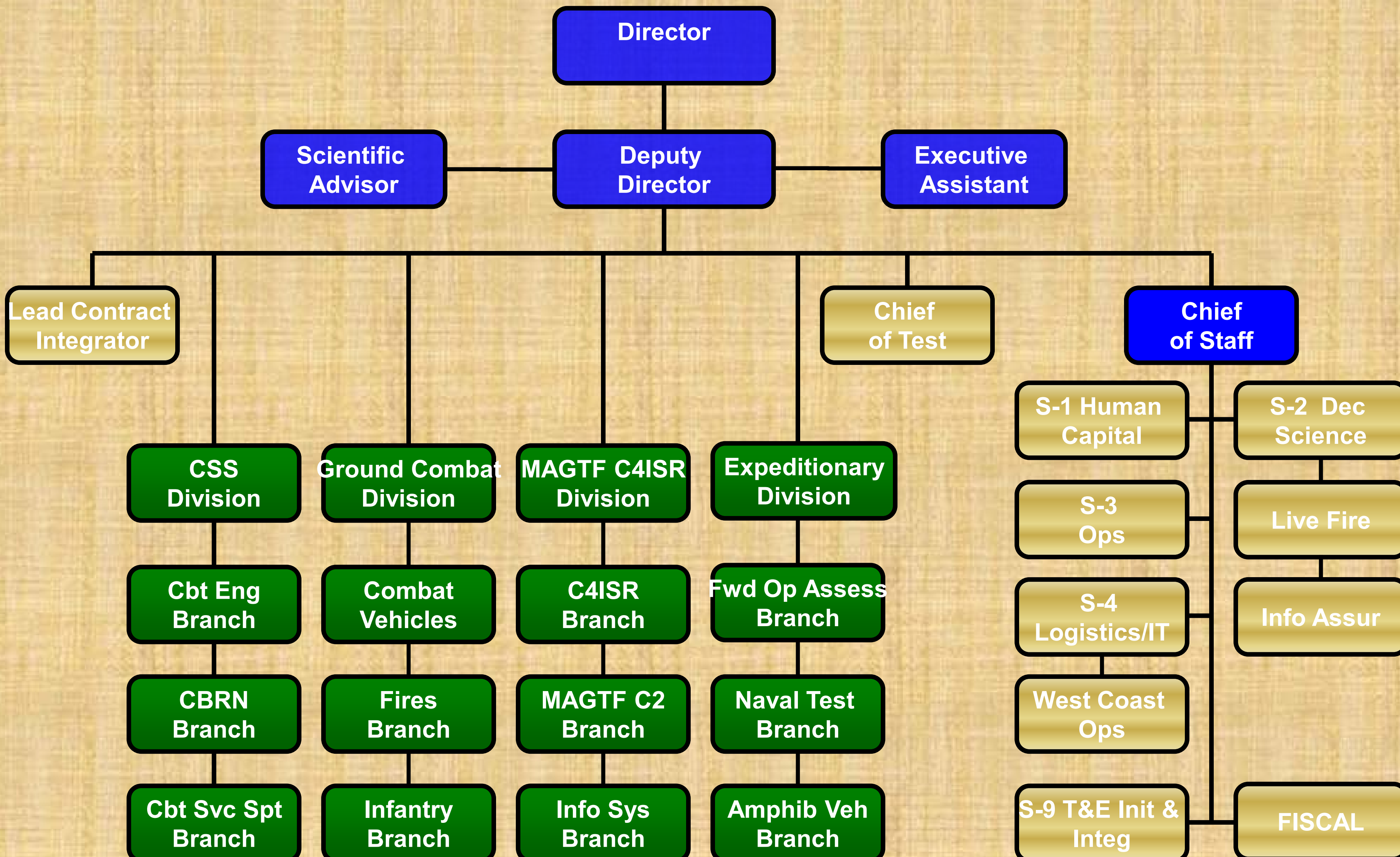
Mission

MCOTEA provides operational testing and evaluation for the Marine Corps and conducts additional testing and evaluation as required to support the Marine Corps mission to man, train, equip, and sustain a force in readiness.

Vision

- MCOTEA will be the Marine Corps leader in all aspects of realistic operational test and evaluation of material system capabilities throughout a material system's life cycle. Our highly trained, professional workforce will be a voice for the Operating Force Marine, enabling informed decision-making, and ensuring always that our test reports accurately and objectively describe what we know and don't know about the Operational Effectiveness and Suitability of the materiel solution we evaluate.
- MCOTEA will be a source for objectivity in the Marine Corps and, where appropriate, DoD's acquisition process. Our expertise, professionalism, and integrity will make us a sought-after partner within the DoD acquisition community.

MCOTEA Organization



MAGTF C4ISR Division

- MAGTF C4ISR Division
  - C4ISR Branch
    - DCGS
    - GBOSS
    - JTRS
  - MAGTF C2 Branch
    - CAC2S
    - CTN
    - GATOR
  - Info Systems Branch
    - GCSS
    - MCEITS
    - NGEN

Ground Combat Division

Ground Combat Division

- **Combat Vehicles Branch**
  - FOLAV (LAV-ATM)
  - Tank Upgrades
- **Fires Branch**
  - FSS/FSA
  - Mortars Upgrade
  - NLWS (OI & MPM)
- **Infantry Branch**
  - SMAW II
  - STS

CSS Division

- Combat Service Support Division
  - Combat Engr Branch
    - M9 ACE
    - R2C Family of Systems
    - MTVR/LVSR AFES
  - Chem-Bio-Rad-Nuclear Defense Branch
    - JBTDS-SS
    - UIPE I1
    - DR-SKO
  - Cbt Service Spt Branch
    - JLTV
    - MRAP
    - LVSR
    - EPLS

Expeditionary Division

Expeditionary Division

Naval Branch

- LHA (R)
- JHSV
- SSC
- MPF (MLP)

Forward Assessment Branch

- GunPACS
- Keyhole/RCOS
- Ex-FOB
- Minehound

Amphibious Vehicle Branch

- AAV SLEP II
- MPC
- ACV

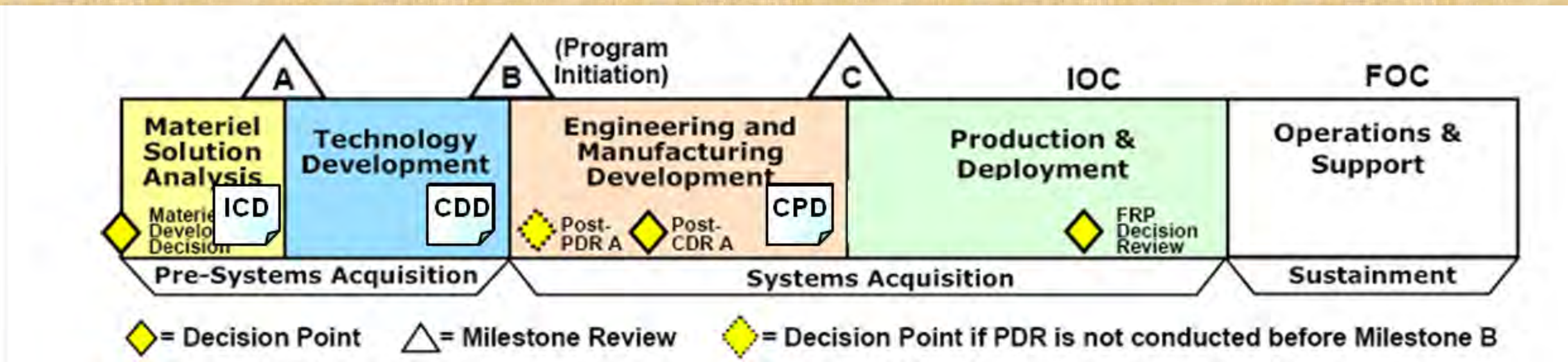
Activity Level Support

- Staff Support
  - S-2 IA/IOP
    - DOT&E Initiative
    - Acquisition Programs
    - IV&V
  - S-2 Live Fire
    - LFT&E
    - OT&E
    - Live Fire Studies
  - Additional Staff Support
    - Training
    - Logistics
    - Scientific Studies

RESOURCES

- **Facilities / Equipment**
  - **Headquarters: Quantico, VA**
    - **Test Support Facility at Camp Wilson, 29 Palms, CA**
    - **Test Support Facility at Del Mar (21 Area), Camp Pendleton, CA.**
- **Test Instrumentation**
  - **Portable Data Collection Suites**
  - **Data Instrumentation Vehicle**
  - **Web-based, data repository**
- **Personnel**
  - **Mix of active duty Marines and government civilians**
    - **28 Active duty Marines**
    - **42 Government civilians**

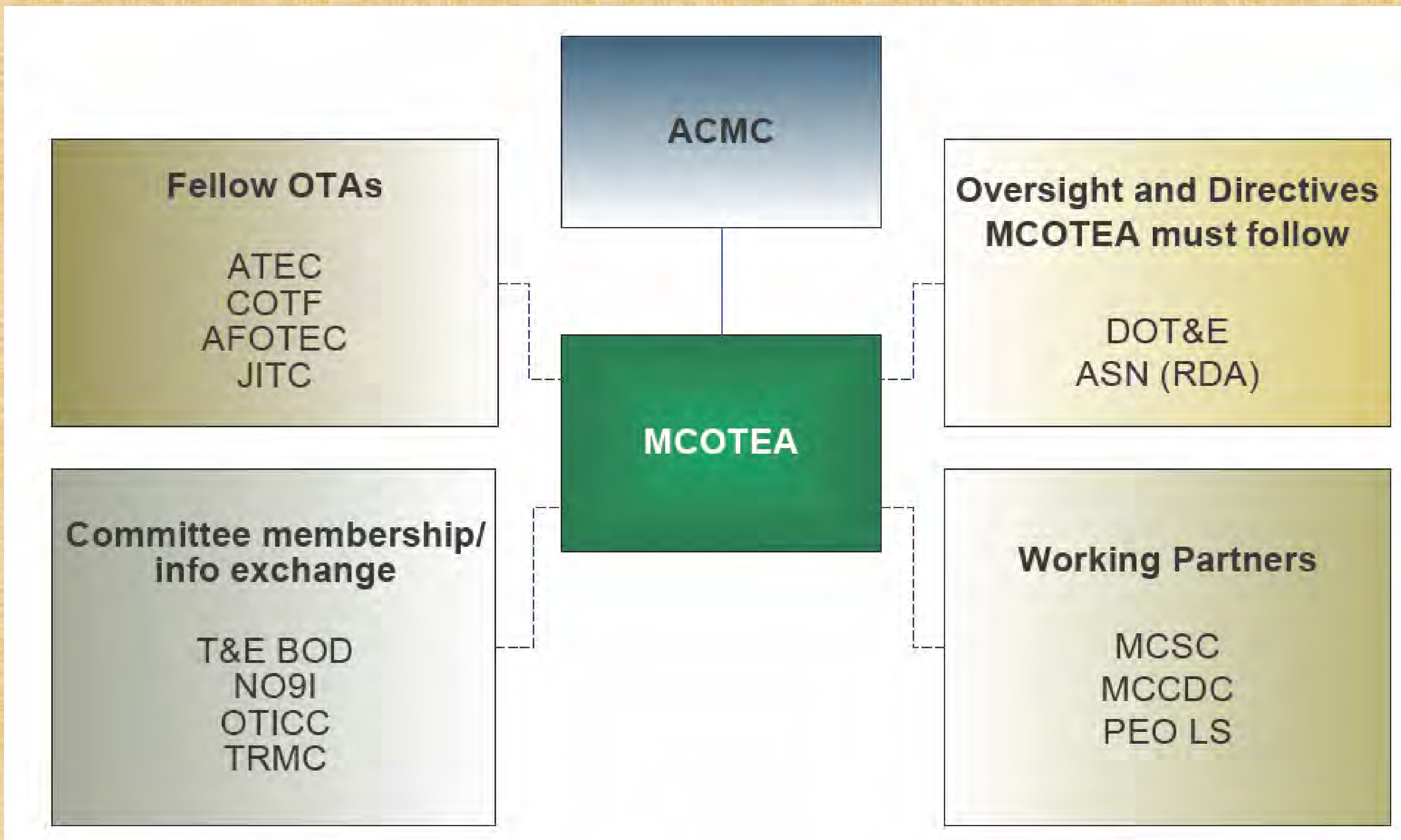
Distribution of T&E Efforts by Acquisition Phase



▪ Technology Development Strategy (TDS) ▪ Test Evaluation Strategy (TES) ▪ ID emerging T&E capability requirements ▪ ID T&E resources ▪ Develop T&E requirements in RFP ▪ Reporting	▪ Systems Evaluation Plan (SEP) ▪ Test and Evaluation Master Plan (TEMP) ▪ Execute T&E Program ▪ CDD requirements for testability and evaluation ▪ TRL Evaluation ▪ Reporting	▪ SEP ▪ TEMP ▪ Execute T&E Program ▪ Support PDR/CDR ▪ CPD requirements for testability and evaluation ▪ TRL Evaluation ▪ CT / DT ▪ Discovery and correction ▪ OA ▪ Reporting	▪ SEP ▪ TEMP ▪ Execute T&E Program ▪ Characterize system capabilities and limitations ▪ T&E results to MDA ▪ AOTR / OTRR ▪ Support training for IOT&E ▪ IOT&E / FOT&E ▪ Reporting	▪ Follow-on DT and OT ▪ Verification of corrections for deficiencies ▪ Develop T&E programs to support upgrades, modifications, increments ▪ Reporting
4%	**12%**	**38%**	**40%**	**6%**

Programs Supported:
ACAT 1 thru ACAT IV, AAP’s, UNS, USON, and Forward Operational Support
Currently supporting 125 programs.

Organizational Relationships



Test & Evaluation Processes

MCOTEA's 6-step Operational Test and Evaluation Process

Plan → Test → Report

1 System Evaluation Plan
- Program Initiation
- SEP Development

2 Test Concept, Test and Evaluation Master Plan Input, *and* **Failure Definition/ Scoring Criteria Charter Development**

3 Test Planning
Operational Test Plan and Logistics

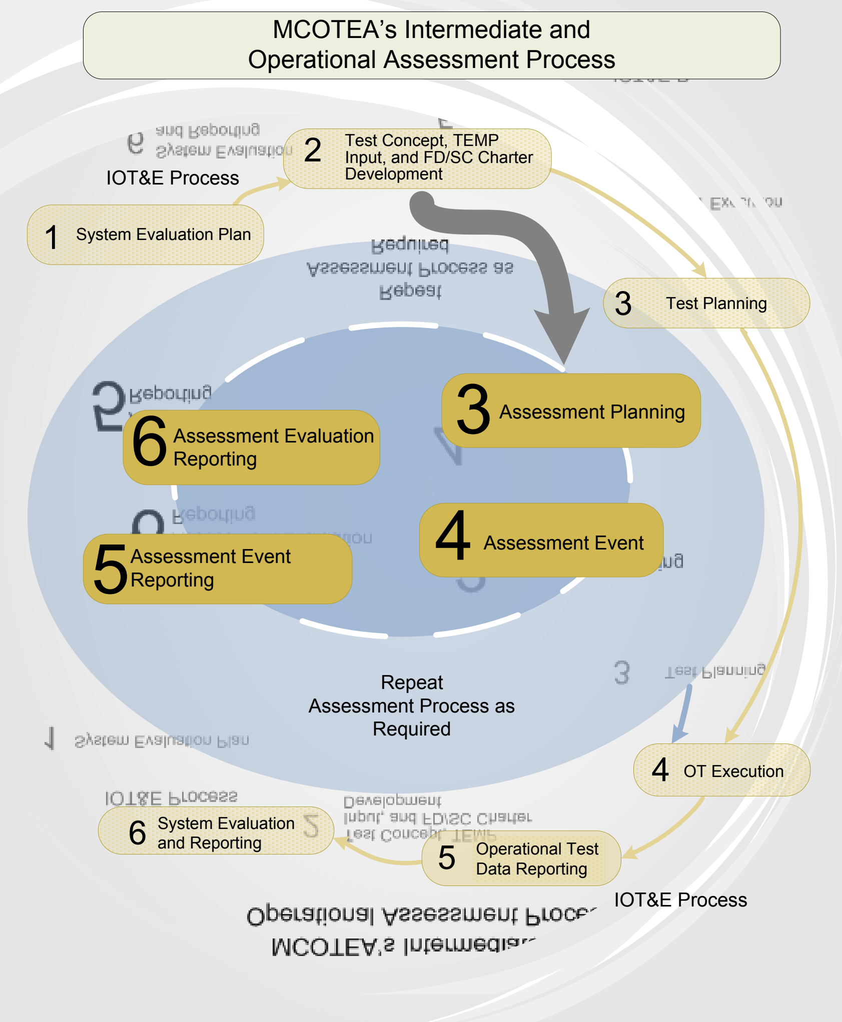
4 Operational Test Execution
- New Equipment Training
- Pilot Test
- Record Test
- Posttest Activities
- Test Data Report Development

5 Test Data Report
- Test Deviations
- Data (unanalyzed)

6 System Evaluation and Reporting
- Final evaluation
- Operational Test Agency Evaluation Report (OER)

or Operational Assessment Report (OAR)

Continuous Evaluation Occurs during *Integrated Testing*



Operational Testing Requirements and Objectives

- **Top-level requirements for adequate operational testing:**
  - employ a production-representative system in realistic operating conditions with typical Marine operators and maintainers
  - collect data that accurately describes the test conditions and system performance results
  - analyze the data independently and without bias for use in system evaluation
- **Top-level requirements for objective system evaluation:**
  - collect and evaluate information from a variety of developmental and operational test events
  - determine if thresholds in the approved capabilities documentation and Critical Operational Issues have been satisfied
  - determine the system's Operational Effectiveness (OE), Operational Suitability (OS), and Operational Survivability (OSur)
  - assess system effects on combat operations
  - provide any additional information on the system's operational capabilities

