



# Realizing the Combat Power of Network Centric Operations



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# Key Messages

- Navy has invested in F/A-18E/F and EA-18G aircraft physical architecture, with AESA radar, ATFLIR pod, MIDS/JTRS and DCS radios, ALR-67(v)3, JHMCS, SHARP, GPS-weapons, and the AEA subsystem.
- These aircraft possess the necessary building blocks that will allow Navy to operate, fight, and win on a joint, networked battlefield.

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## Agenda

- **Naval Aviation in Transition....**
- **F/A-18 Program**
  - **Sensors**
  - **Displays**
  - **Networks**
  - **Weapons**
- **Joint Demonstrations and Experiments**



# CVW Tactical Aviation Evolution

1985

1995

2005

2015

2020

## Mission Centric Operations



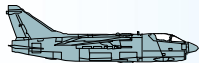
F-14A

- Outer Air Battle
- Fighter Sweep



A-6 / KA-6

- Strike
- Tanking



A-7

- Light Attack



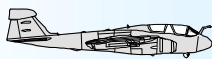
F/A-18A

- Light Attack



S-3B

- ASUW



EA-6B

- SEAD



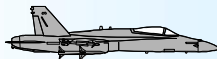
E-2C

- Blue Water AEW

## Multi-Mission Operations



F-14D



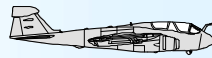
F/A-18A/C

- Precision Strike
- Air Superiority
- RECCE
- FAC(A)



S-3B

- ASUW
- Tanking



EA-6B

- AEA/SEAD



E-2C

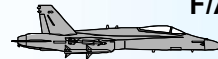
- Littoral Ops (Limited)

Technologies :  
Multi-role, GPS,  
Night Attack.....

## Network Centric Operations

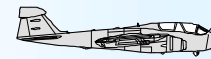


F/A-18E/F



F/A-18C

- Time Critical Strike
- Precision Strike (Fixed and Moving)
- Air Superiority
- CSAR
- RECCE
- FAC(A)
- Battlefield Persistence
- Tanking



EA-6B

- AEA/SEAD



E-2C

- Littoral Ops
- Digital Collaborative Targeting

Technologies :  
AESA, Link-16, DCS,  
Geo-Registration

## Future Operations



F/A-18E/F



EA-18G



F-35B/C



E-2D



•JUCAS

Technologies :  
TTNT, JTRS, WPNS  
DATA LINKS,  
SATCOM, Blue Force  
Tracker, Combat ID



# The F/A-18 & EA-18G Program

## Navy & Marine Corps Inventory

(as of Feb 05)



- 157 A/Bs
- 534 C/Ds
- 212E/Fs (Current)
  - 460 E/Fs
- Inventory Goal
  - 90 EA-18Gs
- 409 FMS (7 Countries)

**The F/A-18 Inventory is the Backbone of Naval Carrier Strike Groups**

## Critical Programs

- F/A-18A-D
- F/A-18 E/F (ACAT I)
- EA-18G (ACAT I)
- F404/F414
- Software (C++)
- AESA / APG-73 (ACAT I)
- ATFLIR / TFLIR (ACAT II)
- SHARP / ATARS (ACAT III)
- ACS
- FTI II
- ANAV
- PIDS
- SLMP/SLAP/SLEP/CBR+
- FIRST
- ALR-67v(3) (ACAT III)
- AIM-9X, AMRAAM (PMA-259)
- JTRS, AMC&D, ARC-210/DCS (PMA-209)
- JHMCS (PMA-202)
- ICAP III, ALQ-99, LBT (PMA-234)
- IDECM (PMA-272)
- MIDS, MIDS-JTRS (PMW-780)
- AARGM (PMA-242)
- Trainers (PMA-205)
- JDAM, JSOW (PMA-201)
- JMPS (PMA-281)
- LITENING (PMA-257)
- SE (PMA-260)
- MODE 5 IFF (PMA-213)

## Facts & Figures (as of 01MAR05)

- PMA-265 Enterprise in FY05: \$4.4B
- PMA-265 Enterprise across the FYDP: \$25.7B
- Workforce: 1814 across 15 geo locations
 

61 MIL	1175 CIV	578 CSS
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- Total USN/USMC Squadrons: 60
 

<u>CNAL</u>	<u>CNAP</u>	<u>USMC</u>	<u>Reserves/RDT&amp;E/NSAWC</u>
11	20	14	15
- EA-18G will replace 12 Squadrons (10 Carrier Air Wing, 1 FRS, and 1 Test)

## PB06 (\$B)

	<u>2004</u>	<u>2005</u>	<u>2006</u>
APN1	3.04	2.98	3.15
APN5	0.37	0.42	0.42
RDT&E	<u>0.37</u>	<u>0.50</u>	<u>0.51</u>
<b>SubTotal</b>	<b>3.78</b>	<b>3.90</b>	<b>4.08</b>
O&M	0.04	0.05	0.05
FMS	<u>0.29</u>	<u>0.49</u>	<u>0.37</u>
<b>TOTAL</b>	<b>4.11</b>	<b>4.44</b>	<b>4.50</b>





# FMS Stakeholders

## FMS Current Inventory

• 409 (7 Air Forces)

Australia: Boeing Australia, Limited  
Canada: Bombardier  
L3 Communications  
Finland: Patria Aviation, Finnair, Instrumentointi  
Kuwait: DynCorp  
Malaysia: Sapporo  
Spain: EADS/CASA, ITP, INDRA  
Switzerland: armasuisse, RUAG



Canada

F/A-18A/B  
77 A – Lot 5-10  
29 B – Lot 5-10  
106 Total



Switzerland

F/A-18C/D  
26 C – Lot 18  
7 D – Lot 18  
33 Total



Finland

F/A-18C/D  
56 C – Lot 17-20  
7 D – Lot 18&19  
63 Total



Spain

F/A-18A/B  
55 A – Lot 8-12  
22 A – Lot 6&7  
12 B – Lot 7-10  
89 Total



Kuwait

F/A-18C/D  
31 C – Lot 14&15  
8 D – Lot 14&15  
39 Total



Malaysia

F/A-18D  
8 D – Lot 19  
8 Total



Australia

F/A-18A/B  
55 A – Lot 7-10  
16 B – Lot 7-10  
71 Total

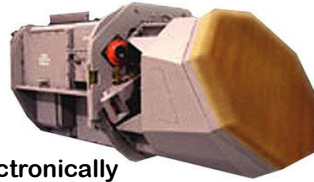
- CF-18 modernization program
- 20<sup>th</sup> anniversary Down Under
- HUG 2.2 / 2.3 / 2.4 / 3.0
- Finland MLU
- Swiss Upgrade 21
- Merdeka Day
- Bulgarian LOR, India, Japan, and others