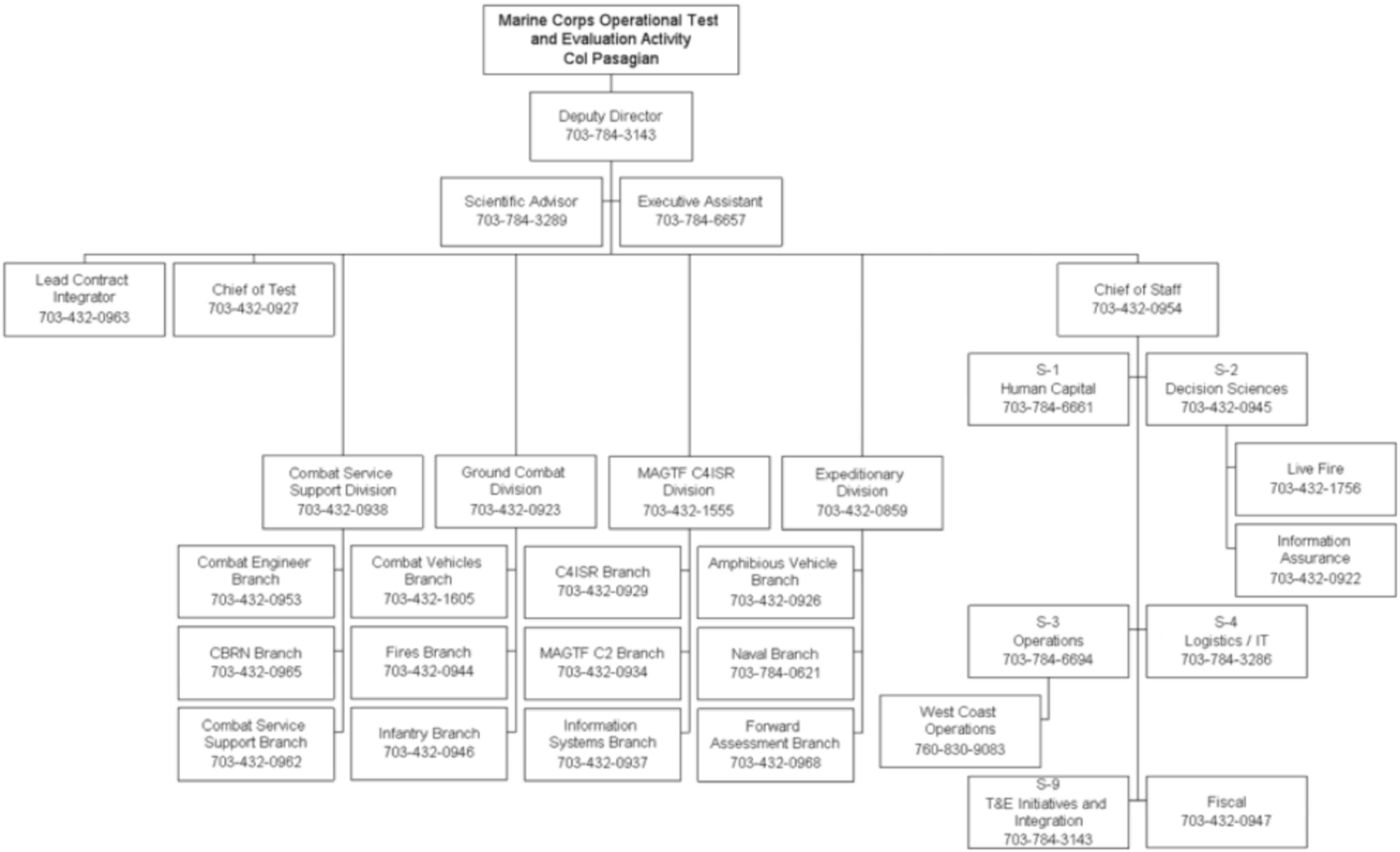
Budget Impacts on Test and Training

- **Continue coordination with Program Managers (SuT & TRNG) and Training & Education Command (TECOM) in development of test resource assets that supports future training with the new SuT.**
- **Realistic Targets**
  - **REMTT –*Full Scale 3D Realistic Electro-Magnetic Threat Tarfet***
  - **TVST- *Full Scale 2.5D Threat Vehicle Surrogate Target***
  - **RLCT- *Full Scale 2.5 Realistic Low Cost Target***
- **Instrumentation**
  - **POESIS – *Portable Oceanographic Environmental Sensor Instrumentation System*: Surf Arrays; Wave Buoys, Digital Weather Stations, Low Light Video – RF / integrated to single command suite.**
  - **FOFTI – *Force-On-Force Test Instrumentation*: Laser engagement system for armored vehicle systems and supports gunner/crew training**

- **Questions?**

Semper Fidelis!

MCOTEA Organization



Hugh Harris Scholarship

- My Purpose
  - Provide annual update to the membership
  - Review/Inform membership on application procedures
  - Solicit your continued support by
    - Identifying qualified applicants
    - Providing continued financial support

Purpose of Scholarship

- Memorialize Hugh Harris
- Provide Financial Assistance to Eligible Students
- Encourage Interest in:

  Science/Engineering/Technology/Mathematics (STEM)

Educational Crisis

- In 30 Years US Public Education Dropped from No. 1 in the World to No. 29
- All-STEM Degrees (% of total awarded)
  - S. Korea: 37.8%
  - Mexico: 28.1%
  - US: 17.6% (Engineering 5%)

Scholarship Status

- Established in 1991: Goal $50K, to be self sustaining
  - Funds Administered by NDIA HQ.
- First Scholarship Awarded in 1992
  - One $1000 Award in ’92
  - Awarded $68K to date
- This year’s winners
  - Savannah Lloyd: University of Florida
  - Ian Villaluz: University of Alabama
  - Robert Witt : University of Florida
  - Keith Nygaard: Colorado School of Mines
  - Tyler Thorneberry: University of Florida
  - Joseph Morris: Clemson University
  - Carroll Cameron: Florida State University

Scholarship Schedule

- 20 January: Members identify applicants
- 1 February: Mail info packets to applicants
- 15 March: Applications to Scholarship Committee
- 1 April: Scholarship Committee ranks applicants
- 10 April: Executive Committee determines number/amount of scholarships
- Early August: NDIA issues scholarship grants

Eligibility

- Be a US Citizen
- High school senior or graduate
- Applied to/enrolled in accredited 4 year college
- Pursuing STEM career
  - **S**cience
  - **T**echnical: Physics, Chemistry
  - **E**ngineering: Aerospace, Chemical, Civil, Computer, Electrical, Industrial, Mechanical, Software
  - **M**athematics

Eligibility (continued)

- Sponsored by Targets/Ranges/UAV Division member (individual or corporate)
- Sponsored by Gulf Coast Chapter
- Recipients of full scholarships (military academy, ROTC, etc.) are ineligible
- Enrollments in 2-year community colleges are ineligible
- Complete by-laws are available upon request

Your Responsibilities

- Identify Potential Applicants
- Notify Scholarship Committee

  Cort Proctor

  1542 Glenlake Circle

  Niceville FL 32578

  email: cortp@aol.com
- Ensure continued tax deductable donations (corporate/individual)

2011 Contributors

NDIA's Gulf Coast Chapter: $3000

THANKS

Questions

?

K-MAX Cargo Unmanned Aerial System

October 2011

Bud Sauvageau

Kaman Aerospace
KAMAN

LOCKHEED MARTIN

Distribution Statement A - Approved for public release; distribution is unlimited, as submitted under NAVAIR Public Release Number 11-571

Agenda

- K-MAX Capabilities
- Resupply Need
- K-MAX History → Manned / Unmanned Variant
- K-MAX Demos
- Cargo UAS Program
- Emerging DoD Programs
- Questions

Distribution Statement A - Approved for public release; distribution is unlimited, as submitted under NAVAIR Public Release Number 11-571

K-MAX: Purpose Built for the Mission

- **K-MAX is the only helicopter designed, built, and tested, for the repetitive lift industry. Made for the logging industry**

- **K-MAX manned version is FAA Certified!**

- **Aircraft has proven itself with over 260K hrs on the K-MAX fleet**

- **Intermeshing rotors eliminate tail rotor and simplify maintenance**

- **K-MAX cost / maintenance / fuel burn < ½ manned cargo RW**
  - **$1,100 / hr – Direct Operating Cost**
  - **2 Maintenance Man Hours per Flight Hour (MMH/FH)**
  - **85 gal / hr – Fuel Burn Rate**

Proven Performance & Affordable Solution

K-MAX Aircraft Capabilities

Speed	with load: without load:	80 kt 100 kt
Range	internal fuel:	267 nm
Endurance	internal fuel: ext. aux tank:	2 hr 41 min 12+ hr
Max Payload		6,000 lb
Weight	Max Gross: Max Take-Off: Empty:	12,000 lb 7,000 lb 5,145 lb
Lift (ISA +15°C)	at sea-level: at 15,000 ft:	6,000 lb 4,313 lb
Multiple Delivery		1 to 4

K-MAX Maintains Performance in High/Hot Environment

Resupply Need

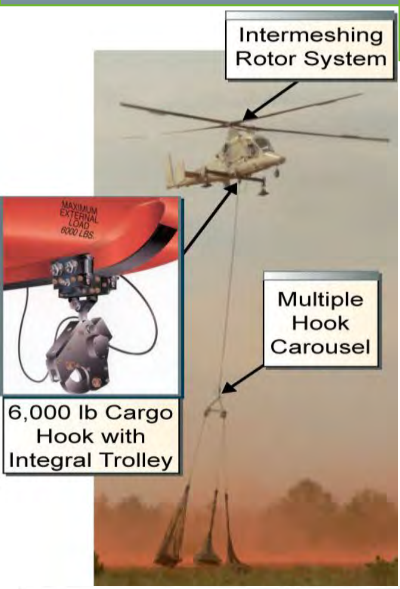
- Mission Critical / Time Sensitive (MC/TS) resupply to any unit
- Routine resupply to a single company-size unit or several smaller units in a 24 hr period
- Difficulty transporting heavy loads over unimproved roads, inhospitable terrain and IED susceptibility on supply convoys
- Limited numbers of utility/cargo helicopters are conducting logistical resupply missions and are not able to focus on combat operational support missions
- Threat to manned aircraft and personnel
- Insufficient rotary wing resupply capabilities caused by extreme heat and high altitudes
- Inability to conduct precision aerial delivery and retrograde

Unmanned K-MAX is the Solution!

K-MAX History

‘93

K-MAX Development



‘99

K-MAX Production

Designed, Built, Certified for Repetitive Lift
Applications: Logging, Construction, Fire Fighting, Mining Surveys

FAA certification ’94
>244,000 flight hrs.

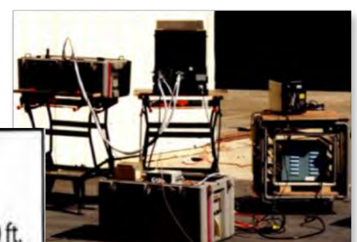
Unique Intermeshing Rotor System
6000 lb lift capability
One to one lift ratio
Low noise signature
Low Maintenance Cost

‘03

Early UAS

High Power RF LOS
-Range ~50 nmi
-Close proximity control

Limited authority Control Station



‘09

Successful Demos

Ft. Eustis
Eglin to Rucker
Ft. Benning
Endurance – Bloomfield CT (12+ hrs)
Ft. Eustis
Quantico

‘10

Robustness

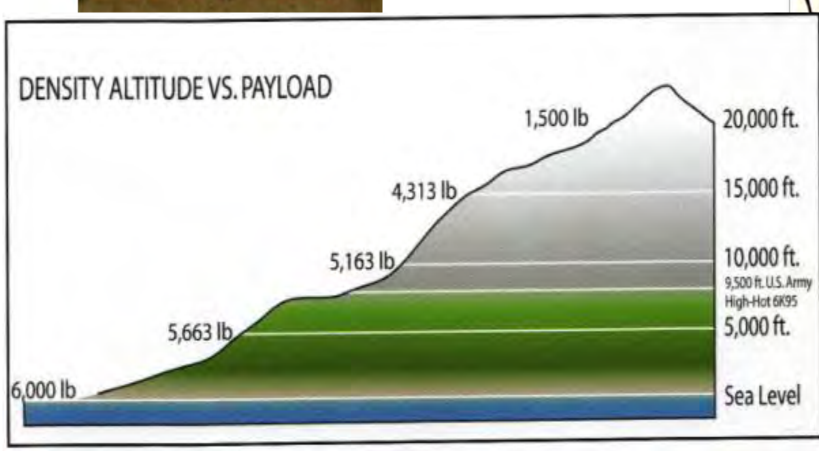
Mission Planning
Dynamic Retasking
Contingency Mgmt
GCS Simplified Interface
Automated Load Delivery
Level 5 Control
Full Authority Autopilot
Communications
- Enhanced LOS Datalink
- BLOS

‘11

Contracts!

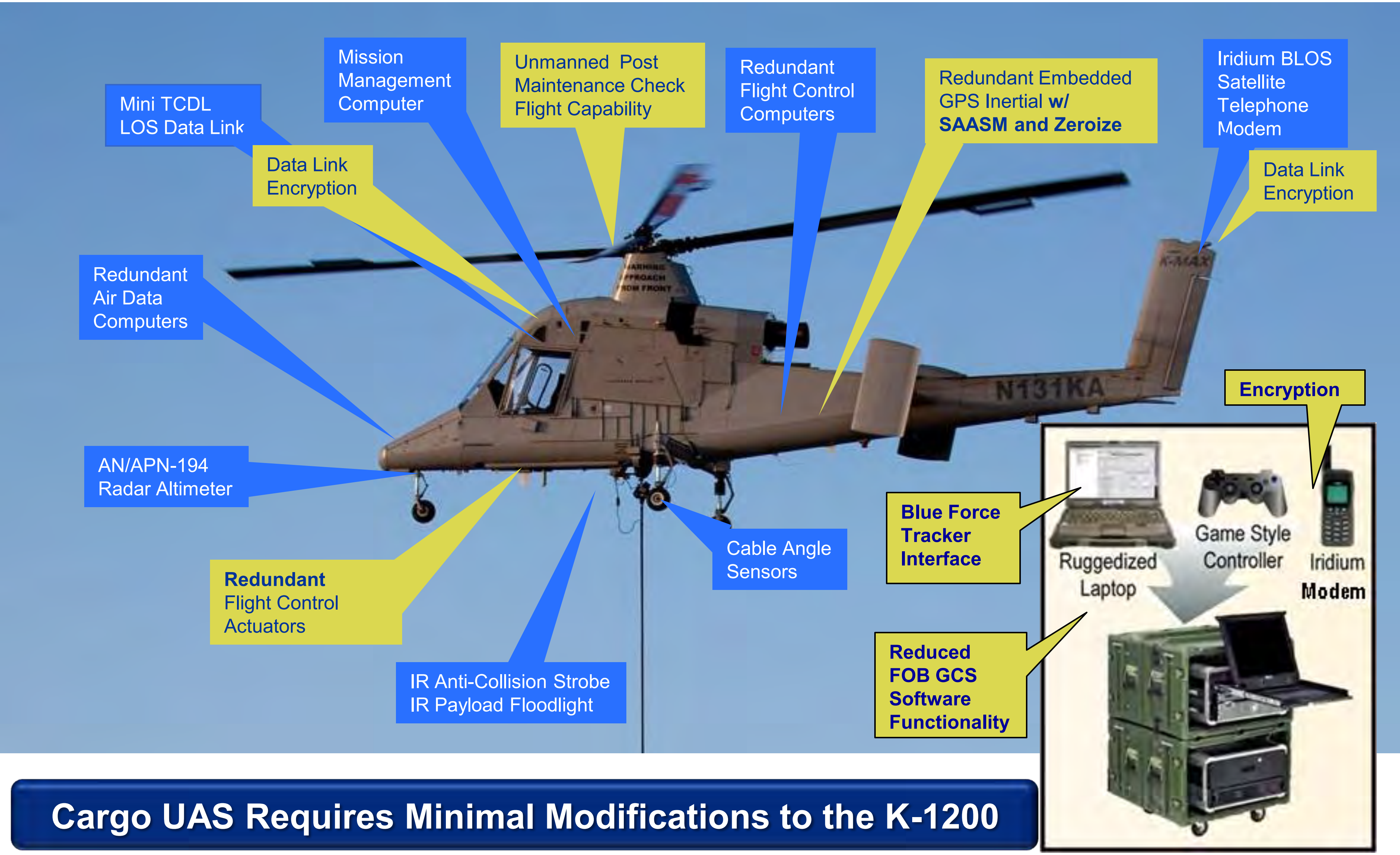
NAVAIR: USMC Immediate Cargo Re-supply

AATD: USA JCTD



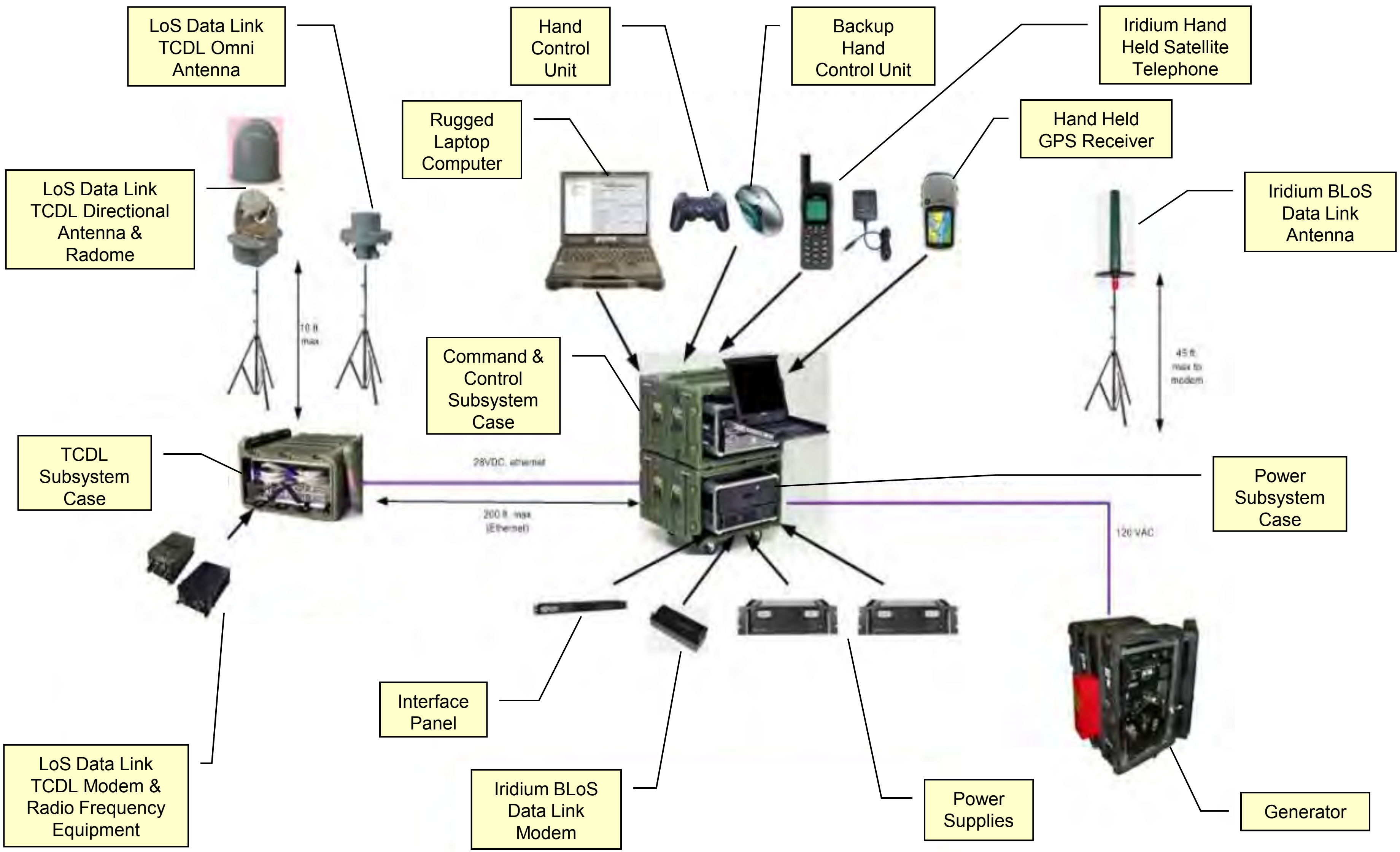
900+ UAS Flight Hours to Date

Cargo UAS Program



Cargo UAS Requires Minimal Modifications to the K-1200

Ground Control Station



Concept of Operations

- **NAVAIR RFP (N0019-10-R-0020) – 22 Sep 2010**

Emerging DoD Programs

- **NAVAIR RFP (23 Sep 2010)**
  - **USMC Immediate Cargo Re-supply - Awarded in Sep 2011**
- **Joint Capability Technology Demonstration (JCTD)**
  - **AATD (Aviation Applied Technology Directorate) ATUAS (Autonomous Technologies for UAS)**
- **Proposed Naval Research**
  - **ONR (Office of Naval Research) AACUS (Autonomous Aerial Cargo/Utility System)**

Summary

- Unmanned Cargo Resupply emerging mission
- Requirements are established to address the need
- K-MAX proven platform for repetitive lift
- Lockheed Martin and Kaman Aerospace making unmanned cargo capability forward
- Near term deployment will demonstrate utility in theater

K-MAX is the right aircraft for unmanned Logistics Resupply !