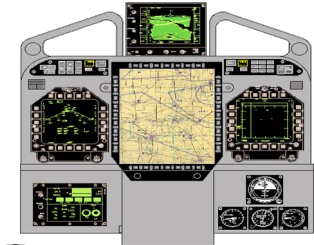
# F/A-18 Integrated Architecture Roadmap



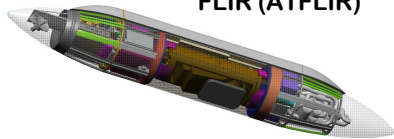
Advanced Targeting FLIR (ATFLIR)



Active Electronically Scanned Array (AESA)



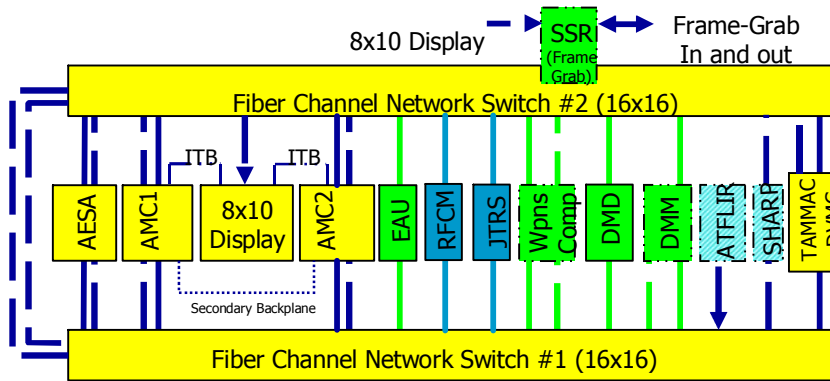
Advanced Crew Station (ACS)



SHARED Reconnaissance POD (SHARP)

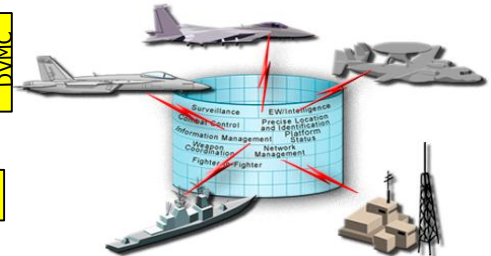


Weapons Integration



High Speed Data Network  
Digital Video Network  
Image Transfer BUS (ITB)  
AMC-to-AMC(2<sup>nd</sup> Backplane)

## Fiber Channel Architecture



Multi-Functional Information Distribution System (MIDS)



ARC210 DCS (VMF)



Joint Helmet Mounted Cueing System (JHMCS)



Advanced Mission Computer & Displays (AMCD)



Solid State Video Recorder (SSVR)

➤ Scalable, Portable, Flexible and Open Architecture  
➤ Modular HOL(C++) Software Organization SEI CMM Level 5





# AESA Radars in Production

## Ready for VX-9 Operational Assessment

*Mission Computer Software*

*Functionality to drive Mission System Requirements*

*High Speed Data Network*

*1 Gbit /Sec*

*Comm Channel*

*Integrated Forebody*

*AESA Radar*

*Electrical Upgrades*

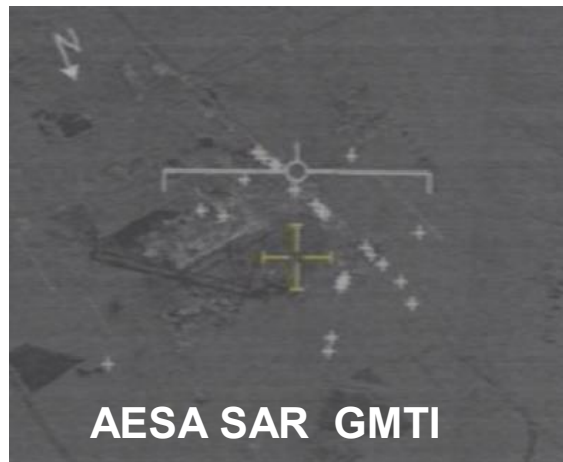
*Additional Power and Redistribution*

*Wideband Radome*

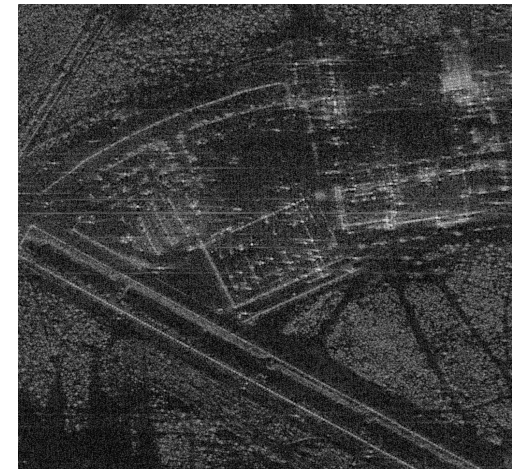
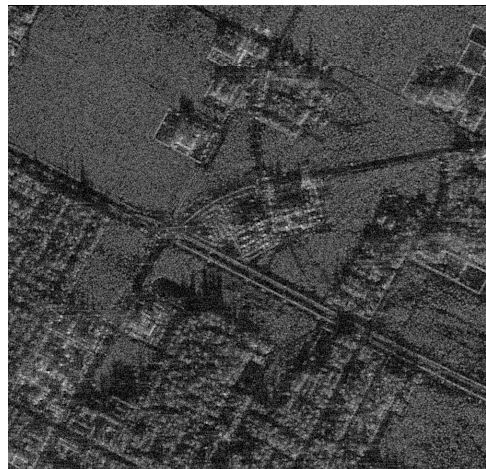
*Bandwidth Complements AESA Capability*

*Liquid Cooling*

*Expanded Cooling  
Capability and Flow*



**AESA SAR GMTI**



### Facts and Figures

- First Fleet delivery in November 2005
- Four AESA Super Hornets in flight test
- Raytheon delivered three AESA radars to Boeing production line ahead of time
- Twenty already on contract