Distribution Statement A - Approved for public release; distribution is unlimited, as submitted under NAVAIR Public Release Number 11-571

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NDIA Symposium
Targets, UAVs & Range Operations

Range Encroachment Defense

October 26, 2011

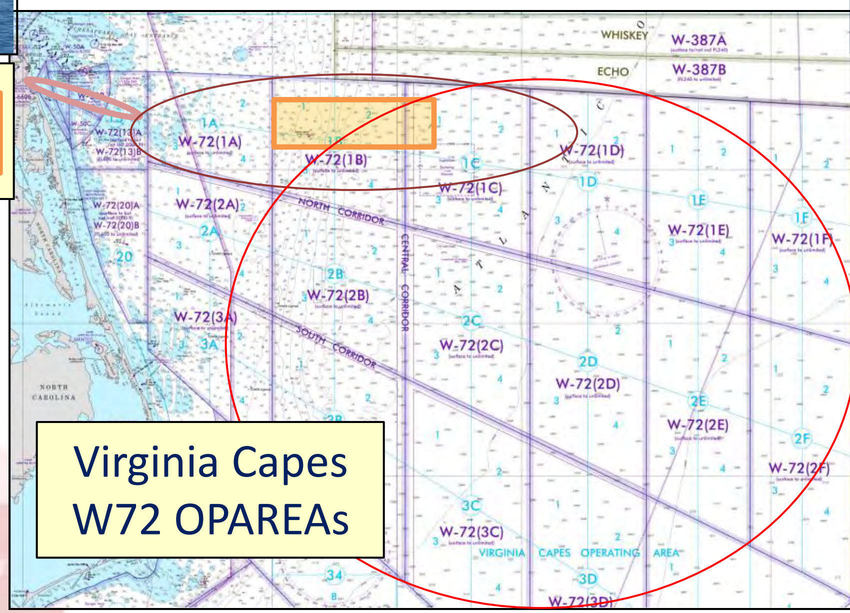
Steve Shegrud
Whitney, Bradley & Brown
703-448-6081 ext. 263
sshegrud@wbbinc.com

Current Encroachment Issue
How TARAT Is Helping DoD / DoN

Encroachment Issue

- VA Task Force wants wind farms in close to Norfolk power grid
- USN wants wind farms further out to lessen impact on training

Notional Wind Turbine Placement



Virginia Capes W72 OPAREAs

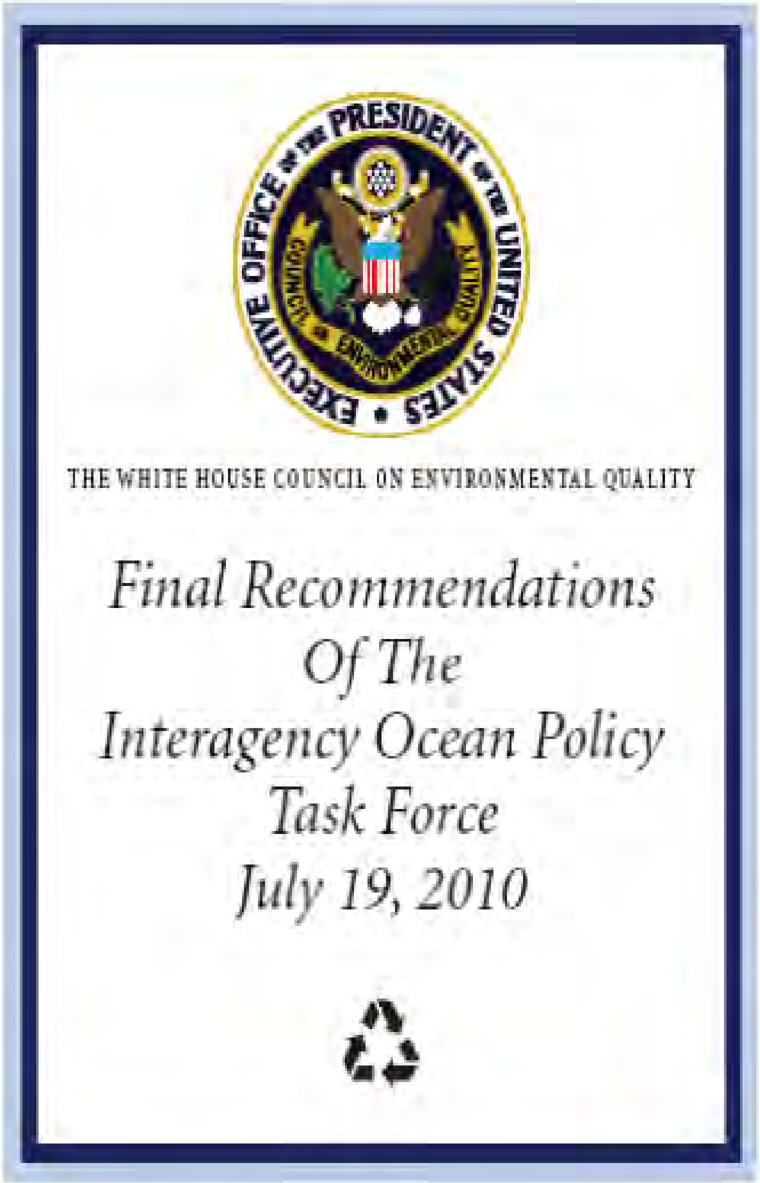
OPAREA Usage Example: Ship Missile Exercise

- Drone Launch/Transit
- Drone Tracking Area
- Missile Hazard Pattern

What is the full 'impact' on DoD / Services for test and training events?

DOD / DoN need a better range encroachment defense to show the full impact to T&E and Fleet Training if certain OPAREA grids are lost or availability is reduced…

Coastal and Marine Spatial Planning (CMSP)



- CMSP above all is ***ecosystem***-based
- National policy driven; ***regional*** focus
- NOAA-White House Council on Environmental Quality ***culture***
- Navy strategy must ensure strong and convincing analytic representation of Navy’s national security equities (e.g., operating sonar in littorals, etc.) and persistently challenge any measures which may restrict valid T&E or Fleet Training, sensor employment or other operational requirements
- Navy-Marine equities ***need stronger metrics-based analysis*** against this new scientifically-based culture

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Data Needed to Defend Range From Encroachment

Identify Hazardous Activity in OPAREAs

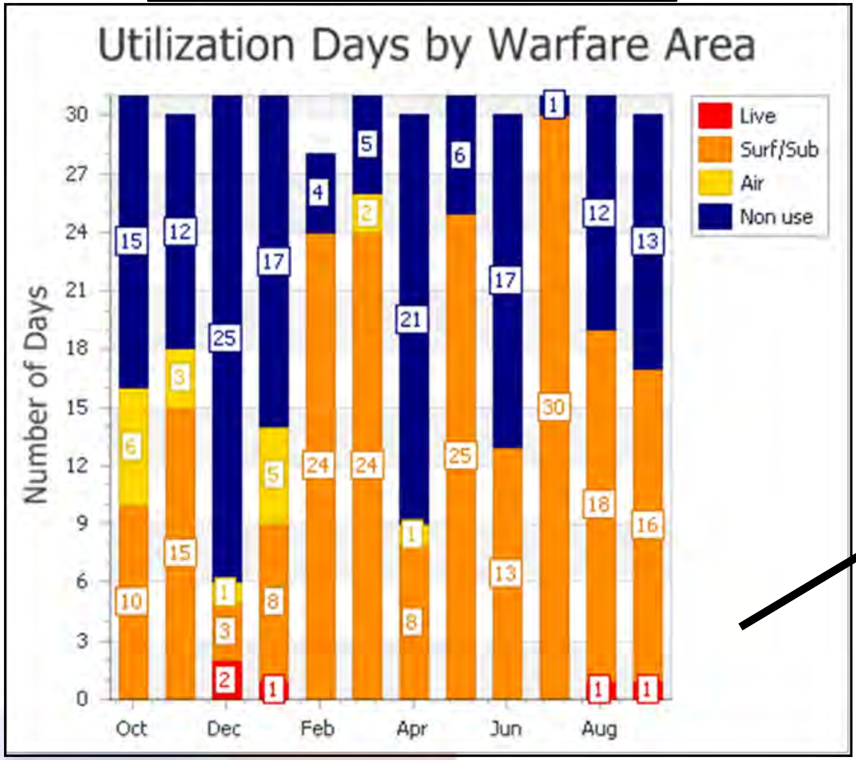
- Ship events
- Submarine events
- Low flying aircraft events
- Aerial targets (subsonic, supersonic)
- Seaborne targets
- UW targets
- HM sled-dragging events
- Ordnance (live or inert) expended, dropped, launched
    - Ships & Submarines
    - Aircraft
    - USCG
    - NASA
    - USMC Air
    - USAF
    - USA
    - Other / DOD

Link event data with hazardous activity – Display by OPAREA Grid

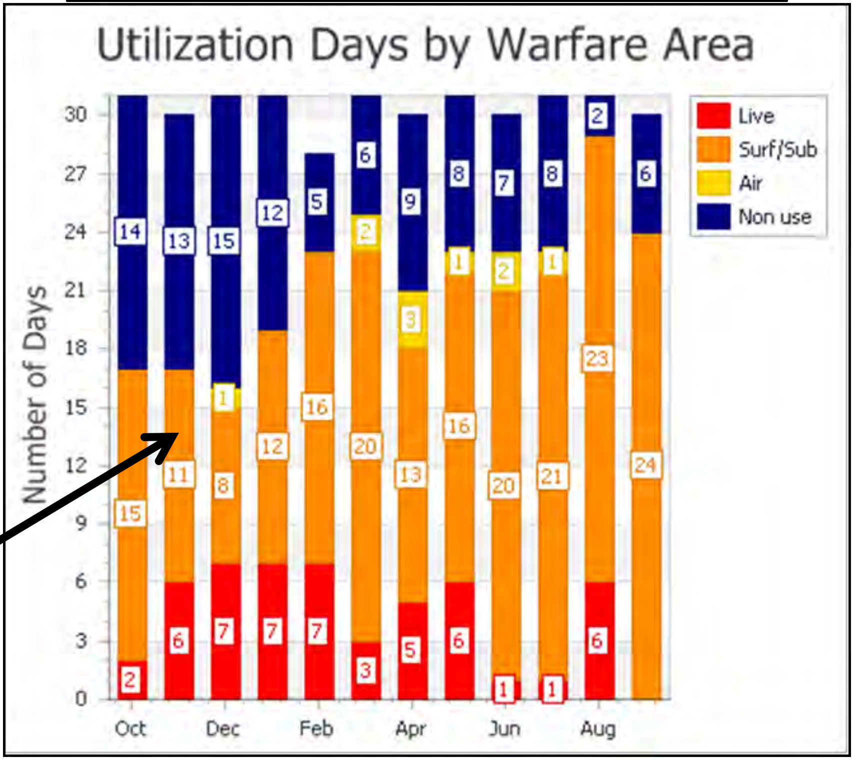
W122 (5) Utilization
Side-by-Side Comparison

Dashboard Report after partial data integration effort (Sep11)

TARAT with TRIMS & SHARP Data - FY09 Data



TARAT with TRIMS, SHARP, NAVSKED, TRMS & TORIS Data – FY10 Data



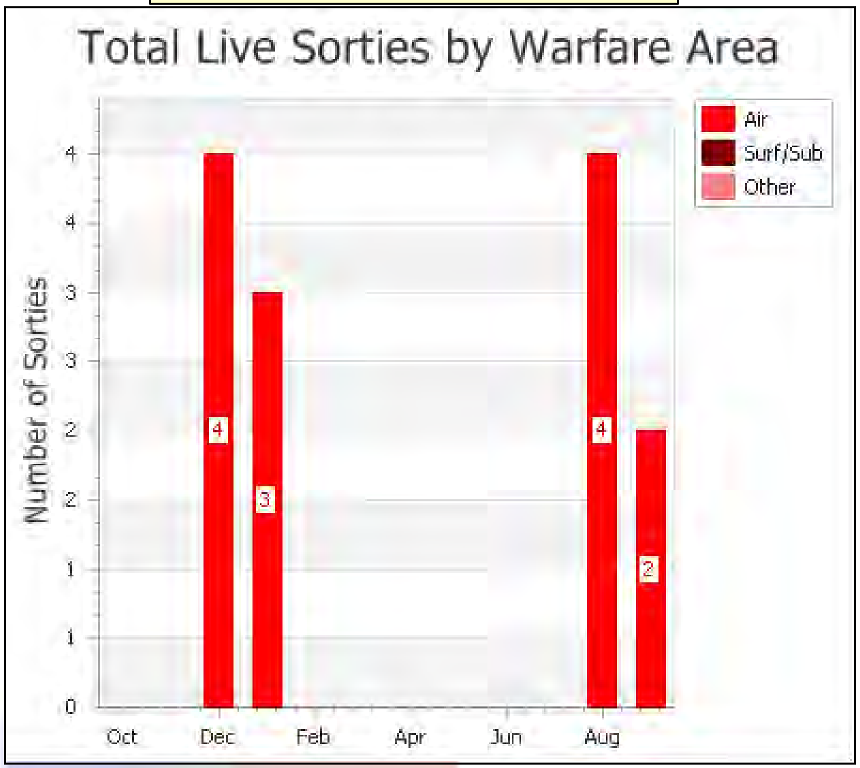
Usage curve increases from FY09 to FY10 with additional data sources

- Improvements over initial dashboard reports (less 'Blue' or 'No Use' days)
- 'Ship Events' will significantly increase with identified additional data

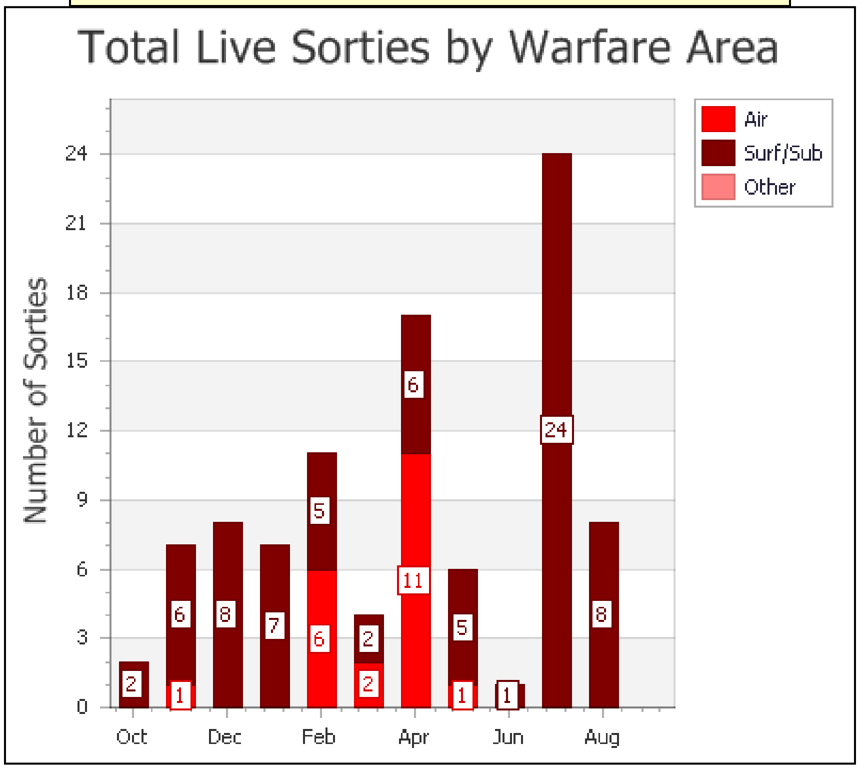
W122 (5) Ordnance Expended
Side-by-Side Comparison

Dashboard Report after partial data integration effort (Sep11)

TARAT with TRIMS & SHARP Data - FY09 Data



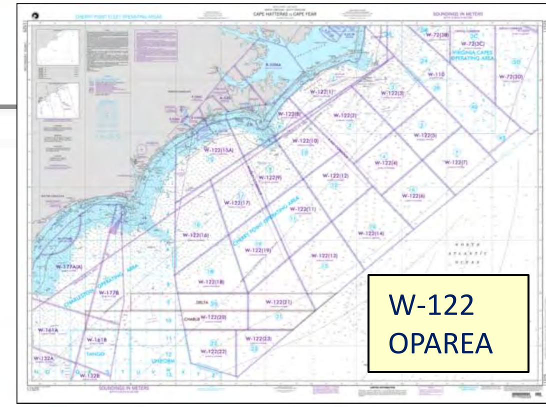
TARAT with TRIMS, SHARP, NAVSKED, TRMS & TORIS Data – FY10 Data

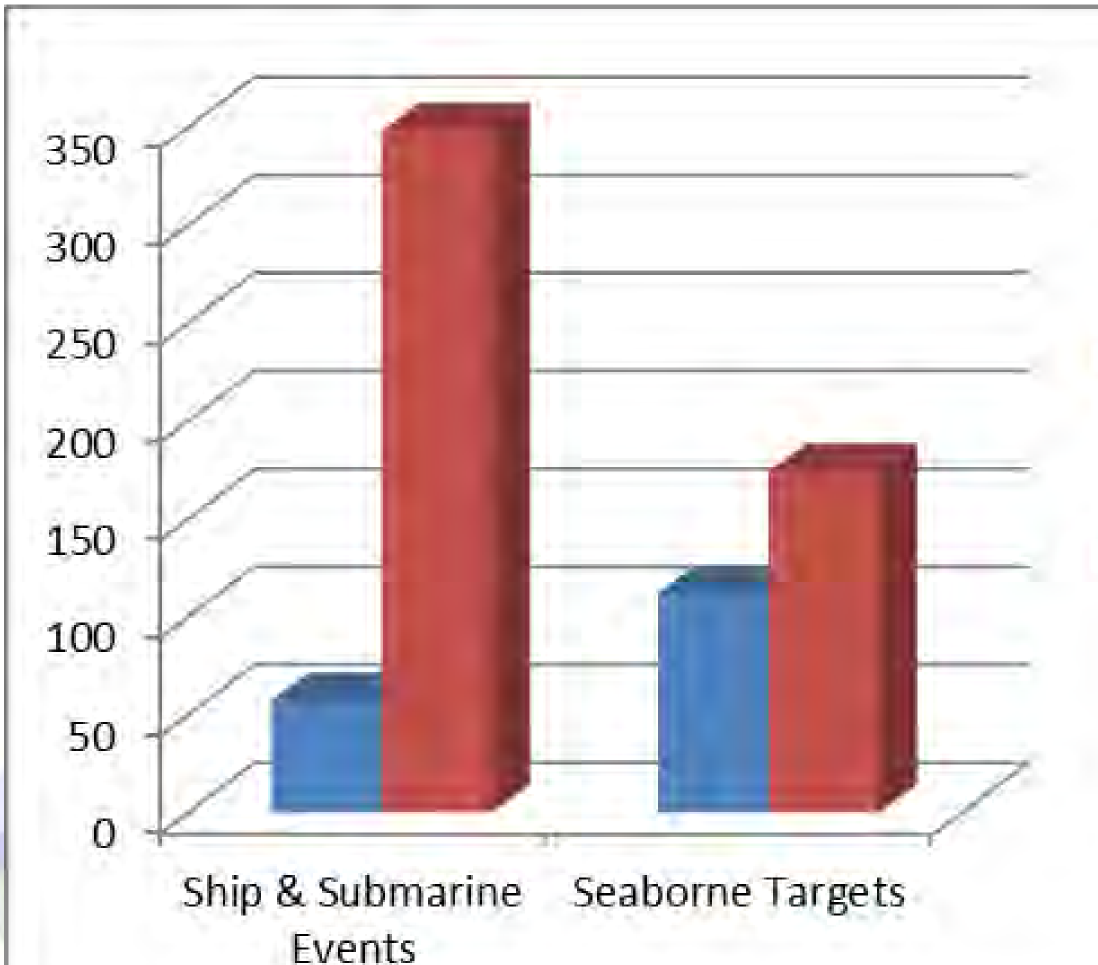


- Improvements over initial dashboard reports
- 'Ship Ordnance Expended' will slightly increase in TARAT with integration of USFF ATR data; will significantly increase with NOLSC data