**Major Component of NCO Strategy Roadmap**



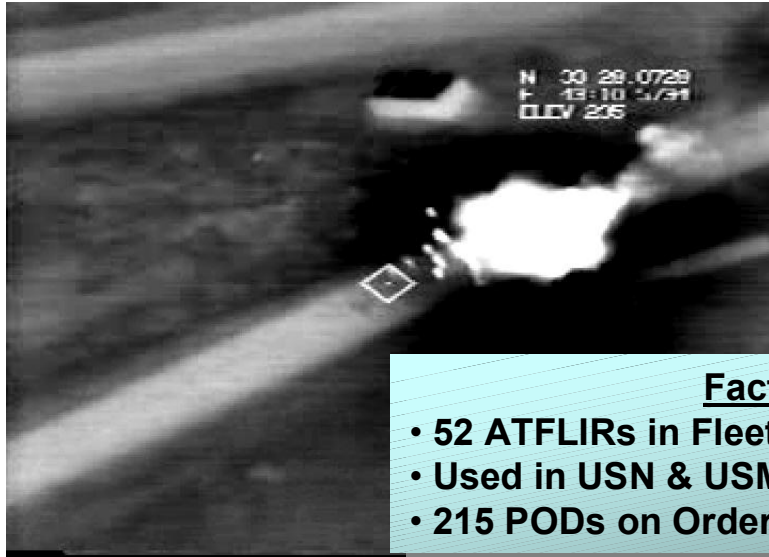
**Sensor Backbone**



# ATFLIR

## Tactical Impact / OIF

- **URBAN CAS**
  - 70% Night Operations
- **ISR / Pipeline Surveillance “Road Recce”**
  - High Value Targets
  - Personnel (Individual on Building)
  - Vehicles



### Non-Traditional ISR Missions



### Facts and Figures

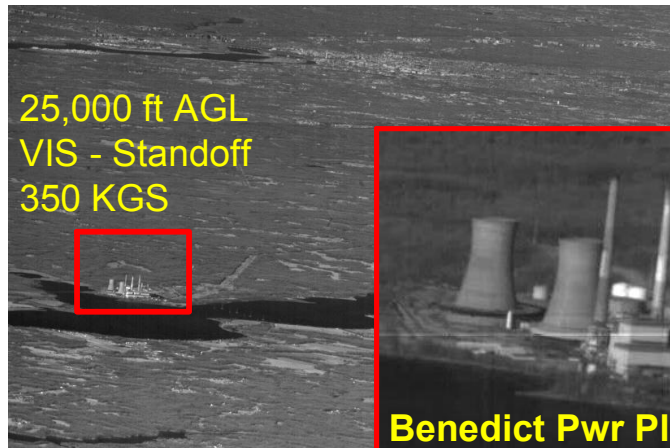
- 52 ATFLIRs in Fleet
- Used in USN & USMC aircraft: F/A-18A+/C/D/E/F
- 215 PODs on Order



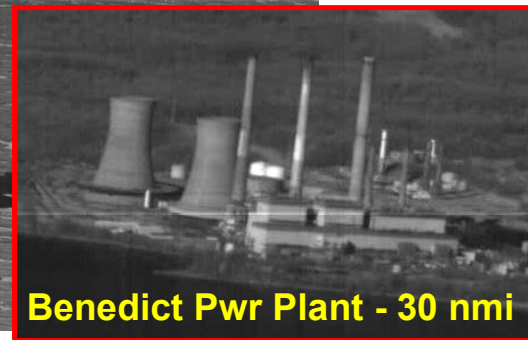


# SHARP Enters OPEVAL

Simultaneous collection of EO and IR



25,000 ft AGL  
VIS - Standoff  
350 KGS



Benedict Pwr Plant - 30 nmi





# First EA-18G Test Aircraft Moves into Modification Line



- Cost, Schedule, Performance as planned
- GTAT, CONOPS, QFD to shape the future
- On track to IOC in FY-09

## Delivering Hardware



Communications Countermeasure Set



Wing Tip Pod Radome



CCS



WTP

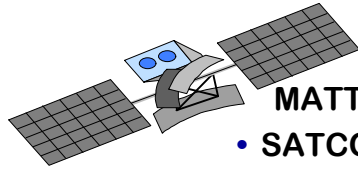




# EA-18G Products



**ARC210  
DCS (VMF)**



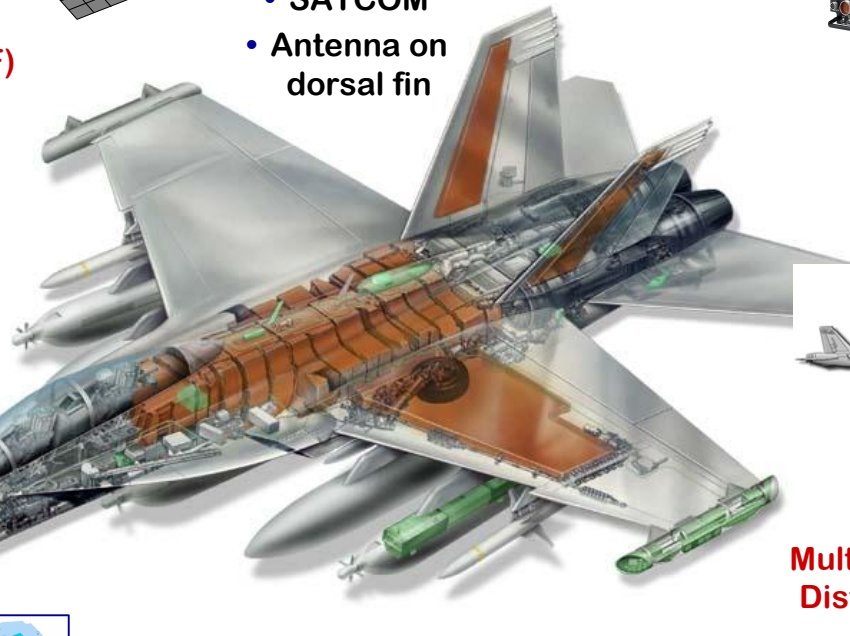
**MATT**  
• SATCOM  
• Antenna on dorsal fin



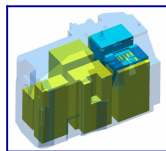
**Communications  
Countermeasures Set**