Decisions Being Made With Incomplete Data

Ship Events & Seaborne Target Utilization





Decision Quality Data Needed & Not Available

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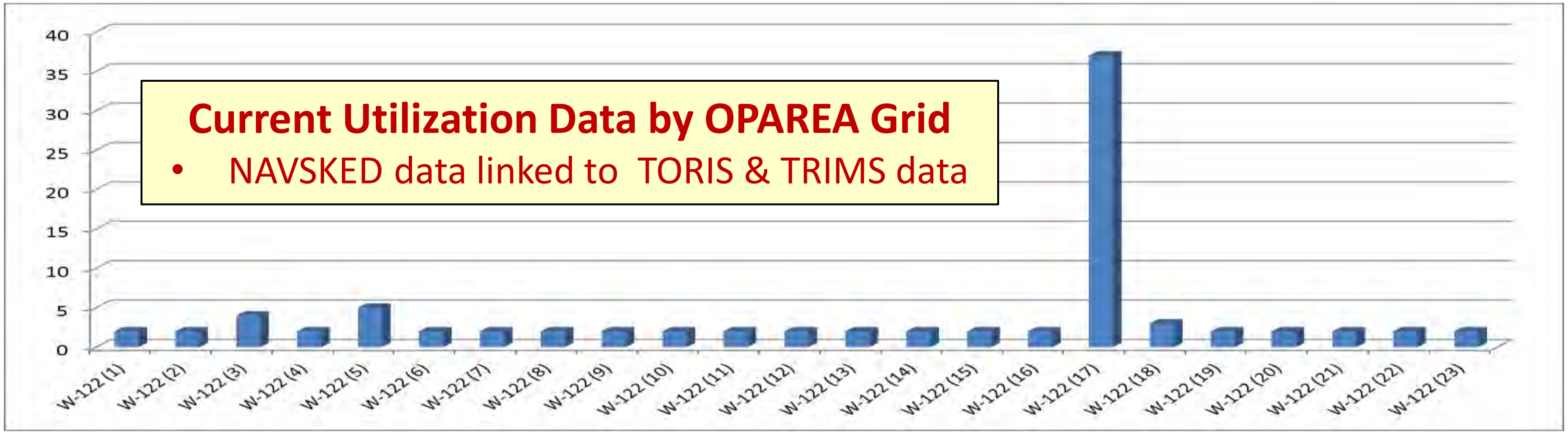
W122 OPAREA Grid Use (7Jul10-15Jul10))
USS KEARSARGE Expeditionary Strike Group Exercise

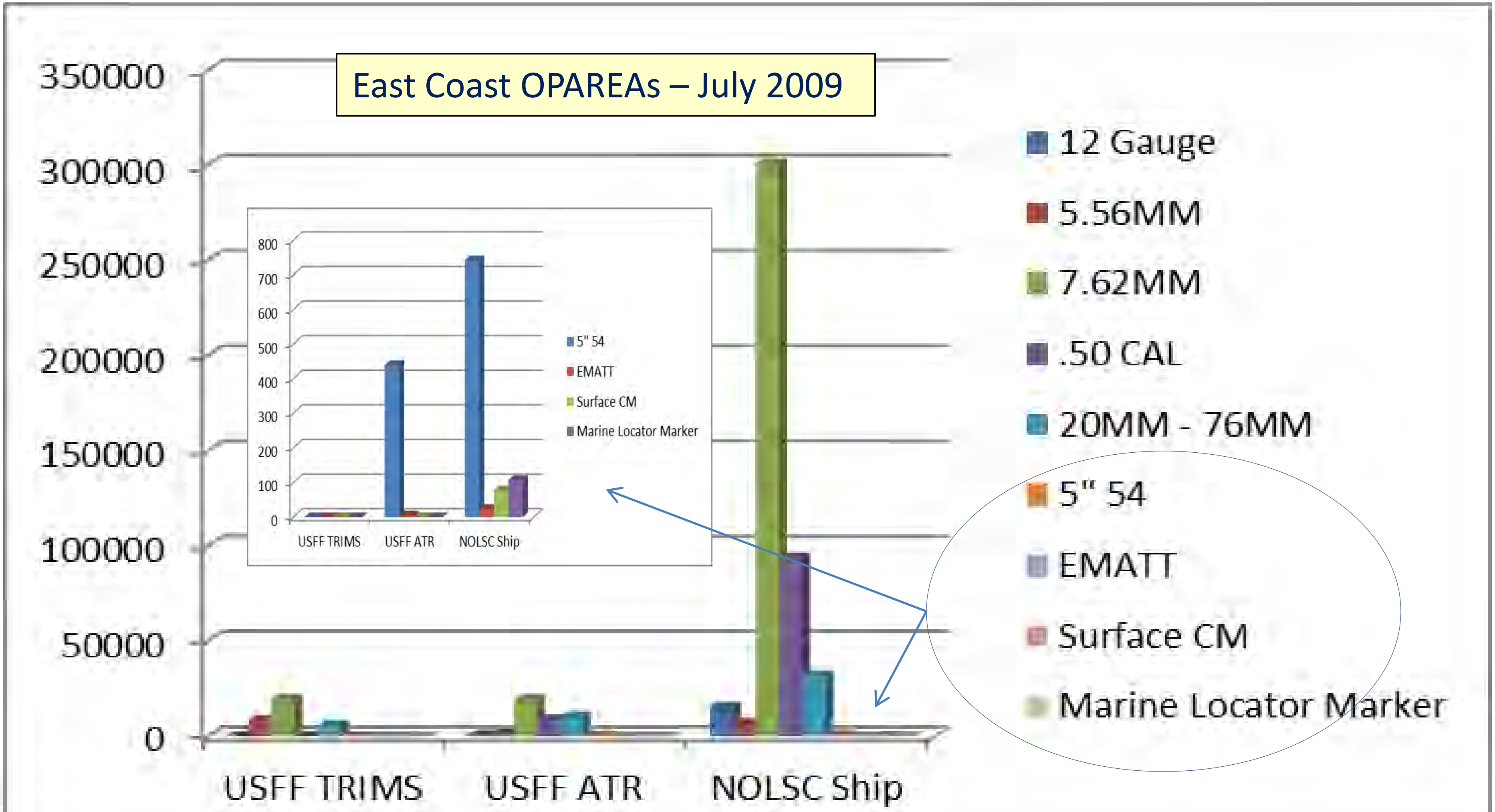
Current Utilization Data by OPAREA Grid
- NAVSKED data linked to TORIS & TRIMS data



Commander Strike Forces Training, Atlantic
- NAVSKED data linked to CSFTL Ship Event data

- **USFF TRIMS records average of 4 ship events per grid over 9 days**
- **Exercise records average of 212 ship events per grid over 9 days**

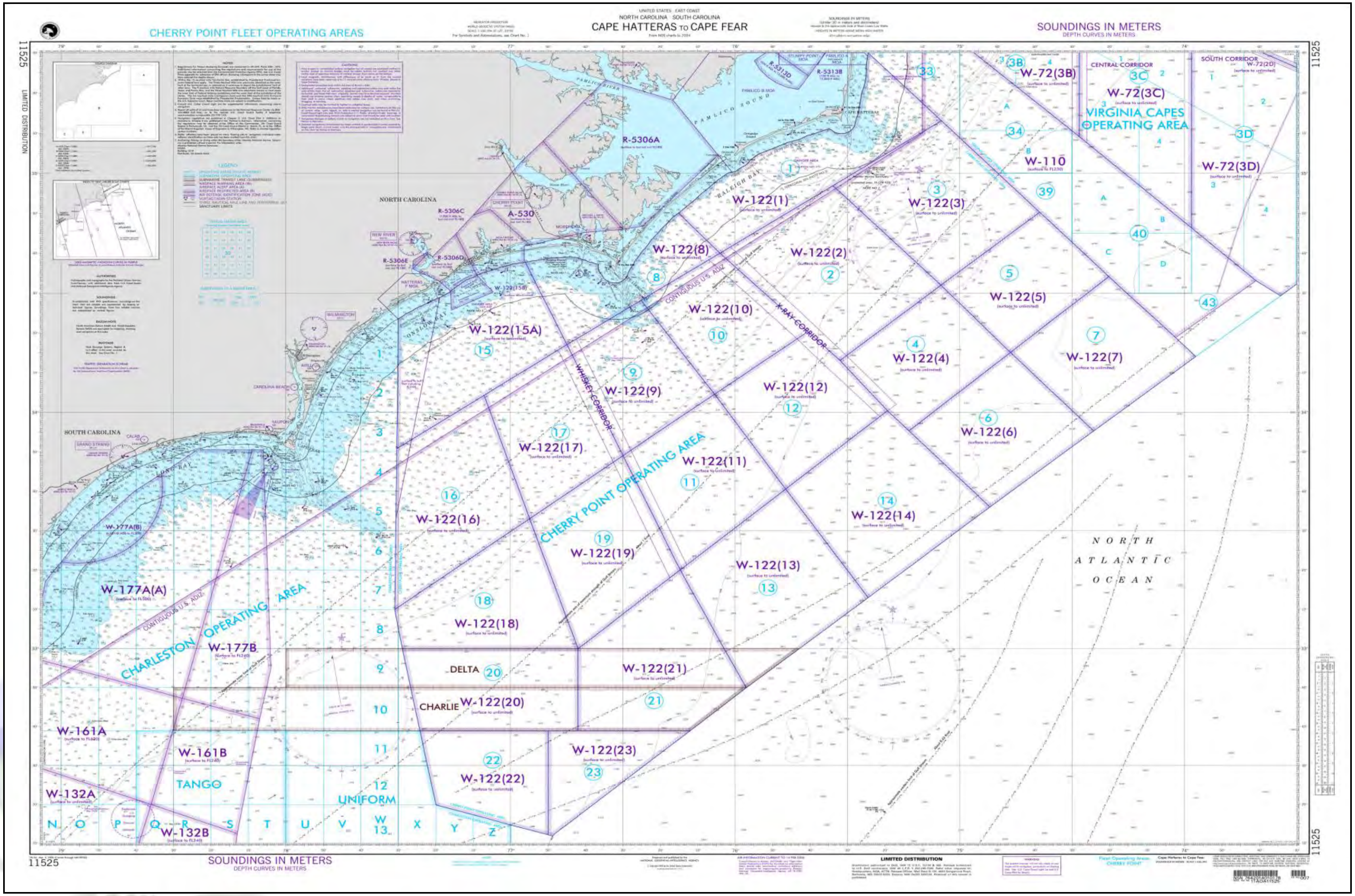
Ship Ordnance Expended Data on LANT OPAREAs
Comparison From Separate Databases



Ship Ordnance Expended Data will improve encroachment defense for DOD/DoN

- TRIMSV & USFF ATR slightly improve ship ordnance expenditure data (only record ~9%)

Questions


CHERRY POINT FLEET OPERATING AREAS
CAPE HATTERAS TO CAPE FEAR
SOUNDINGS IN METERS
NORTH CAROLINA
SOUTH CAROLINA
R-5306A
R-5306C
A-530
R-5306E
R-5306D
W-122(1)
W-122(2)
W-122(3)
W-122(4)
W-122(5)
W-122(6)
W-122(7)
W-122(8)
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W-122(10)
W-122(11)
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W-122(13)
W-122(14)
W-122(15A)
W-122(16)
W-122(17)
W-122(18)
W-122(19)
W-122(20)
W-122(21)
W-122(22)
W-122(23)
W-72(3B)
W-72(3C)
W-72(3D)
W-110
VIRGINIA CAPES OPERATING AREA
CENTRAL CORRIDOR
SOUTH CORRIDOR
WHISKEY CORRIDOR
X-RAY CORRIDOR
CHERRY POINT OPERATING AREA
CHARLESTON OPERATING AREA
W-177A(A)
W-177B
W-161A
W-161B
W-132A
W-132B
DELTA
CHARLIE
TANGO
UNIFORM
NORTH ATLANTIC OCEAN
11525

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N433 Range Sustainment Project
Concept & Objectives

Project Concept:

- Quantitatively determine Navy range complex contribution to readiness & better understand the linkages between readiness, range use and cost
- Link above data in an automated, sustainable & repeatable process
- **Improve DOD / DoN range encroachment defense**

Objectives:

Do the following…

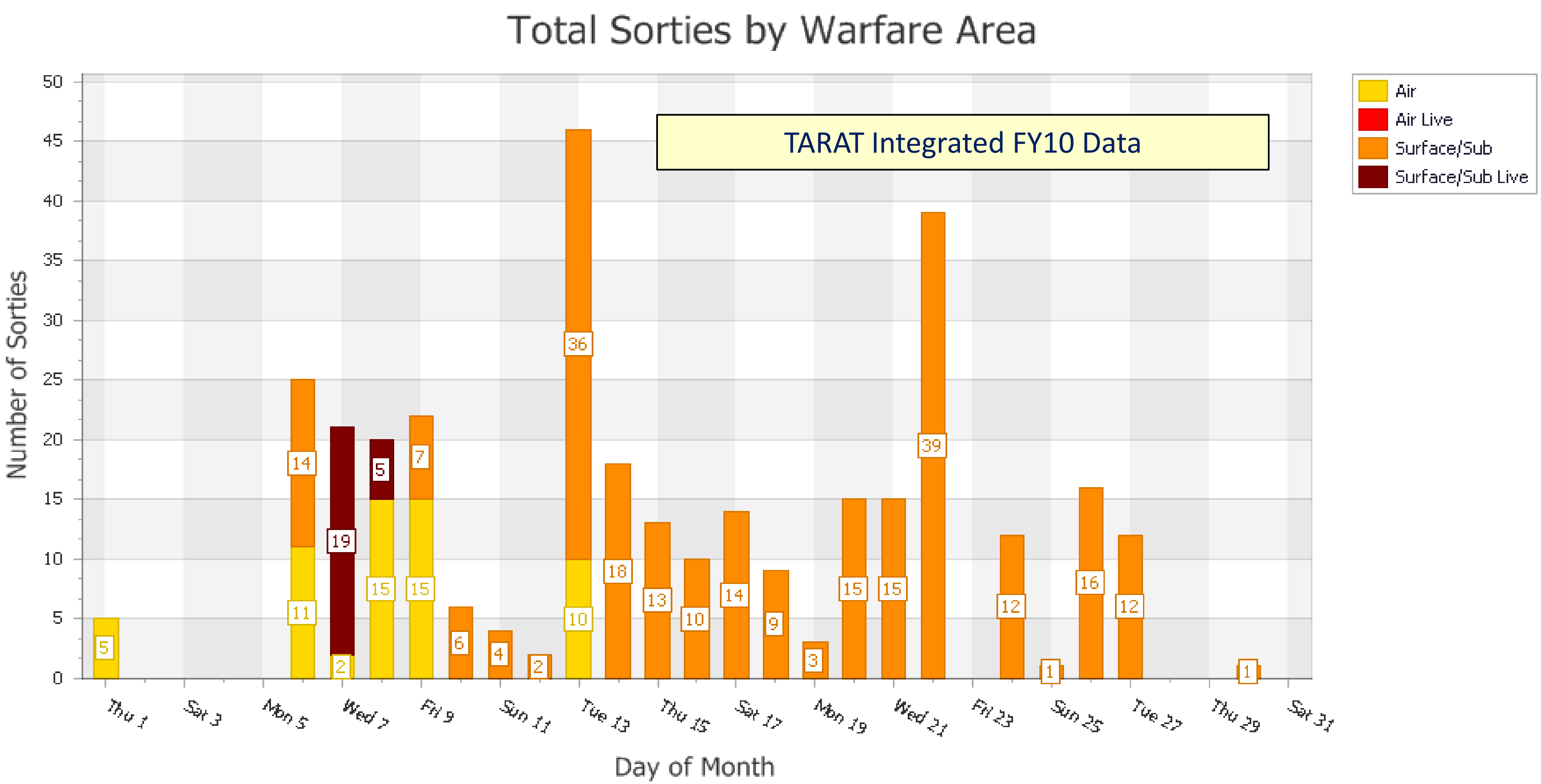
- Align existing cost, readiness & utilization databases
- Create an assessment tool with reports to display range contribution to fleet readiness linked to utilization and cost

…to be able to…

- **Provide impact analysis to defend against encroachment**
- Assess validated range resource requirements
- Show readiness impact of budget decisions
- Provide business case analysis to support POM build

W122 (5) Utilization

Day-by-Day Comparison



Usage curve increases from FY09 to FY10 with additional data sources

- Improvements over initial dashboard reports (less 'Blue' or 'No Use' days)
- 'Ship Events' will significantly increase with identified additional data

Data Sources in TARAT
Training Area & Range Assessment Tool

Larger Utilization Databases with Data Integrated in TARAT:

- U.S. Fleet Forces (USFF) Range Utilization for Fleet Training
- Navy Air Readiness Reporting
- Navy Ship Readiness Reporting
- Fleet Area Control & Surveillance Facility (FACSFAC) Airspace Scheduling
- NAWC Test Range / MRTFB Utilization
- AUTEC T&E
- SCSC NASA / SCSC Wallops
- USFF ATR (Ordnance Expended)

Data being Integrated in TARAT:

- ATMO Aerial & Seaborne Targets (East Coast only)
- AWIS Aerial Targets
- STAIRS Seaborne Targets
- Ship Electronic Support Evaluation Facility (SESEF)
- USMC RFMSS (only MCAS Cherry Point data at this time)
- NSWC PHD CSSQT data