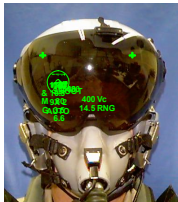
**Advanced  
Crew Station  
(ACS)**



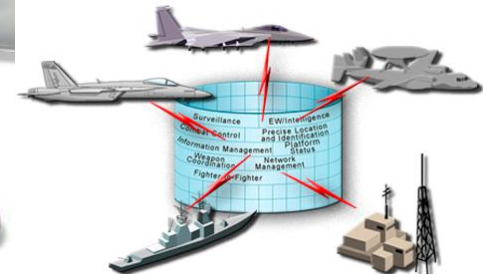
**AESA**



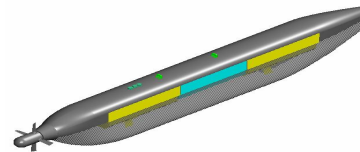
**ALQ-218 Radar Receiver**  
• WRAs mounted on Gun Bay pallet



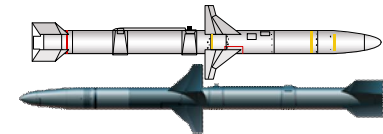
**Joint Helmet Mounted  
Cueing System (JHMCS)**



**Multi-Functional Information  
Distribution System (MIDS)  
2009/10: JTRS**



**ALQ-99 Tactical  
Jamming Pods**



**HARM /AARGM**  
• UDF  
download  
to missile





# JHMCS Aft Seat Test Underway

## F/A-18D and F/A-18F





# 8 X 10 Ready For Service Advanced Crew Station Under Cost







# Sea Power 21 (21st Century Naval Capabilities)

- Sea Strike (Power Projection)
- Sea Shield (Theater Ballistic Missile Defense)
- Sea Basing (Deployment and Floating Logistics)

**FORCEnet is the architecture of sensors, networks, and weapons to enable these capabilities.**

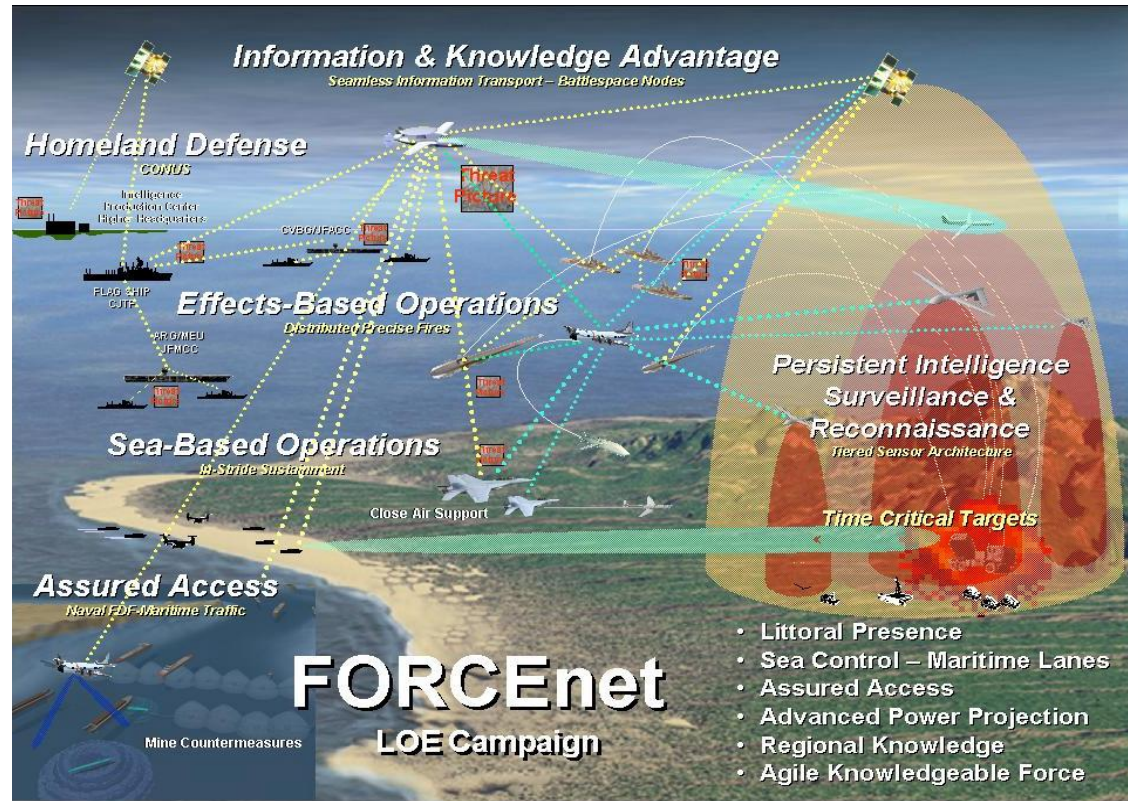






# FORCEnet

**SSG XXI Definition:** “The operational construct and architectural framework for Naval Warfare in the Information Age which integrates Warriors, sensors, networks, command and control, platforms and weapons into a networked, distributed combat force, scalable across the spectrum of conflict from seabed to space and sea to land.”



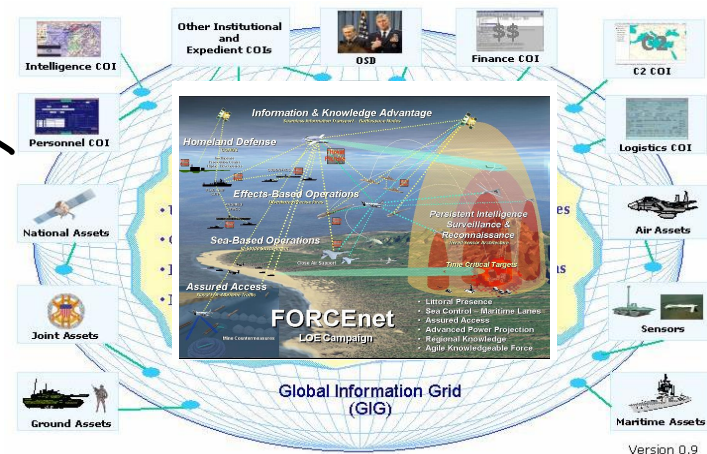
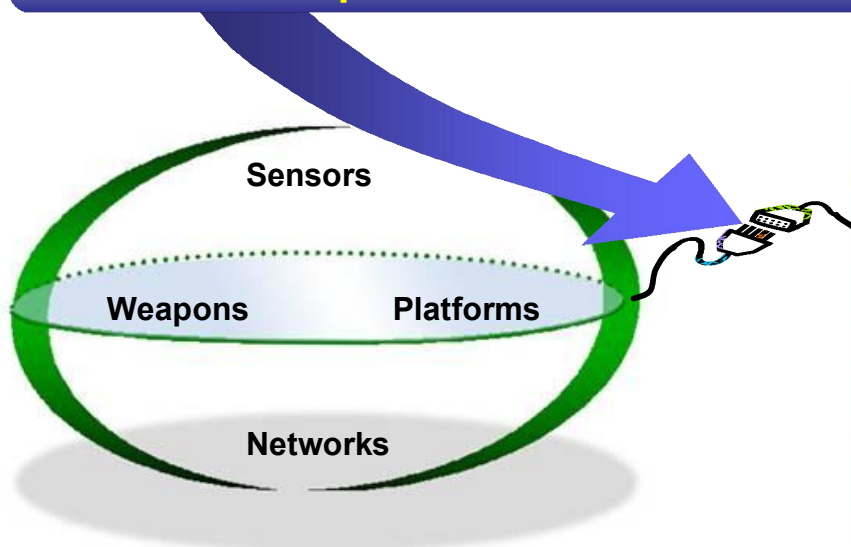


# Naval Aviation in Transition....

## Mission Capability Focused: Speed, Agility, & Alignment

- We must be networked and interoperable with joint forces (MTM)
- We must possess the ability to move tactical war fighting information seamlessly on/off the aircraft and across a networked force
- We must manage at the interface

- Information Elements
- Std & Arch Implementation
- Network Spec
- ICDs
- COI's and Training
- CONOPS



What's the future Machine-to-Machine architecture look like?



# NCO Strategy

**EA-18G**



- Near-term NCO - existing links, translators
- Future NCO - Wideband network (JTRS), SATCOM

**Key NCO upgrades**



*Transformational capability*



**F/A-18E/F**

- Linking ground troops and aircrews
- Tactical imagery, image exploitation/targeting

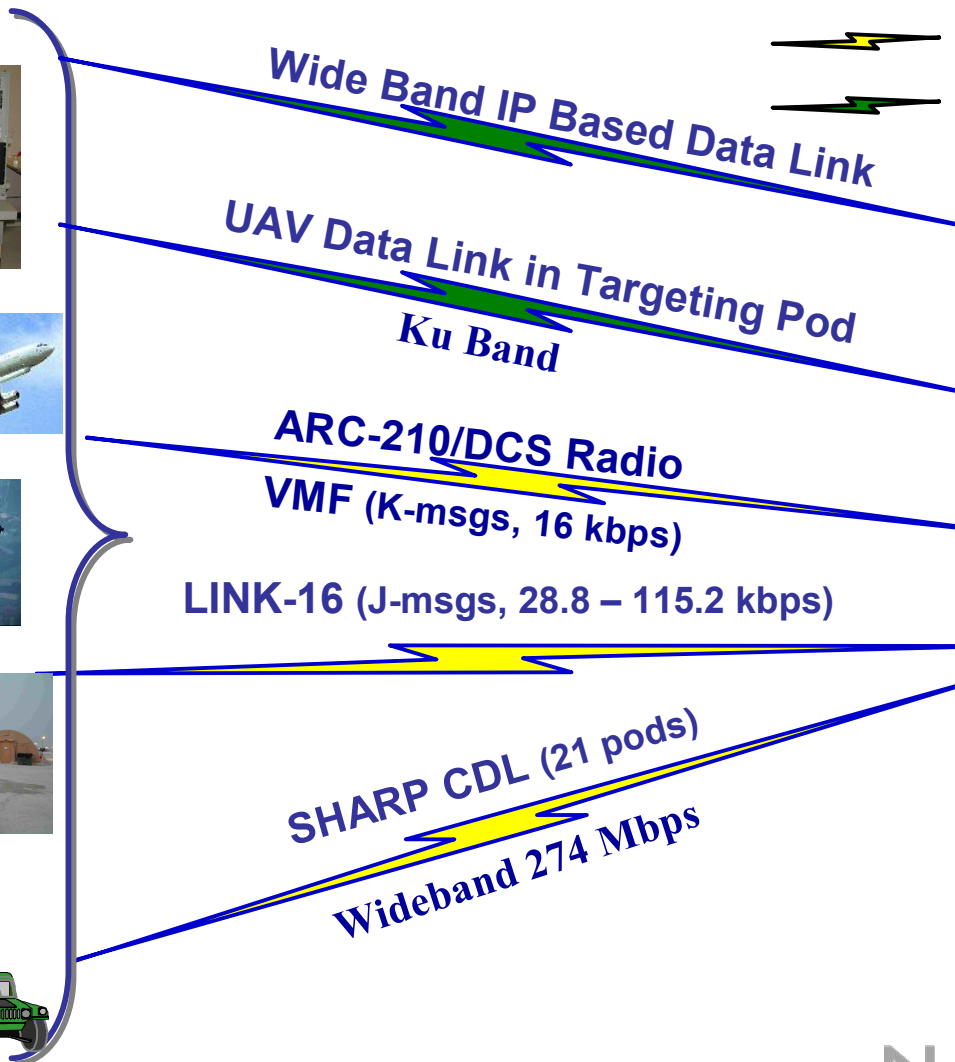
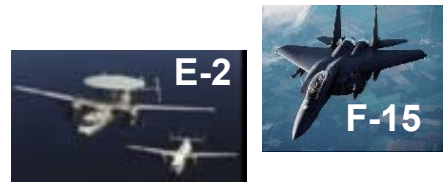




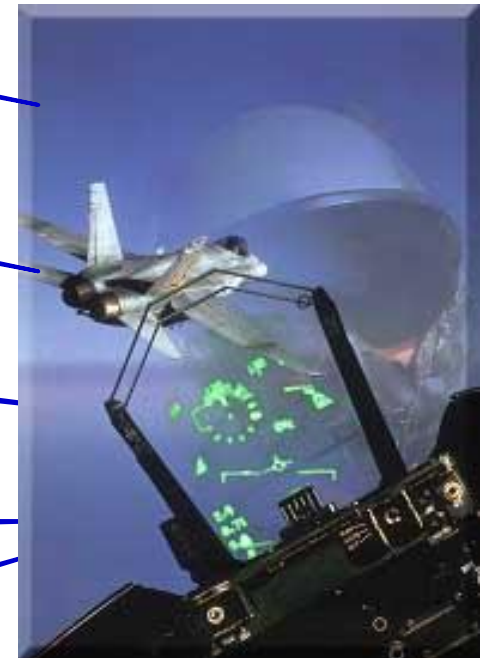
# Today's F/A-18 Interoperability Capabilities