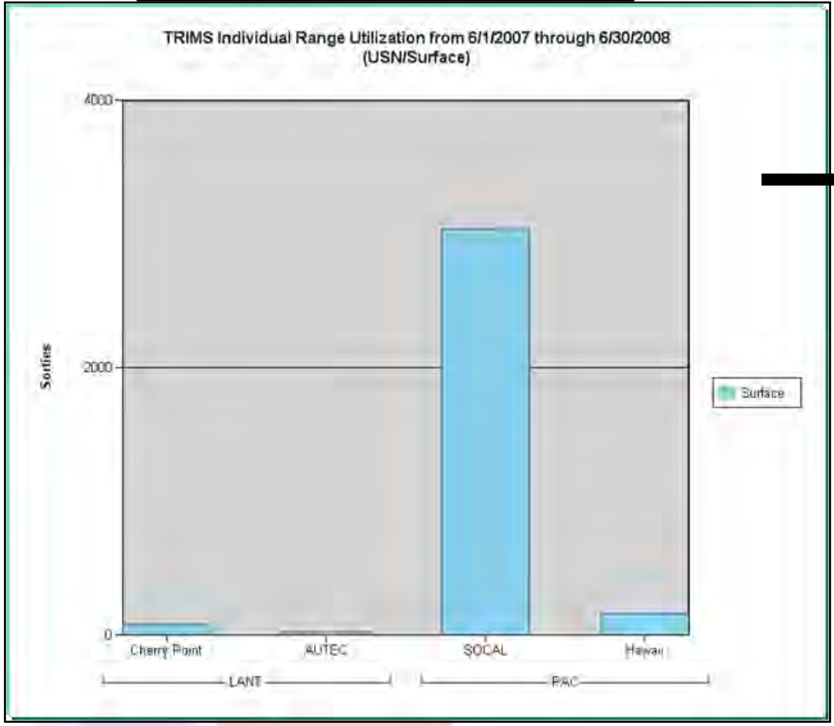
Future Expansion (FY12):

- Ship Ordnance Expended
- Exercise Event data for Ships

TARAT Level of Data Improving

Exercise Event Data Will Give TARAT Density of Operations

Thru Jun08 – No Ship Event Data Recorded on East Coast



After TORIS / NAVSKED Integration

W122 Ship Events Matched in TARAT (as of 29Sep11)		
Data Source	**# Ship Events**	**# LHD/LPD/LSD Ship Events**
TORIS	250	111
TRIMSV	145	75

With Exercise Event Data Integrated in TARAT

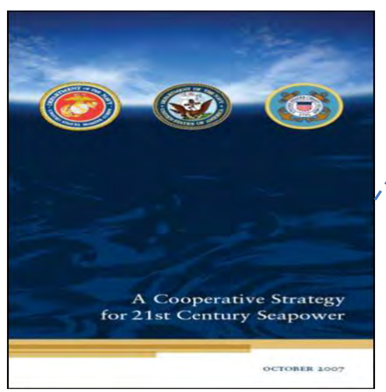
W122 Ship Events Matched in TARAT		
Data Source	**# Ship Events**	**# LHD/LPD/LSD Ship Events**
CSFTL linked to NAVSKED/TRIMSV/Other Sources	990	420
CSFTL will also match hundreds of ship events / month for JAX & VACAPES OPAREAs		

Exercise Event Data Will Give TARAT Full Fleet Use of OPAREA Grids

- Ability to Show 'Impact' to Loss of OPAREA Grid
- Will Provide 'Density of Operations' & Help Connect To Ship Ordnance Data

Naval Operations Concept – 2010

- Describes how, when and where U.S. naval forces will contribute to preventing conflict and prevail in war in order to guide maritime strategy implementation
- "Naval" encompasses Navy, Marine Corps and Coast Guard personnel and organizations
- "Implements" the Maritime Strategy – organized around & expounds upon the six expanded core capabilities identified in the maritime strategy
  - Forward Presence
  - Deterrence
  - Sea Control
  - Power Projection
  - Maritime Security
  - HA / DR



Naval Forces \ Core Capabilities	Forward Presence	Maritime Security	HA/DR	Sea Control	Power Projection	Deterrence
Aircraft Carriers	X		X	X	X	X
Aircraft	X	X	X	X	X	X
Amphibious Ships	X	X	X	X	X	X
SSNs	X	X		X	X	X
SSGNs	X	X			X	X
SSBNs					X	X
Large Surface Combatants	X	X		X	X	X
Small Surface Combatants	X	X		X		
Major Cutters	X	X	X	X		X
Patrol Craft	X	X	X	X		X
Combat Logistics Force	X	X	X	X	X	
Hospital Ships	X		X			
Maritime Prepositioning	X		X		X	
JHSV	X	X	X			
Command and Support	X					
Icebreakers[31]	X	X	X	X		X

Navy ranges critical to platform and integrated readiness

Fleet Response Training Plan (FRTP)

- FRTP is the training cycle the units of a CSG accomplish to be deployment ready
- FRTP Phases
  - Maintenance, Basic (Unit Level), Integrated, Sustainment
  - CSG “Surge Ready” after completion of Integrated phase
- Major CSG FRTP Events
  - CVW Fallon (Air Wing Det)
  - Composite Training Unit Exercise (COMPUTEX)
  - Joint Task Force Exercise (JTFEX)

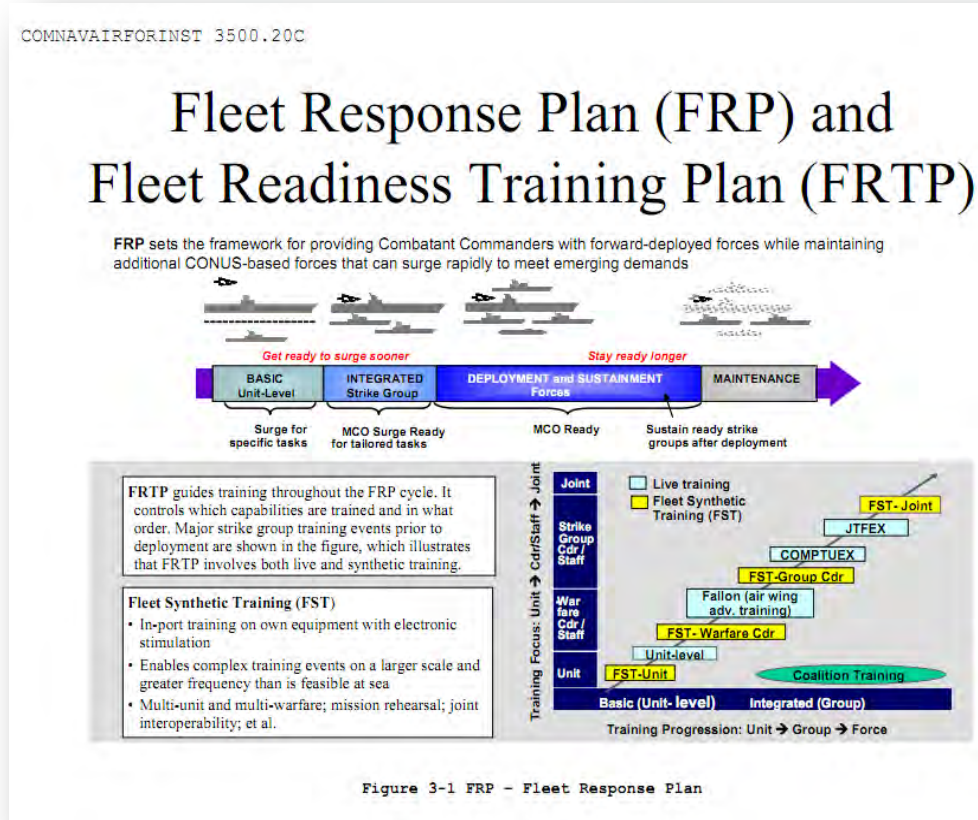


Figure 3-1 FRP - Fleet Response Plan

Ship Ordnance Expended Data on LANT OPAREAs

NOLSC vs. TRIMS vs. USFF ATR Comparison

USFF ATR Data
LANT OPAREAs - Jul09

USFF ATR Ship Ordnance Expenditures for CP, JAX & VC OPAREAs (Jul10)

Munition Type	Total Rounds By Type	ASW / USW Sonar Use	Hours Used
12GA	640	SLQ-25	8.42
20MM CIWS	2840		
20MM DS	5389		
25MM SAPHEI-T	825		
40MM HE-DP	954		
76MM BL-P	108		
C-4 CHARGE (1-1/4 LB)	34		
5.56MM	1180		
5/54 BL-P	221		
5/54 HE-CVT	76		
5/54 ILLUM	159		
7.62MM GRENADE	4		
7.62MM T	14373		
9MM	4923		
BOMB 500LB GEN PURP	10		
CAL.50 T	8900		
EMAT	5		
SIMULATOR FLARE	381		
Total Ordnance Expended (Jul10)	**41,022**	***Source: USFF ATR***	

NOLSC Data
LANT OPAREAs - Jul09

(Initial Look) NOLSC Ship Ordnance Expenditure Data for CP, JAX & VC OPAREAs (Jul10)

Munition Type	Total Rounds By Type	Description / Added Detail
12GA	15505	
20MM CIWS 20MM DS 25MM SAPHEI-T 40MM HE-DP 76MM BL-P C-4 CHARGE (1-1/4 LB)	31927	*OSG / Pyro / Grenades*
5.56MM	6873	*Small Arms 5.56 - 9MM, 22/30/38/45 Cal, Mines*
5/54 BL-P 5/54 HE-CVT 5/54 ILLUM	742	*Also 751 Charge/Propellant, 458 MK199 Mod1*
7.62MM GRENADE 7.62MM T 9MM	300,349	*Small Arms 5.56 - 9MM, 22/30/38/45 Cal, Mines*
BOMB 500LB GEN PURP	60	
CAL.50 T	93697	*Small Arms 5.56 - 9MM, 22/30/38/45 Cal, Mines*
EMAT	23	
SIMULATOR FLARE	0	*Could Not Associate Entry in NOLSC*
SURFACE CM	77	*None of these entries were found in TRIMV or USFF ATR Ordnance Expended Data*
CADS/PADS/AEPS	2	
SUS	1	
MK46 (5) TORP / EXTORP	1	
5" ROCKETS	5	
LGB	6	
MARINE LOCATION MARKER	107	
Total Ordnance Expended (Jul10)	**449,375**	***Source: NOLSC***

TRIMSV Data
LANT OPAREAs - Jul09

TRIMS Ship Ordnance Expenditures for CP, JAX & VC OPAREAS (Jul10)

LHD-3	LHD	W-122 (17)	20MM	5780
LHD-3	LHD	W-122 (17)	7.62MM	19600
LHD-3	LHD	W-122 (17)	.50 CAL	8400

NOLSC Data will provide 'full impact' picture for DOD / DoN in encroachment defense

- TRIMSV & USFF ATR have slightly improved ship ordnance expenditure data since 2009
  - Still only record ~9% of actual expenditures

National Ocean Policy Priority Objectives
www.whitehouse.gov/oceans

National Priority Objectives

1. **Ecosystem-Based Management:** Adopt ecosystem-based management as a foundational principle for the comprehensive management of the ocean, our coasts, and the Great Lakes.
2. **Coastal and Marine Spatial Planning:** Implement comprehensive, integrated, ecosystem-based coastal and marine spatial planning and management in the United States.
3. **Inform Decisions and Improve Understanding:** Increase knowledge to continually inform and improve management and policy decisions and the capacity to respond to change and challenges. Better educate the public through formal and informal programs about the ocean, our coasts, and the Great Lakes.
4. **Coordinate and Support:** Better coordinate and support Federal, State, tribal, local, and regional management of the ocean, our coasts, and the Great Lakes. Improve coordination and integration across the Federal Government, and as appropriate, engage with the international community.
5. **Resiliency and Adaptation to Climate Change and Ocean Acidification:** Strengthen resiliency of coastal communities and marine and Great Lakes environments and their abilities to adapt to climate change impacts and ocean acidification.
6. **Regional Ecosystem Protection and Restoration:** Establish and implement an integrated ecosystem protection and restoration strategy that is science-based and aligns conservation and restoration goals at the Federal, State, tribal, local, and regional levels.
7. **Water Quality and Sustainable Practices on Land:** Enhance water quality in the ocean, along our coasts, and in the Great Lakes by promoting and implementing sustainable practices on land.
8. **Changing Conditions in the Arctic:** Address environmental stewardship needs in the Arctic Ocean and adjacent coastal areas in the face of climate-induced and other environmental changes.
9. **Ocean, Coastal, and Great Lakes Observations, Mapping, and Infrastructure:** Strengthen and integrate Federal and non-Federal ocean observing systems, sensors, data collection platforms, data management, and mapping capabilities into a national system, and integrate that system into international observation efforts.

- Priority/Objective number two is the most important near term concern
- Priority/Objective nine may have implications for TARAT long term use by the Navy

CMSP Goals

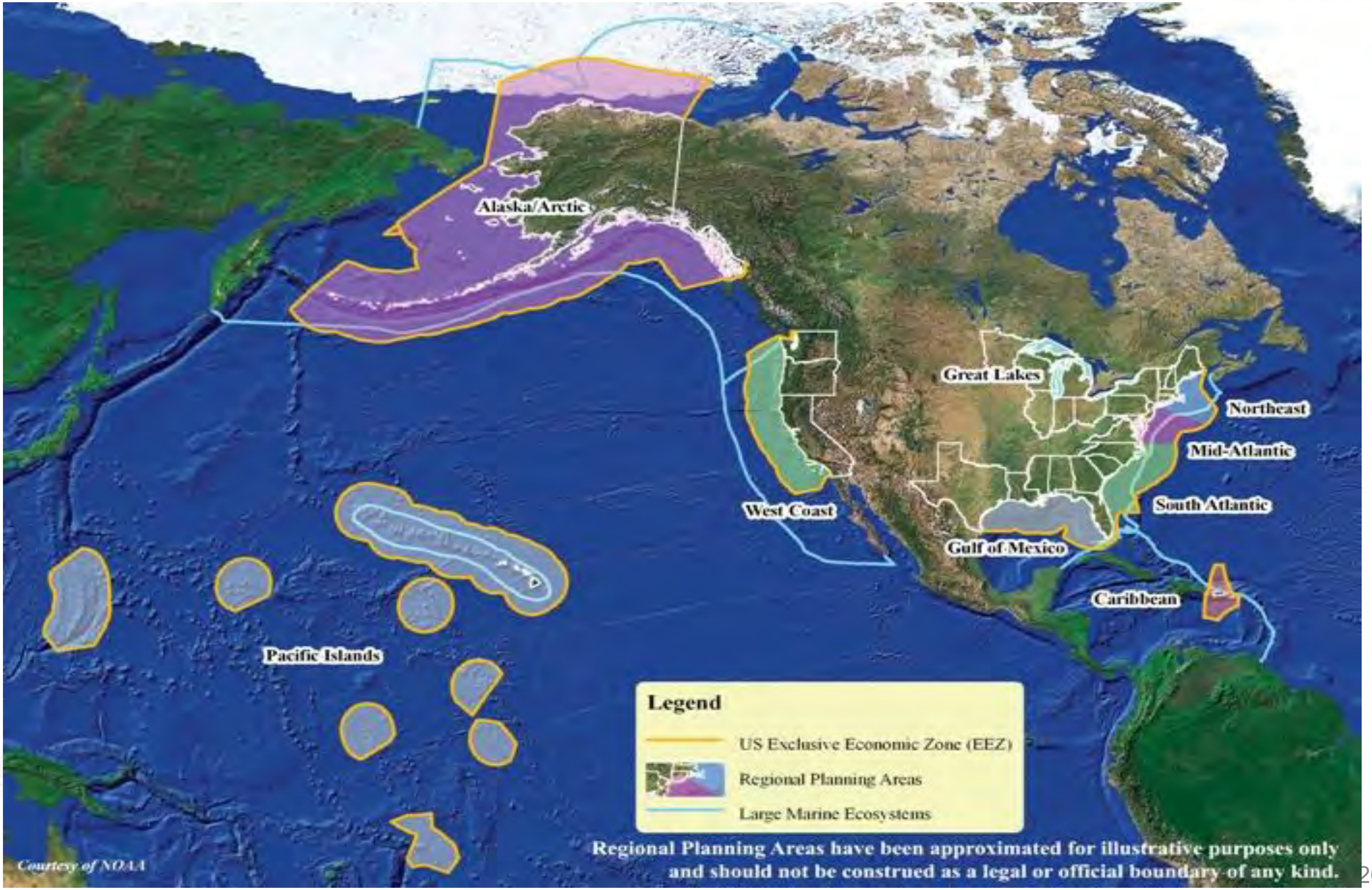
The National Goals of Coastal and Marine Spatial Planning

1. Support sustainable, safe, secure, efficient, and productive uses of the ocean, our coasts, and the Great Lakes, including those that contribute to the economy, commerce, recreation, conservation, homeland and national security, human health, safety, and welfare;
2. Protect, maintain, and restore the Nation's ocean, coastal, and Great Lakes resources and ensure resilient ecosystems and their ability to provide sustained delivery of ecosystem services;
3. Provide for and maintain public access to the ocean, coasts, and Great Lakes;
4. Promote compatibility among uses and reduce user conflicts and environmental impacts;
5. Improve the rigor, coherence, and consistency of decision-making and regulatory processes;
6. Increase certainty and predictability in planning for and implementing new investments for ocean, coastal, and Great Lakes uses; and
7. Enhance interagency, intergovernmental, and international communication and collaboration.

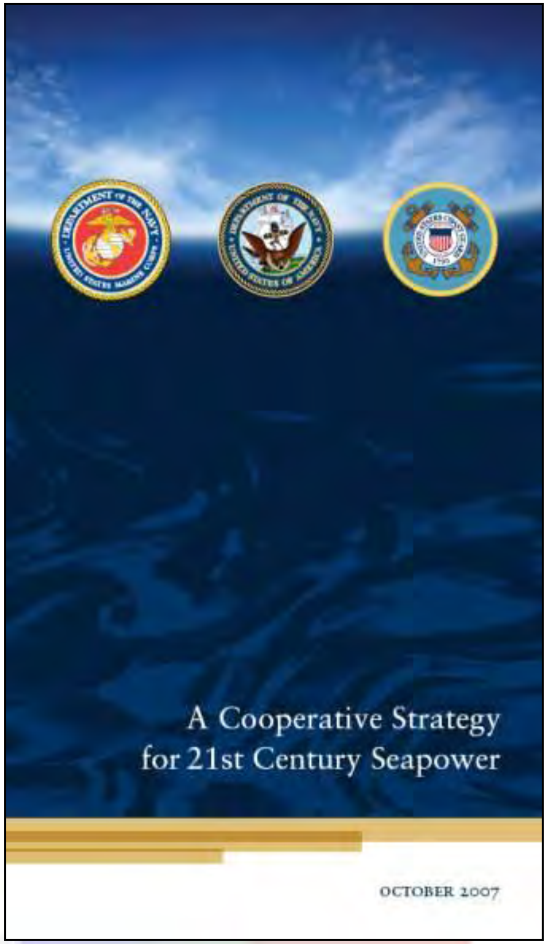
- Goal seven assumes metrics and data (scientific basis) for communication and collaboration

WBB CONSULTING
Solutions and Support for a Changing World

CMSP Management Regimes



The Maritime Strategy



National Strategic Imperatives:

1. *Limit regional conflict with forward-deployed, decisive maritime power*
2. *Deter major power war*
3. *Win our Nation's wars*
4. *Contribute to homeland defense in depth*
5. *Foster & sustain cooperative relationships with more international partners*
6. *Prevent or contain local disruptions before they impact the global system*

Core Capabilities of the Maritime Strategy:

1. *Forward Presence*
2. *Deterrence*
3. *Sea Control*
4. *Power Projection*
5. *Maritime Security*
6. *Humanitarian Assistance and Disaster Response*

Core Fleet Response Plan training range requirements drive usage and utility of ranges for the Navy and U.S. National Security

Composite Engineering Inc.