**Current F/A-18 INTEROPERABILITY = LINK-16 + VMF + CDL**

**Samples:**



 Fielded Tactical Data Links  
 Planned Digital Links



LINK	Mil-Std
CDL	Mil-Std-7681990
L16	Mil-Std-6016
VMF	Mil-Std-188-220



# Net Centric in F/A-18

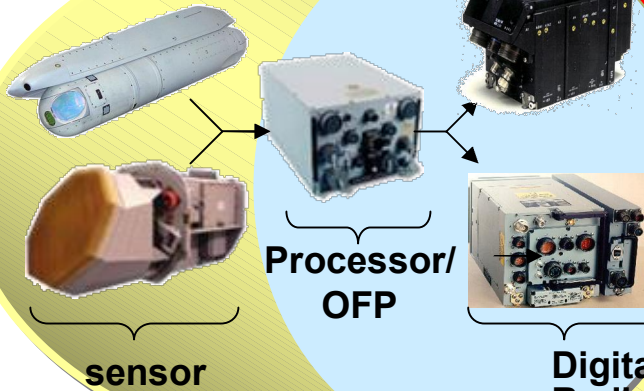
FAC(A)/SCAR  
"Finder"



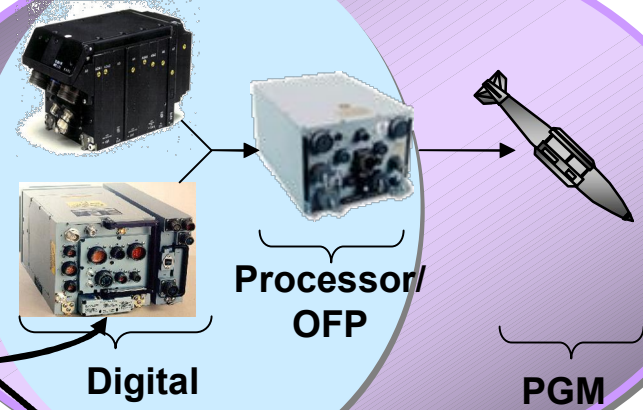
CAS/Armed Recce  
"Shooter"



"Machine"



"Machine"



"To"

Link 16

Digital Link

Digital Radio

Digital Link

PGM

Digital Msg (VMF K02.57)  
Aircraft Position & Target Designation (APTD)  
(Sensor/Weapon Designation lat/long)



"Machine"



FAC with THS (ACASS)





SEAVANS 291:16:26:58.1845 9786894  
VX-9 JDAM (HE) 10/18/01



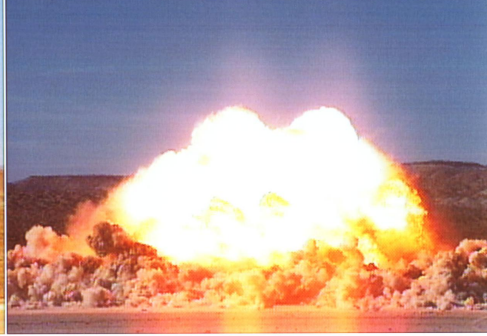
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VX-9 JDAM (HE) 10/18/01



SEAVANS 291:16:26:58.2513 9786894  
VX-9 JDAM (HE) 10/18/01



SEAVANS 291:16:26:58.4181 9786894  
VX-9 JDAM (HE) 10/18/01



# VMF

# F/A-18 Providing Better Close Air Support

HOWITZER 291:16:26:47.2945 8885131  
VX-9 JDAM (HE) 10/18/01



HOWITZER 291:16:26:47.3612 8885131  
VX-9 JDAM (HE) 10/18/01



HOWITZER 291:16:26:47.4781 8885131  
VX-9 JDAM (HE) 10/18/01



HOWITZER 291:16:26:49.7804 8885131  
VX-9 JDAM (HE) 10/18/01





# VMF Status and System Synopsis

- Program development started in mid-1990s
- F/A-18 Initial Operating Capability (IOC) in 2003
  - Included with 17C/18E OFPs
- 400+ VMF-capable aircraft currently in the Fleet (with DCS radio)
  - It will be the most numerous fielded & commonly configured TACAIR VMF data link
  - DCS Retrofits to fleet aircraft will be on-going for next 3 to 4 years
- Fleet will have 1000+ VMF-capable aircraft when DCS retrofits are completed
  - Approximately 500 C/D, 100 A+, and 460 E/F aircraft
- U.S. coalition nation aircraft also planning to field VMF per the F/A-18 configuration
  - Australia, Canada, United Kingdom





# Simplified F/A-18 A+/C/D/E/F VMF Implementation

- Entire Fleet VMF Capabilities are Identical Today: OFP 17C (A+,C,D), OFP 18E (First Super Hornets), OFP H2E (Newer Super Hornets)
  - 1<sup>st</sup> spiral digital CAS
  - Messages per VMF TIDP-TE Reissue 2 (same as 15C)
  - K01.01 (Free Text); K02.33 (CAS 9-line Brief); K02.34 (Aircraft On Station); K02.35 (Departing Initial Point)
- Entire Fleet Software Upgrade in Fall 2005: 19C (A+, C/D) & H2E+ (Super Hornets)
  - 2<sup>nd</sup> spiral digital CAS
  - Messages per VMF TIDP-TE Reissue 6
  - Three new messages
    - K02.57 (Aircraft Position & Target Designation - APTD); K02.58 (Final Attack Control); K02.59 (Request APTD)
  - New Imagery K (H2E+ only)
- Future Fleet Software Upgrade in Fall 2006: H3E & 20X ICPs to MIL-STD-6017
  - 3<sup>rd</sup> spiral digital CAS
  - Update K02.28 CAS Bomb Damage Assessment (BDA) message
  - Update K02.33 CAS 9-line & K02.57 APTD message





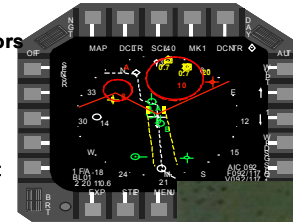
# MIDS (Link-16) Status

## MIDS Highlights

- VFA-131 (deployed on USS GW) Reports: “... Voice A (16 kbps) functions excellently as a Tactical Net, and in many cases has worked better than HQ or KY.”
- **24 F/A-18 Squadrons have 163 MIDS-LVTs installed**
- MIDS flown over **12,000** flight hours in EOC squadrons **during Operation Iraqi Freedom. 30,061** Fleet Flight Hours (as of Jun04)
- MIDS Squadrons currently deployed on **3 Carrier Battle Groups: USS JFK, USS Stennis, USS Kitty Hawk**
- MIDS Exceeding Reliability Expectations with Fleet MTBF of **825 Hrs**

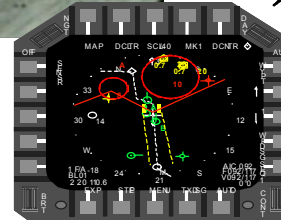


F/A-18F FAC(A) acquires/  
Designates target via sensors  
(JHMCS/ATFLIR)



FAC(A) sends target  
Designation to CAS  
Striker(s) via L16

Target Designation  
received by CAS Strike  
aircraft via L16



FAC(A) controls CAS  
striker sensors  
(JHMCS/ATFLIR) on  
ingress

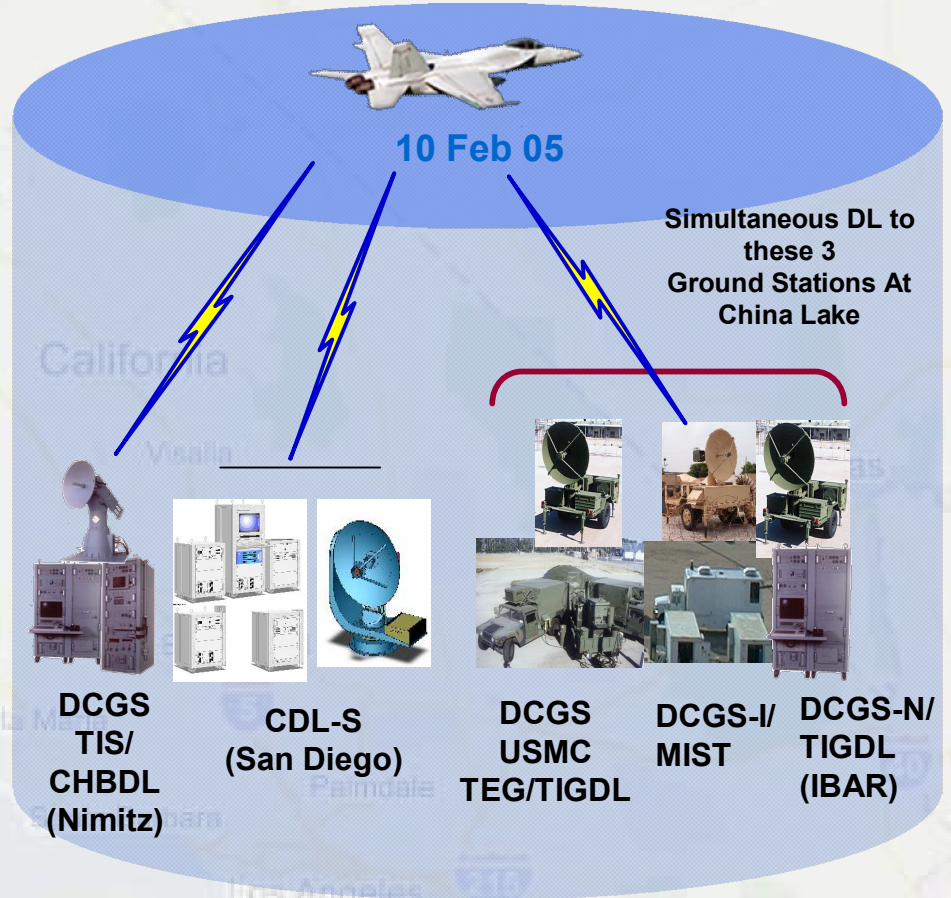
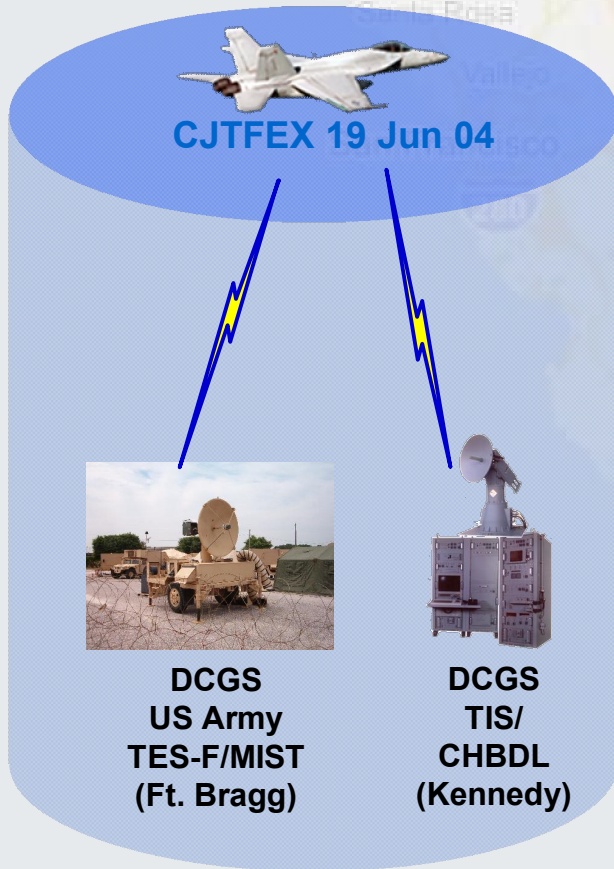


- Machine-to-machine
- No voice required
- Shortens kill chain

## ***Navy MIDS-LVT(1) Approved for Full Rate Production***

# F-18F SHARP Wideband CDL to DCGS Ground Stations

- Wideband 247 Mbps CDL format data link
- 100's to 1000's of NITF images are sent on each mission
- Ku Band