The High Performance Aerial Target Company

Subsonic Aerial Target System (SSAT)

BACKGROUND

The Navy uses aerial targets as surrogates of Anti-Ship Cruise Missile (ASCM) threats to:

- Test the effectiveness of shipboard Air Defense systems
- Train Fleet forces in the use of Air-to Air Missile (AAM)
- Train Surface-to-Air Missile (SAM) systems.

The SSAT represents the subsonic class of ASCM threats in support of Test and Evaluation (T&E) of weapons systems acquisition programs.

KEY PERFORMANCE PARAMETERS

The Design Meets or Exceeds all KPP's			
Key Performance Parameters	Threshold	Objective	SSAT Projected Performance
Maximum Speed at Low Altitude [Mach (M) at feet (ft) above wave crest at WMO Sea State (SS) conditions]	0.90 M @10.0 ft @ SS 3	0.95 M @ 6.6 ft @ SS 5	0.90M @ 6.6ft, 0.95M @ 10ft SS3
Minimum Altitude [ft above wave crest]	10.0 ft @ 0.90M @ SS 3	6.6 ft @ 0.95M @ SS 5	0.90M @ 6.6ft, 0.95M @ 10ft SS3
Maneuverability [Constant Gravitational Force (g)]	6.0 g @ 500 ft	8.0 g @ 500 ft	8.0 g @ 500 ft, 50% fuel
Maneuverability During Programmable Weave at Minimum Altitude and Maximum Speed [Instantaneous g]	1.0 - 6.0 g	1.0 - 8.0 g	1.0 - 8.0 g
Target Size Characteristics [inches] [Dimensions During Target Presentation] Length Diameter	149.0 - 258.0 inches 13.0 - 21.0 inches	No Objective Requirement	207 inches 19.6 inches
Radar Cross Section (RCS) Reduction [X-band, monostatic] [Decibels per square meter (dBsm)]±2 dBsm	[-14.6, -10.0, -3.0, 0.0 dBsm] ±2 dBsm	-17.0 dBsm ±2 dBsm	Threshold
Material Availability (A_M)	0.85	0.95	0.85

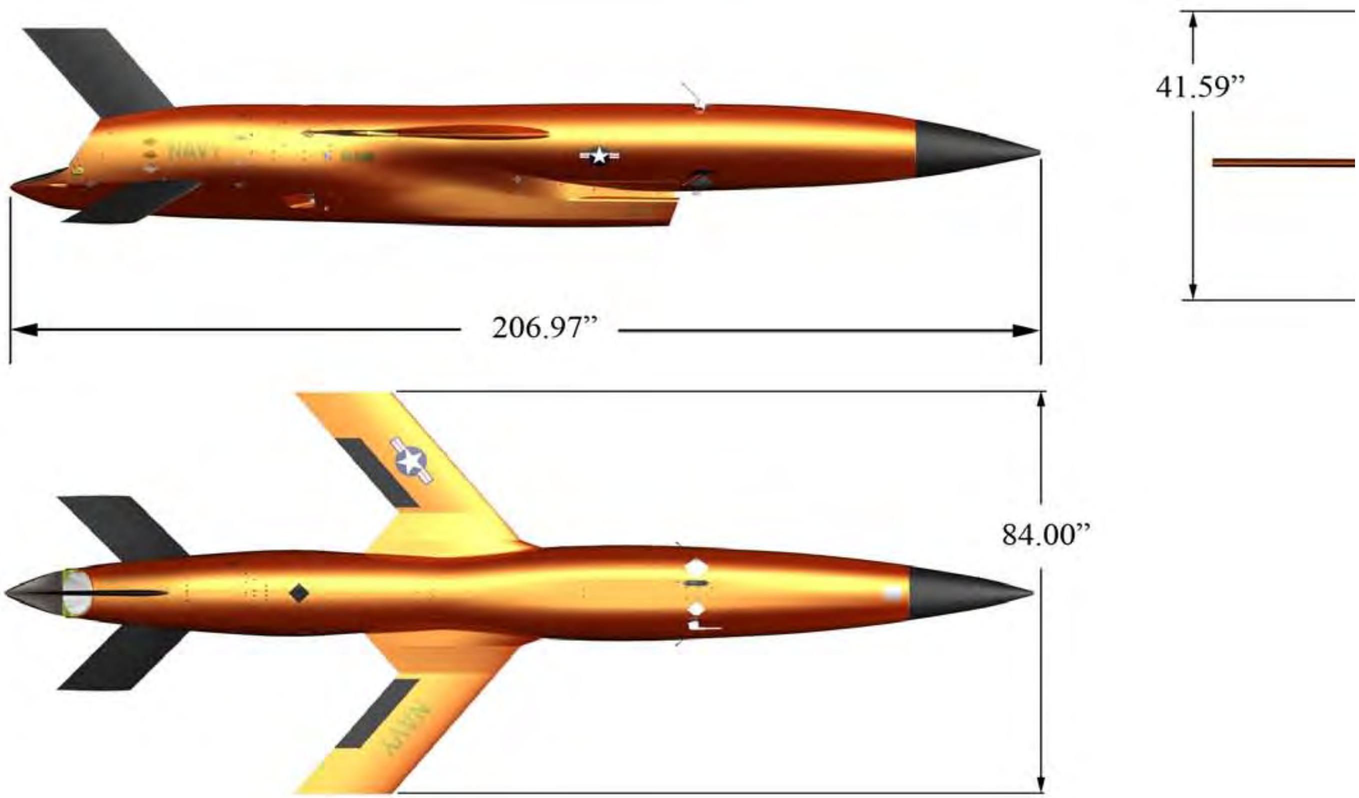
KEY SYSTEM ATTRIBUTES

The Design Meets or Exceeds all KSA's			
Key System Attributes	Threshold	Objective	SSAT Projected Performance
Reliability (R_M)	0.94	0.98	0.94
Range [nautical miles (nmi)] At most efficient speed at 20,000 ft (Kft) At 0.90M at 50.0 ft Above Ground Level (AGL)	 300 nmi 150 nmi	 400 nmi 200 nmi	 400 nmi 200 nmi
Endpoint Accuracy [Fixed and Moving]	± 100 ft	± 25 ft	± 100 ft
Air Vehicle Retrieval Mode	Land and Sea	NR	Land and Sea
Service Life –Air Vehicle [number of flights (flts)]	20 flts	30 flts	30 flts
Turn-Around Cost [Fiscal Year (FY) 08 $]	$11,000	$ 9,500	$11,000

KEY VEHICLE SPECIFICATIONS

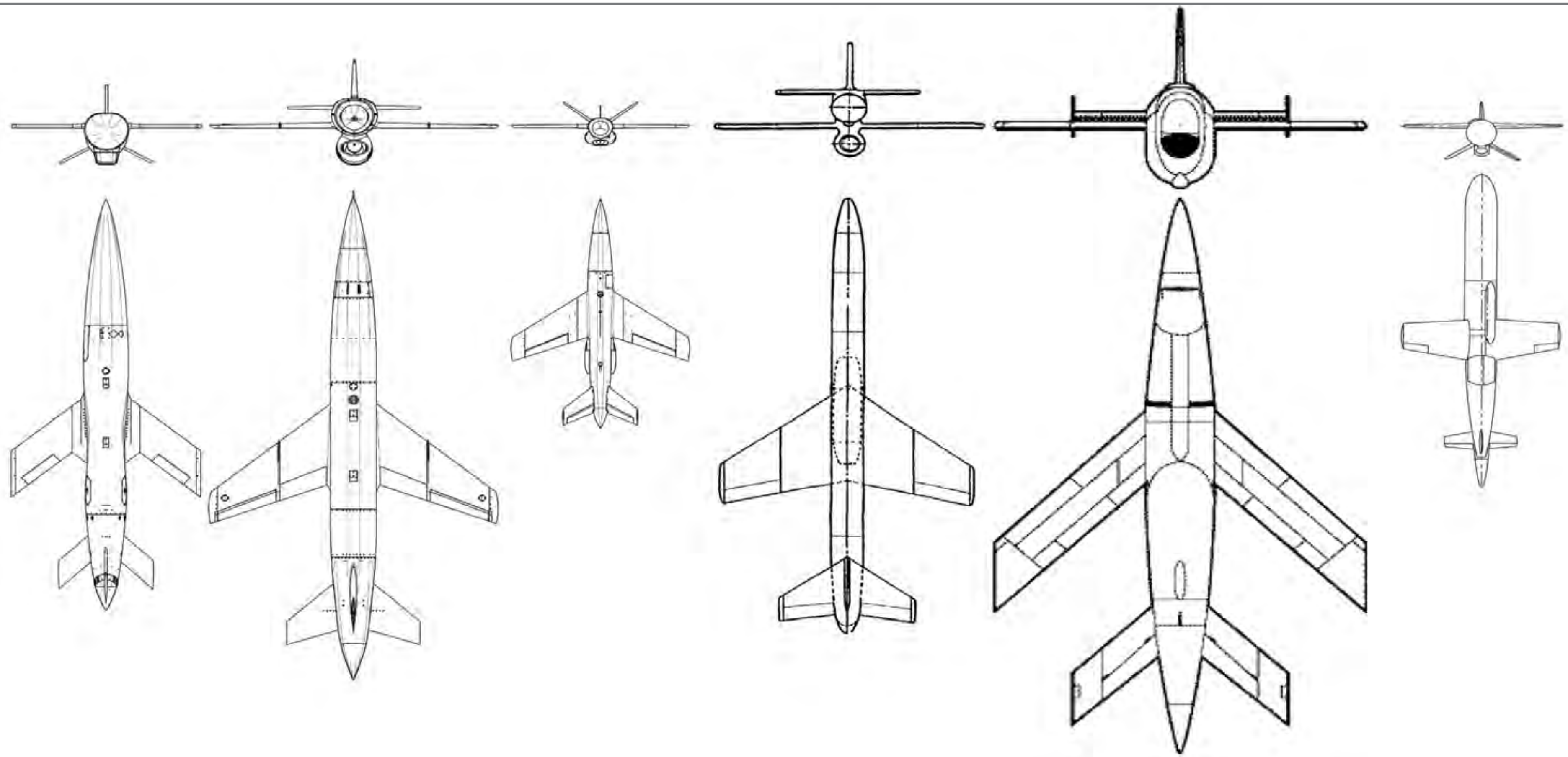
Length	207 inches
Wingspan	84 inches
Range	217 nmi @ 0.9M, 50 ft. (KPP); 576 nmi @ 400 KTAS, 20k ft. (KPP); 800+ nmi @ 30k ft.
Altitude	6.6 ft AGL – 45k ft MSL
Speed	0.45 – 0.96 Mach @ SL (KPP); Maximum: 1.1 Mach @ 40k ft. MSL
Endurance	120+ min. @ 30k ft.; 22 min @ 0.9M, 50 ft.
Dry Weight	531 – 653 lb.
Fuel Capacity	62 gal.
Max Launch Weight	1,350 lb. w/o RATOs
Engine Thrust	1,000 lb Static Sea level
Fuel	JP-8, JP-5, or Jet-A

OVERALL DIMENSIONS



TARGET SIZE COMPARISON

SSAT	BQM-167A	FireJet	MQM-107	BQM-34	BQM-74



SSAT is the replacement for the BQM-74E and BQM-34S targets.

SURFACE LAUNCHER

- **The Combined Transport Launch Rail (CTLR) provides multiple functions:**
  - **Vehicle Transportation**
  - **Engine Run Test Stand**
  - **Launch Platform**
  - **Maintenance Platform**
- **RATO Assembly**
  - **Controlled, Predicable Separation**
  - **Insensitive to misalignment**
- **The RATO firing assembly is the same GFE as used for the BQM-74E**

Combined Transport Launch Rail (CTLR) Assembly

RATO Assembly

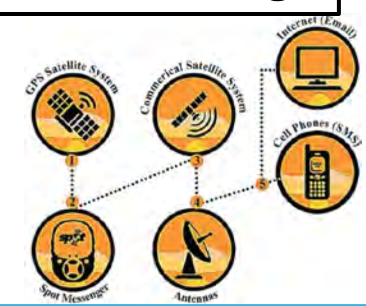
RATO Firing Assembly

FLOATATION / HELO TOW

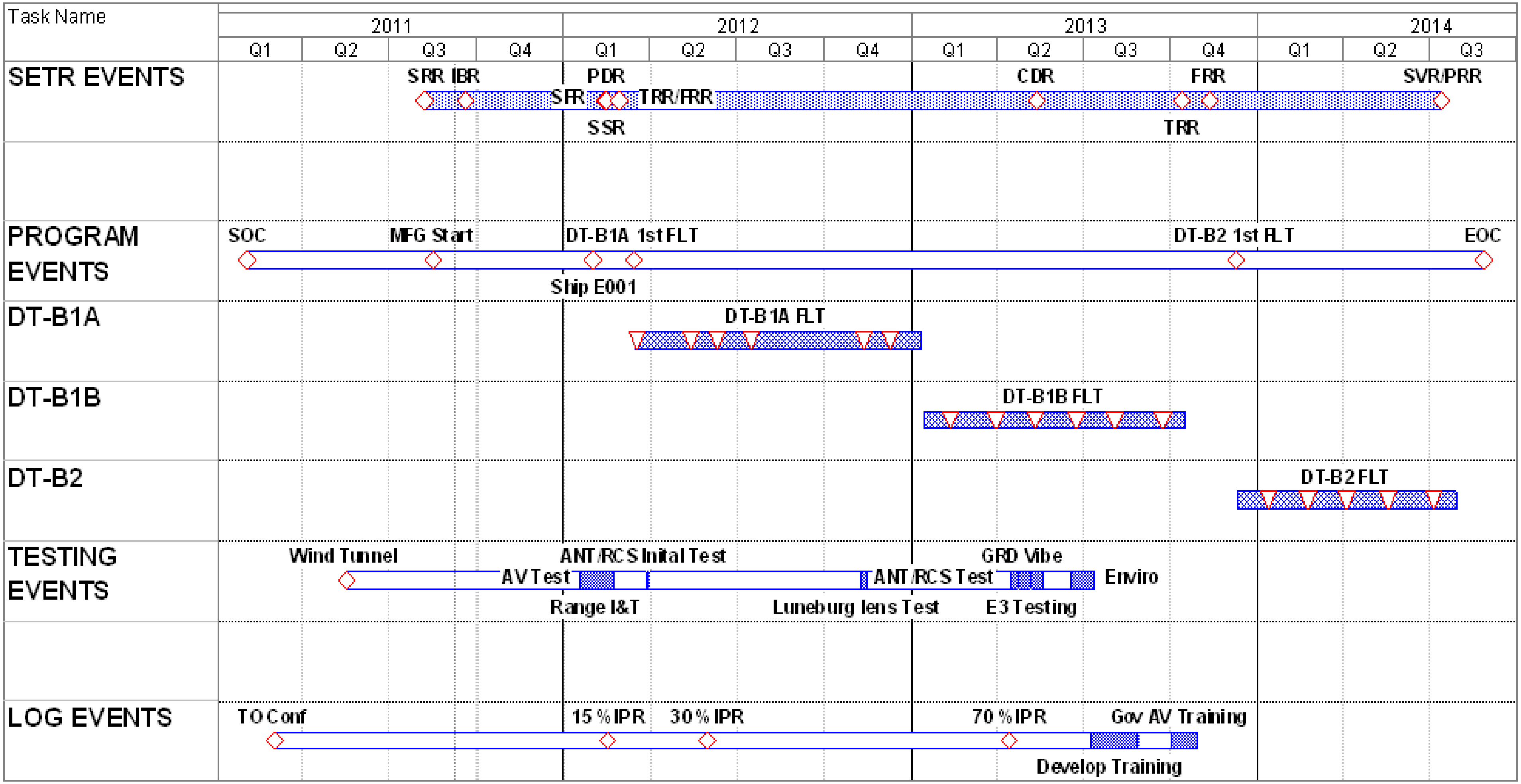
High strength Kevlar® retrieval loop integrated into a water activated flotation bag

Attachment point provides good attitude for high speed towing- no need for a stabilizing chute

SPOT Personal Tracker with an internal battery mounted with our flotation bag



SSAT PROGRAM SCHEDULE



PROGRAM PROGRESS TO DATE

- **Completed - Systems Requirements Review (SRR) as part of the Systems Engineering Technical Review (SETR) Process**
- **Completed - Wind Tunnel Testing**
- **Completed - Aerobatic testing of the CEi Navigation System**
- **85% complete - air vehicle design**
- **95% complete - tooling designs**
- **60% complete - composite tools fabrication**
- **Began manufacturing of the first Test and Flight Targets**
- **Began HW/SW Integration**

Army Test and Evaluation Command

NDIA Symposium

Allen Tyler

Threat Coordinator, ATEC G-9 / Test Management

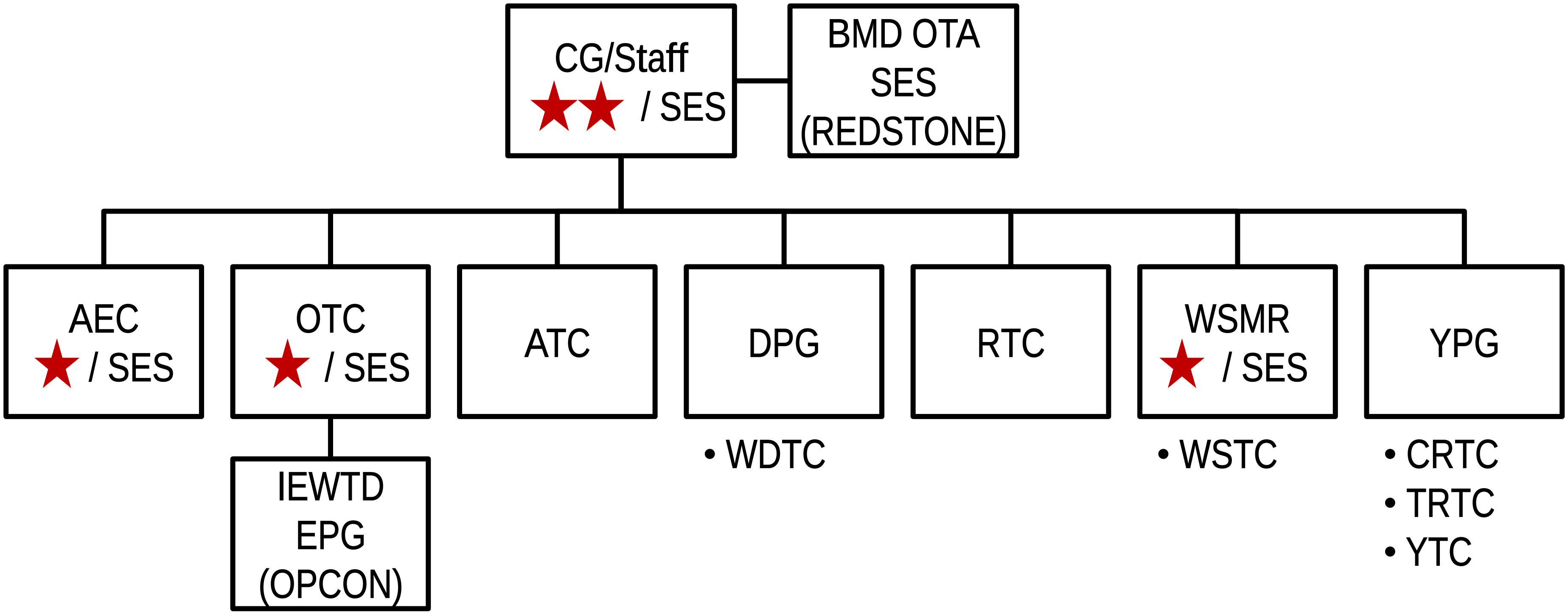
Army Proven
Battle Ready

Agenda

- New ATEC address
- ATEC Reorg
- Rapid Equip vs Title X
- AGILE
- Summary

New ATEC HQ

ATEC Reorganization



ATEC: Army Test Evaluation Command
DTC: Developmental Test Command
OTC: Operational Test Command
AEC: Army Evaluation Center
BMD: Ballistic Missile Defense
OTA: Operational Test Agency

WDTC: West Desert Test Center
WSTC: White Sands Test Center
CRTC: Cold Regions Test Center
TRTC: Tropical Regions Test Center
YTC: Yuma Test Center
IEWTD: Intelligence Electronic Warfare Test Directorate

ATC: Aberdeen Test Center
DPG: Dugway Proving Ground
EPG: Electronic Proving Ground
RTC: Redstone Test Center
WSMR: White Sands Missile Range
YPG: Yuma Proving Ground

Rapid Equipping

- Quick, overlapping
- Higher Risk
- Opportunistic/ Ad hoc
- Less bureaucratic & little oversight
- Proponent & Community of the Willing
- Incomplete Data
  - –Constrained DT
  - –Limited OT
  - –C&L Report to User
- Cheap to Community – Expensive to ATEC

Title X, DoD 5000, etc.

- Deliberate
- Risks Mitigated
- Fully Synchronized
- Bureaucratic & oversight
- Full Community involvement
- All data
  - –Robust DT
  - –Full OT
  - –OMAR/OER to MDA
- Expensive to Community

COCOMs

Critical to immediate need

Whole Army

Ultimate customer is the soldier

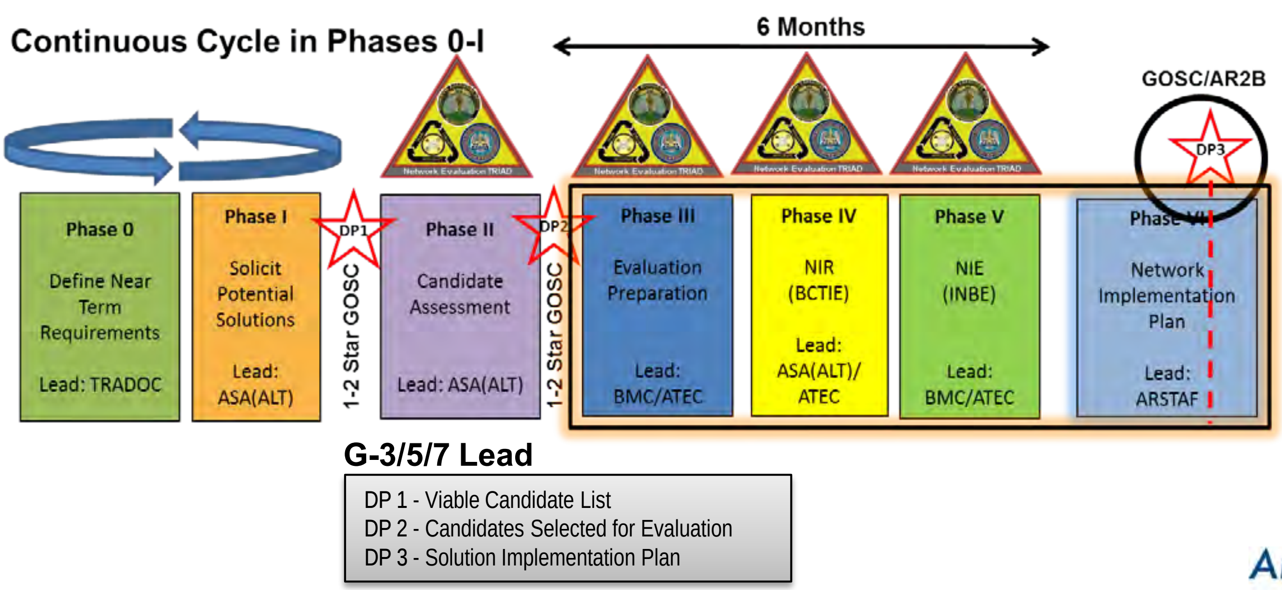
MDA

Fully scrutinized

Army Agile Process – Briefly

To shape the Development, Integration, Test and Certification of the Network for Success:

- Common understanding of desired capabilities, limitations and system requirements
  - Enables ability to know how to test; cost of test (dollars and risk); and creates early dialogue between stakeholders
- Common set of "core" vignettes based on "in-the-dirt" testing
  - Facilitates Model-Test-Model approach, and understanding of "baseline" conditions under which system must perform
- Common set of "core" measures
  - Allows for reuse of data, promotes similarities in findings and results, and improvements to processes
- Data Model
  - Ensures reuse of data, clear understanding of measures and data elements to be collected, and analytic consistency between test events and capability sets



Army Proven Battle Ready

Summary

- HQ ATEC is now located on APG MD
- Brand new building
- Reorganized
- Implementing efficiencies in T&E thru AGILE process

Questions?

Directed Energy Test & Evaluation Capability 10 Years Later

26 October 2011

Doug Weatherford
Senior Advisor, PEO STRI SETA Team

NDIA Targets, UAVs & Range Ops Symposium
Ft Walton Beach, FL

Distribution Statement A: Approved for public release; distribution is unlimited.

Overview

- DETEC Mission and History
- Tri-Service Study Shortfalls
- Capabilities Developed
- DET S&T and DETEC Interaction
- Additional Successes
- Tri-Service Study 2011
- Summary

DETEC Mission

Funded by TRMC's Central Test and Evaluation Investment Program

- Develop Joint T&E MRTFB infrastructure required for T&E of DEW systems
  - Instrumentation
  - Equipment
  - Software tools
- DEW systems supported
  - High energy laser (HEL)
  - High power microwave (HPM)
- Coordinate T&E needs with TRMC S&T efforts

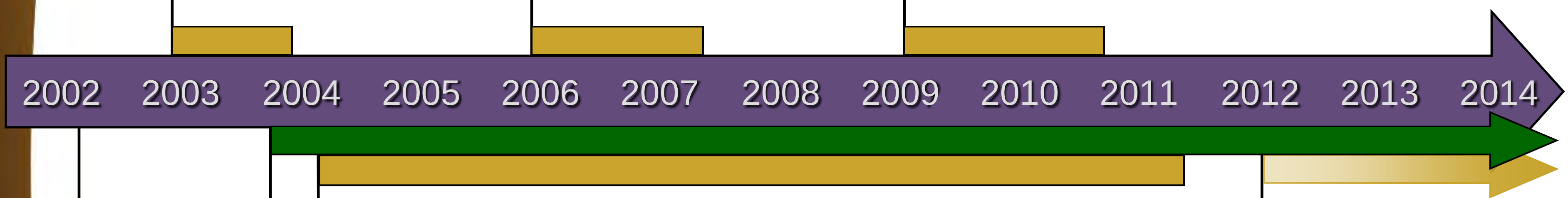
DETEC – Directed Energy Test and Evaluation Capability **MRTFB** – Major Range and Test Facility Base
DEW – Directed Energy Weapon **TRMC** – Test Resource Management Center **T&E** – Test and Evaluation

DETEC History

T-SS Begins to identify and scope shortfalls in DE T&E infrastructure

T-SS Update (2007) Begins to capture current DE T&E infrastructure shortfalls for DETEC II, originally planned to start in 2010

T-SS 2011 Begins to capture most current DE T&E infrastructure shortfalls for DETEC II, now projected for consideration to start in the 2012-2014 timeframe



DETEC Effort Proposed to CTEIP

DETEC Begins to resolve 12 high priority capabilities identified by the T-SS. DETEC is developing 16 systems (covering 40 shortfalls) to address these infrastructure shortfalls

Projected Window for Services/TRMC to consider resolving the highest priority shortfalls identified by the T-SS 2011

DET S&T Begins to address high-risk, high-pay-off shortfalls identified by the T-SS. To date, DET S&T has delivered 20 projects

DETEC Tri-Service Study (2004) High Priority Shortfalls

DETEC program to develop 12 Synergies covering 32 shortfalls

High Energy Laser (HEL)

- Ground Target Irradiance Measurement (GTIM) – H1
- Airborne Target Irradiance and Imagery Measurement (ATIM) – H3
- Target Subsystems Protection (TSP) – H5
- Target Surface Temperature Measurement (TSTM) – H11
- Target Reflected Energy Measurement (TREM) – H12

High Power Microwave (HPM)

- Sensor Suite (SS) – H2
- Propagation Environment Measurement (PEM) – H4
- Test Target Subsystems Surety (TTSS) – H6
- Target Surrogate Materials (TSM) – H7
- Narrowband Threat Systems (NBTS) – H8
- Test Hazard Prediction (THP)– H9
- Wideband Threat Systems (WBTS) – H10

DETEC Capabilities Overview

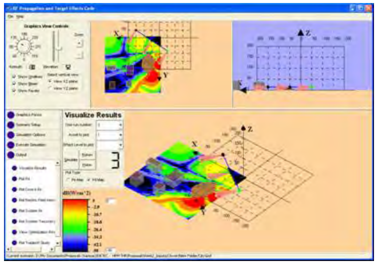
DETEC actually developed 16 solutions addressing 40 T-SS shortfalls:

HEL TSP Handbook

HEL TREM

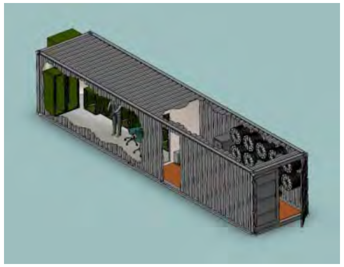
HEL GTIM

HEL ATIM

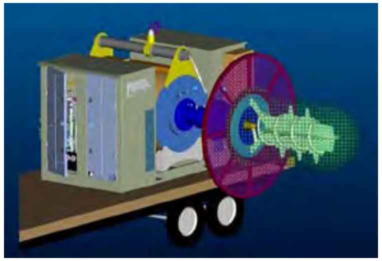


HPM THP

HPM TTSS Reference Guide



HPM SS

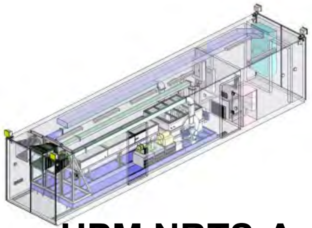


HPM WBTS

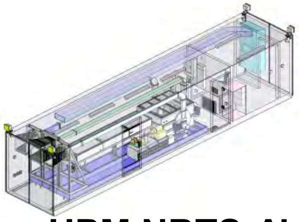
HPM COTS WBTS (2)

HPM PEM

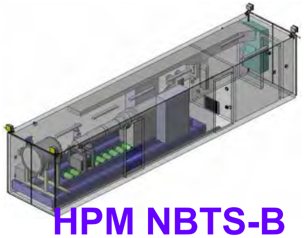
HPM TSM Database



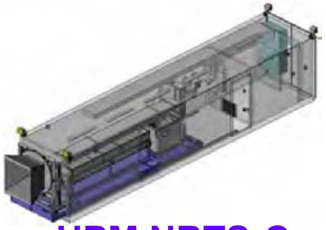
HPM NBTS-A



HPM NBTS-A'



HPM NBTS-B

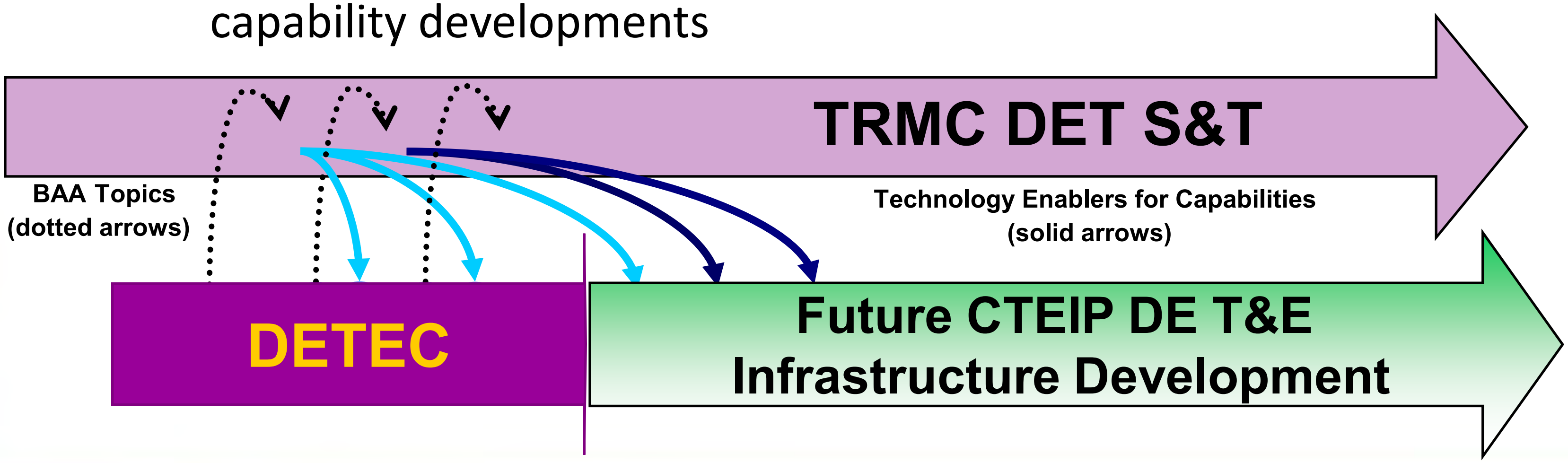


HPM NBTS-C

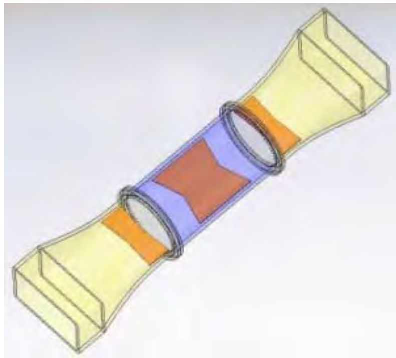
*** - Purple text indicates additional sources delivered**

DET S&T Interaction with DETEC

- **TRMC DET S&T and DETEC under common management**
  - DETEC uses risk reduction requirements for planned capability developments as S&T BAA topics
  - DETEC uses and augments existing IPT structure to generate future S&T topic needs that support capability development timeline
  - DETEC announces annual BAA issued by DET S&T with updated topics
  - DETEC leverages DET S&T projects as risk reductions for DETEC capability developments



DET S&T Enhancements for HPM NBTS

Rotating Step-Twist Polarizer (RSTP)	Resistive Waveguide Attenuator (RWA)	Microwave Rotary Attenuator (MRA)
		
Rotating step-twist polarizer that enables polarization change without the delays associated with breaking vacuum	Automatic, continuously adjustable attenuator from 0 to ~18 dB, for installation in high-power high-vacuum environment	Enables user to continuously and dynamically vary power output by 0 to ~15 dB
Installed in HPM NBTS-A’3	Installed in HPM NBTS-B	Installed in NBTS-C

DETEC Capability Support to Major Tests

HPM NBTS-A

HPM NBTS-A'

HPM NBTS-C

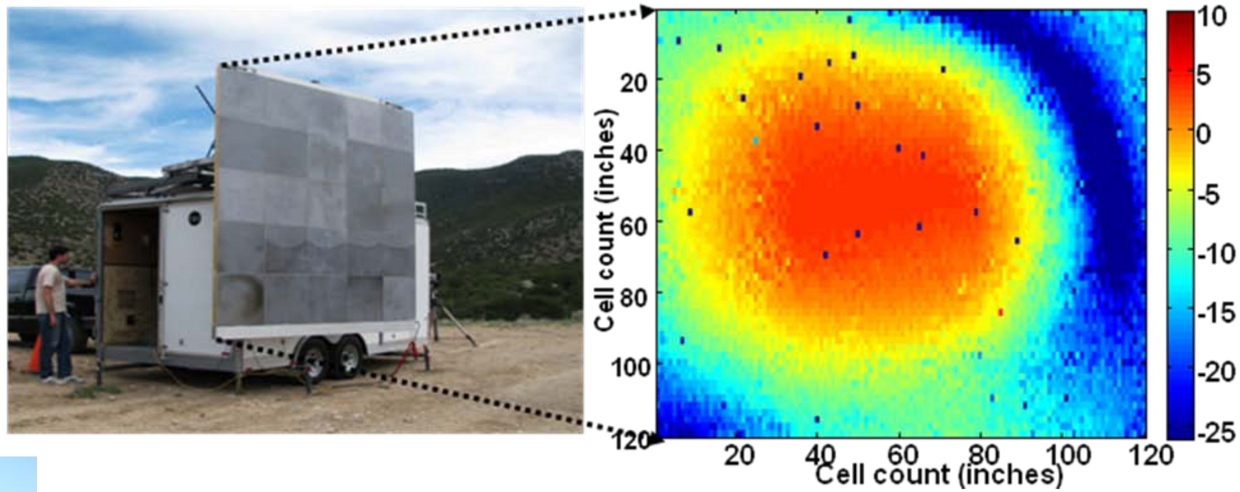
HPM Narrowband Threat Systems are in frequent use at WSMR for multi-Service test requirements. Includes numerous Army vehicles, Brigade Combat Team modernization programs, and AFRL projects. Also, the Navy extensively uses the HPM SWBTS2 for aircraft systems.

HPM SS Shield Room

HPM SS used with HPM WBTS

HPM Sensor Suite used with threat systems testing both around and in test articles.

DET Deliverables Support to Major Tests



Scanning Target Board (STB) used to characterize ADS beam shape at High Energy Test Research Facility, Kirtland AFB

HPM Soil Electrical Properties (HSEP) Brass Board in use at CHAMP initial test location to measure actual soil electrical properties to support modeling.

T-SS 2011

- **Objective:** Identify and prioritize T&E shortfalls for DE systems planned to enter test in the next 12 years
- Conducted 7-step process to identify DE requirements, existing capabilities, and shortfalls
- Strong participation from Army, Navy, and Air Force throughout the process, including Service
  - Research Laboratories
  - Program/Demonstrator Offices
  - Operational Test Organizations
  - Senior Leadership
- FOUO version available via requests at “detecteam.org”

T-SS 2011 High Priority Capability Shortfalls

#	Domain	Capability Shortfall
1	HPM	Non-intrusive E-field and B-field probes*
2	HPM	X-band surrogate narrowband threat source*
3	HEL	Continuous Wave (CW) irradiance measurement on surface moving target board, towed airborne target board, and actual target*
4	HPM	C-band surrogate narrowband threat source*
5	HPM	Multiple node wireless data acquisition system*
6	HEL	Imagery of airborne targets*
7	HEL	Front target surface temperature*
8	HEL	Dynamic hazard analysis tool (M&S)
9	HEL	Predictive avoidance and airspace deconfliction tools (M&S)
10	HPM	Beam propagation in and near surfaces (M&S)
11	HPM	Test Hazard Prediction (THP)/Builder integration (M&S)

*** Technology investments made through DET S&T program could potentially be leveraged in acquiring a solution to this shortfall.**

Summary

ACCOMPLISHMENTS:

- Improved MRTFB infrastructure supporting DEW T&E
  - Addressed 40 of 88 original T-SS shortfalls
  - Delivered 4 HEL and 12 HPM capabilities
  - All hardware capabilities transportable between ranges
  - Reference Guides and Software tools distributed widely
  - Integrated several S&T projects improving performance/usability

PATH FORWARD:

- Recently completed T-SS 2011 Update
  - Identified 11 High Priority Capabilities for CTEIP consideration
  - Identified 16 S&T topics for Test Resource Management Center and Service 'reliance process' consideration

Acronyms

APT – Advanced Pointer Tracker
APOS – Advanced Polymer Optical Sciences
ATIM – Airborne Target Irradiance and Imagery Measurement
BAA – Broad Area Announcement
BOIS - Bi-Static Optical Imaging Sensor
BITS - Beam Irradiance on Target Systems
CCB – Configuration Control Board
COTS – Commercial-off-the-Shelf
CTEIP - Central Test and Evaluation Investment Program
CW – Continuous Wave
DE – Directed Energy
DET – Directed Energy Test
DETEC – Directed Energy Test and Evaluation Capability
DEW – Directed Energy Weapon
DoD – Department of Defense
DT&E – Developmental Test and Evaluation
FTS – Flight Termination System
GTIM – Ground Target Irradiance Measurement
HEL – High Energy Laser
HELSTF – High Energy Laser Systems Test Facility
HPM – High Power Microwave
IEMS - Integrated Electro-Magneto-Optic Sensor
IPT – Integrated Product Team
LCSP – Life Cycle Support Plan
LFT&E – Live Fire Test and Evaluation
MRA - Microwave Rotary Attenuator
MRTFB – Major Range and Test Facility Base
M&S – Modeling and Simulation
MSWG – Modeling and Simulation Working Group
NBTS – Narrowband Threat Systems
OT&E – Operational Test and Evaluation
OTICC - Office of the Secretary of Defense Test Investment Coordinating Committee
PD – Project Director
PEM – Propagation Environment Measurement
PEO STRI - Program Executive Office for Simulation, Training, and Instrumentation
RAM - Rockets, Artillery, Mortars
RF – Radio Frequency
RFI – Request for Information
RFP – Request for Proposal
SAIC – Science Applications International Corporation
SHEF - Skin Heating/Electric Field Strength Measurement
SIC – Systems Integration Contractor
SME – Subject Matter Expert
SMFS - Spectrographic Magnetic Field Sensor
S&T – Science and Technology
SRG – Senior Review Group
SS – Sensor Suite
STB - Scanning Target Board
TAOS - T&E Adaptive Optics System
T&E – Test and Evaluation
THP- Test Hazard Prediction
TISM - Temperature and Irradiance Sensory Matrix
TREM – Target Reflected Energy Measurement
TRMC – Test Resource Management Center
TSM – Target Surrogate Materials
TSP – Target Subsystems Protection
T-SS – Tri-Service Study
TTSS – Test Target Subsystems Surety
WBTS – Wideband Threat System
WSMR – White Sands Missile Range

Targets, UAVS & Range Operations Symposium & Exhibition

Some Enabling Technologies

Brad Westphal

October 26, 2011

Honeywell

Agenda

- Budget impacts and macro environment
- Platforms and positions
- Technology portfolio
- Selected products and technology
- Conclusion

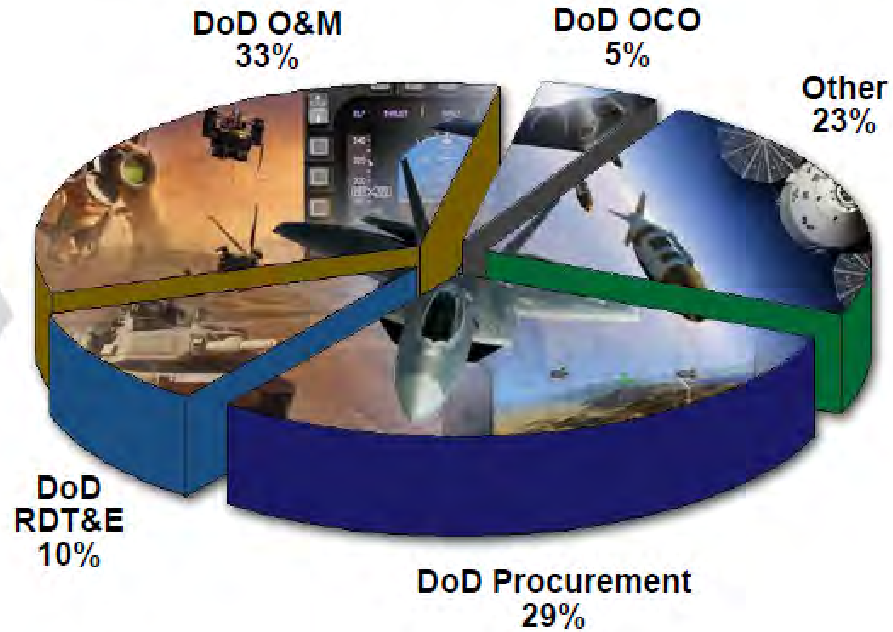
Defense Outlook & Budget Impacts*

DEFENSE BUDGET TRENDS

U.S. Area of Interest	'12-16E CAGR	HON Exposure
O&M	+1 to 3%	+++
OCO	-20 to -25%	+
Procurement	-4 to -6%	++
RDT&E	-10 to -12%	+

Int'l Area of Interest	'12-16E CAGR	HON Exposure
O&M	+2 to 4%	+
Procurement	+3 to 6%	++
Net Total	Flat to +3%	+

HONEYWELL DEFENSE REVENUE MIX



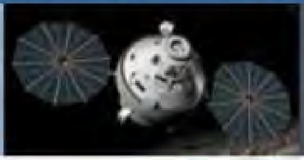
**Management Estimates*

Modest Exposure To Declining OCO and RDT&E Budget; International Opportunity

Strong Defense Platform Positions

Conventional Defense & Space (Near-Peer Combatant Threats)

Fighter/Attack/ Trainer Aircraft
30+ platforms



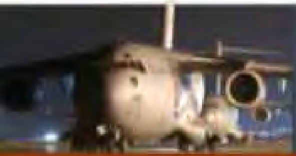
Human Space
10+ Platforms

Surface/Soldier Vehicles
15+ platforms

Bomber Aircraft
3 platforms

DoD, Civil, and Commercial Space
30+ Platforms

Military Helicopters
20+ platforms



Mobility/Tanker Aircraft
40+ platforms

Army, Navy and Air Force
60+ Platforms

Naval Platforms
10+ platforms

Asymmetric Threats

Special Mission/UAV Aircraft
20+ platforms

International: GROWING

International
20+ Platforms

Commercial-Related

Commercial Helicopters
20+ platforms

Services

HTSI
Space, networks, comms, logistics, tech services

FM&T
Specialized services & solutions

Broad & Diverse Install Base Creates Synergy Opportunities

Expansive Product and Technology Portfolio

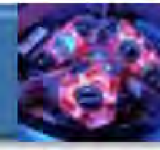
Crew Interface

- Commercial Crew Interface & Displays
- Commercial Software Products
- Flight Management Systems
- Military Crew Interface
- Navigation Database & RNP Services

Safety & Information Management

- Cabin Mgmt System
- Comm/Nav Radios
- DataLink/Data Mgmt & Recorders
- Long Range Communication
- Ground Proximity
- Radar
- Traffic Surveillance
- Integrated Surveillance

Navigation Systems & Sensors

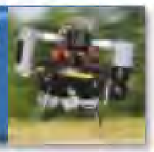


- Commercial Navigation Systems
- Defense & Space Navigation Systems
- Inertial Sensors – Accelerometers
- Inertial Sensors – Gyros
- Non-Inertial Sensors
- Magnetics & Personal Nav Systems
- Precision Landing Systems
- Radiation-Hardened Components
- Space Navigation
- Tactical Navigation Grade Systems

Propulsion

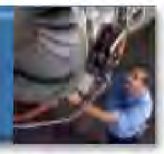
- AGT1500
- ALF502/LF507
- CFE738
- F124/F125
- HTF7000
- HTS900
- LTS101
- T55
- TFE731
- TPE331

Platform Systems / High Integrity Controls



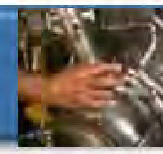
- Integrated Avionic sSystem
- T-Hawk Micro Air Vehicle
- Real-time Information in a Tactical Environment (RITE)
- Space Systems
- Electronic Eng Controls
- Flight Controls
- Space Pointing & Stabilization

Aero Services



- Vibration Monitoring/HUMS
- Zing™ Remote
- Maintenance Services
- Flight Support Services

Mechanical Sub Systems



- Air & Thermal Systems
- Auxiliary Power Units
- Electric Power

Mechanical Components

Wheels & Brakes

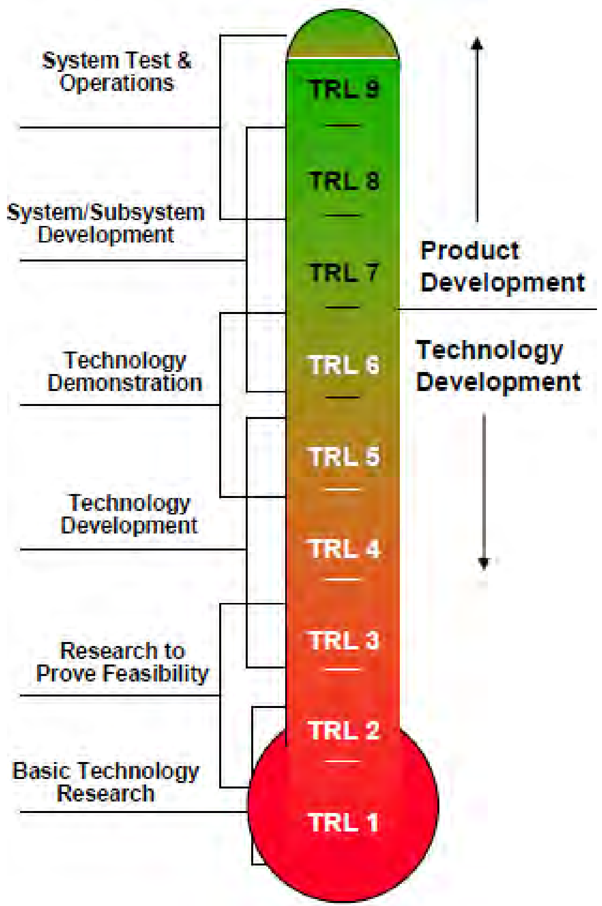
Lighting

Focused on Safety, Cost and Efficiency

Product and Technology Development

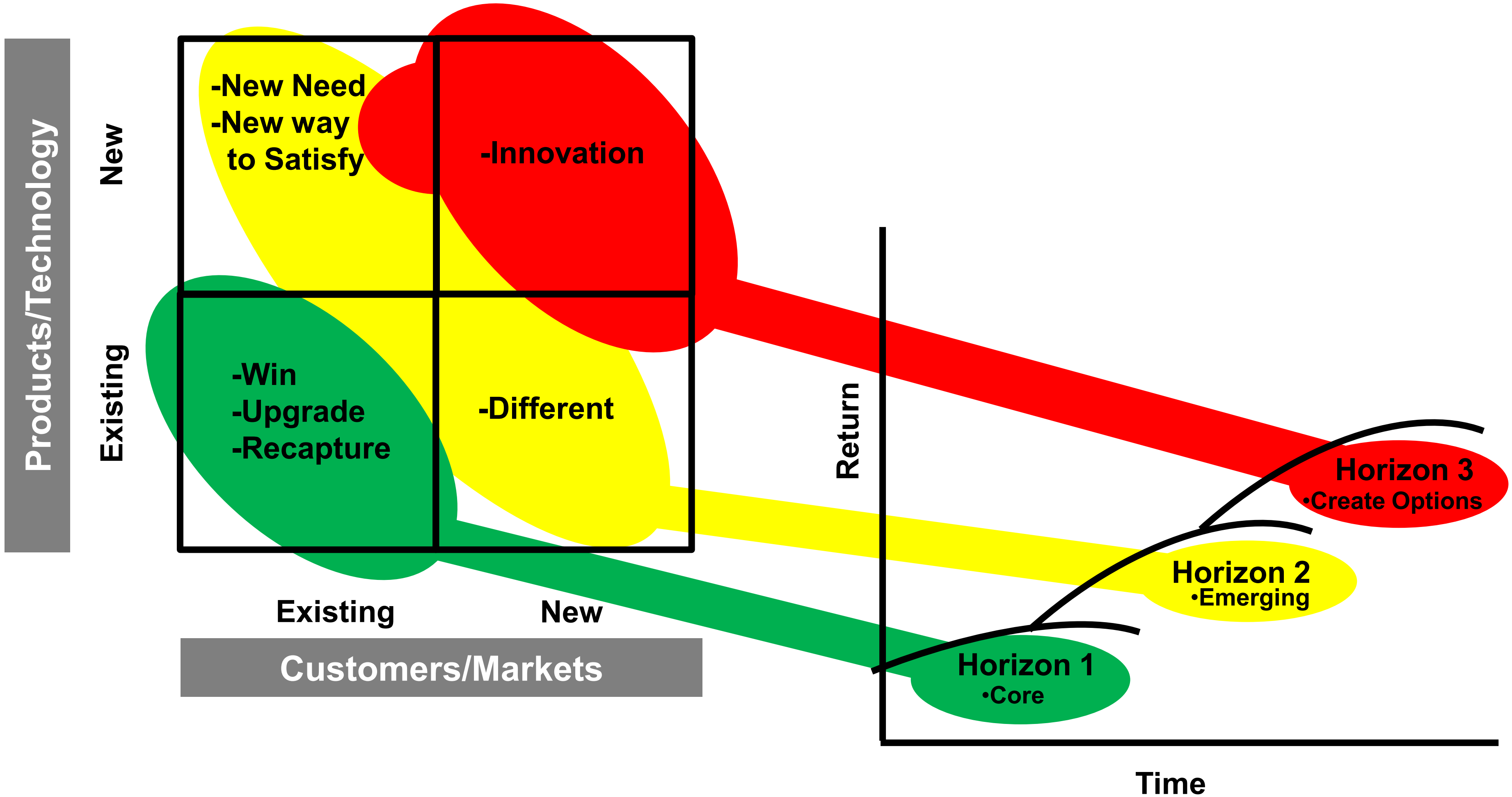
- Product development
  - Has clear external customers
  - Utilizes proven technologies
  - Late stage-gate development
  - Tightly connected to market opportunities

- Technology development
  - Has internal or S&T customers
  - Matures technology (TRL < 6)
  - Supports early stage-gate product development
  - Tied to market need



Distinction Between Product & Technology Development

(Product) and Technology Field of Play



Product & Technology Horizons Support Different Needs

(Product) and Technology Field of Play

Horizon 1	Horizon 2	Horizon 3
• Core technology	• Technology differentiation	• Disruptive
• Approaching maturity	• Patentable or licensable	• Discontinuous
• Mild improvements	• New entry	• Provides diversification
• Engineering to sustain	• Horizon 1 replacement	• Exclusive IP
• Mostly existing products	• Mostly existing products	• Basic/applied research
• Available	• ~TRL 4-7	• ~TRL 1-3

Product & Technology Horizons Support Different Needs

Some Enabling Products and (Technologies)

Radar Altimeters

- 0-30,000 ft
- 28V 16W
- 59 Cu In and 3 lbs.
- RS 422 and Analog I/O

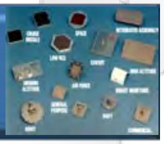
Rate Sensors

- 2 or 3 Axis
- 5V and .13 lbs.
- MEMS technology
- RS 422 Digital Output

INS/GPS Systems

- INS/GPS Deeply Integrated
- Modular and configurable
- MEMS or RLG based
- 2.4 inches (d) x 2.5 inches (h)

Antennas

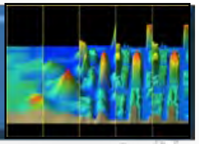


- Low-Observable and custom
- Beam shaping

Inertial Measurement

- RLG or MEMS technology
- 5V and 15V
- 1.6 lbs to .35 lbs
- 33 Cu In. to 4 Cu In.
- RS422 Digital Interface

Terrain Navigation

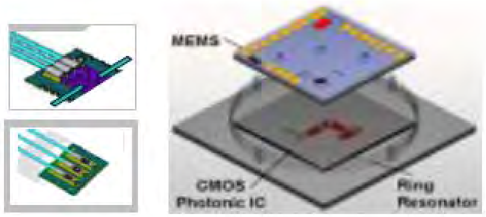


- Height above ground
- 3D position
- High speed digital processing
- Doppler beam sharpened interferometric radar altimeter
- Digital map correlation

Horizon 1 Products & Technology Are Available

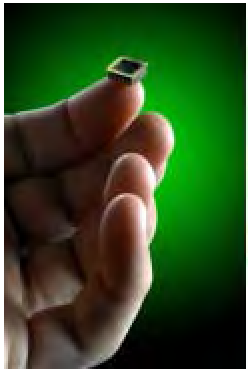
Growing Emerging Technologies

Cold Atom Clock



Band Gap RFOG

Single Antenna Radar Altimeter



MEMS and System-on-Chip

Reaction Jet & Hybrid Controls

Growing Technologies For Evaluation and Insertion

R&D Yield Function

R&D Yield =

f (R&D effectivity, R&D efficiency)

- **R&D effectivity means working on the "right" things. This implies <u>every technology has a path to a valued product and market.</u>**
- **R&D efficiency means that we are good stewards of the funds. This implies that our <u>project management discipline</u> is sound (including make/buy, buy/source process for efficient application of the funds)**

System Challenges

- Keep pace with the evolution of threats
  - Evolution or revolution of vehicle capability
- Develop and enable new target capabilities
  - Enhance capabilities in guidance, navigation and control systems
- Manage and execute production
- Control cost of acquisition, operation and maintenance
  - Total life-cycle cost
  - Inventory and obsolescence

"Do More With Less" to Overcome Challenges – 360º Collaboration

In Conclusion

- Technology Leadership
  - Precision Navigation, Power/Propulsion, Safety Products
- System Integration Capabilities
  - Power Management Systems, Avionics, Air Systems
- Logistics & Support
  - In-Theater Support, Asset Management, Predictive Maintenance
- Global Footprint Customer Support

Focused On HON Core Themes: Efficiency & Safety

Industry Leader Committed to Innovation & Performance

Targets, UAVS & Range Operations Symposium & Exhibition

"Some Enabling Technologies"

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