**DCGS Compatible Ground Stations**





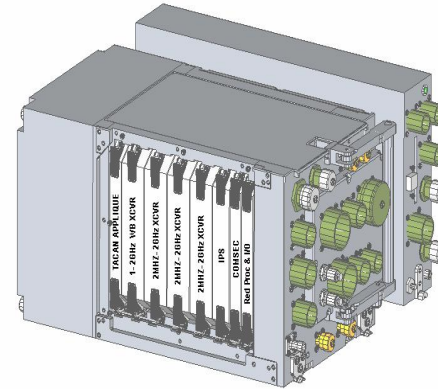
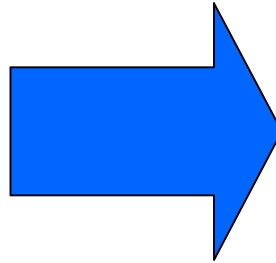
# MIDS JTRS



## MIDS-LVT (1 Channel)

Link-16, J-Voice, and TACAN

Location in F/A-18 Avionics Bay



## MIDS JTRS (4-Channel)

- Link-16, J-Voice & TACAN on Channel #1
- 3 JTRS universal channels (Channels 2-4)
  - 2 MHz - 2 GHz capability
  - Programmable with any JTRS Waveform

**“Plug and Play” Replacement,  
Form Factor Compliant**

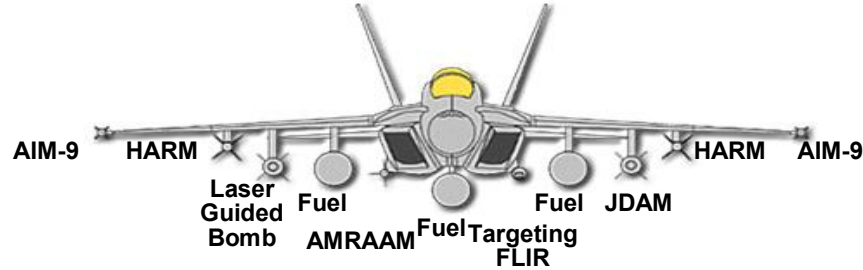


# UAV Data Link in Targeting Pod OIF Video





# F/A-18E/F Multi-Mission Weapons Flexibility















*Precision strike with self-escort/self-protection*

Current F/A-18E/F Capability	
AIM-7 Sparrow	JDAM Mk84/BLU-109
AIM-9L/M Sidewinder	JSOW-A (Baseline)
AIM-120AB/C AMRAAM	GBU-10/12/16
M61 Cannon	AGM-88 HARM
	Mk-82/BLU-111
Refueling Pod	MK-83/ BLU-110
NAVFLIR/TFLIR/ATFLIR	MK-84
ALE-47 Chaff/Flare	CBU-99/100
ALE-50 Towed Decoy	AGM-65 Maverick
TACTS Pod	AGM-84D Harpoon
AWW-13 DL Pod	AIM-84E SLAM
	BDU-45/48, MK76
	BDU-48 / LGTR

## Weapon

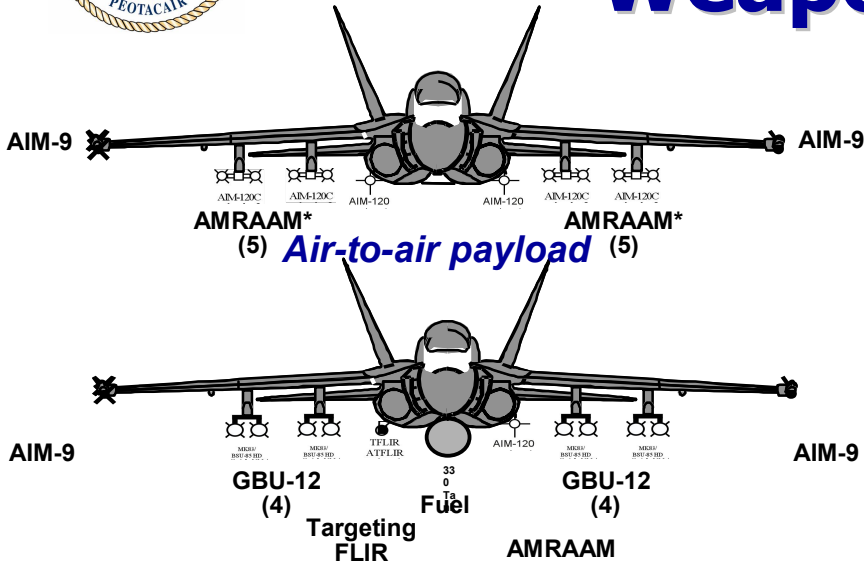
## IOC/Remarks

	2008
AIM-120 C5/6	
	2008
AGM-154 C JSOW Glide Bomb	
	2008
GBU-12 Paveway II 500-lb LGB (MK-82 Warhead)	
	2008
GBU-24B/B Paveway III 2,000-lb LGB	
	2008
GBU-16 Paveway II 1,000-lb LGB (MK-83 Warhead)	
	2008
AIM-9X Sidewinder	
	2008
GBU-38 JDAM 500-lb (MK-82 Warhead)	
	2008
AIM-120D	
	2008
GBU-32 JDAM 1,000-lb (MK-83/BLU-110 Warhead)	
	2008
BRU-55 Dual Carriage Rack 1760 & 1760	
	2008
Dual Mode LGB (GBU-12/16)	
	2009
AGM-88E AARGM	





# F/A-18 A+/C/D Multi-Mission Weapons Flexibility



## Precision strike with self-escort/self-protection

### Current F/A-18A+/C/D Capability

AIM-7 Sparrow	JDAM Mk84/BLU-109
AIM-9M Sidewinder	JDAM Mk83/BLU-110
AIM-120AB/C AMRAAM	JSOW-A (Baseline)
M61 Cannon	GBU-10/12/16
LAU-10 5in Rockets	GBU-24B/B
LAU-61 2.75in Rockets	AGM-88 HARM
NAV FLIR/TFLIR/A TFLIR	Mk-82/BLU-111
ALE-47 Chaff/Flare	MK-83/ BLU-110
TACTS/LA TR Pod	MK-84/BLU-117
AWW-13 DL Pod	CBU-78/99/100
ADM-141 TALD	AGM-65E/F Maverick
LUU-2 Parafares	AGM-84D Harpoon
Mk52/55/56/58/62 Mines	AIM-84H/K SLAM ER
Mk77 Fire Bomb	BDU-45/48, Mk76
PDU-5 Leaflet Bomb	BDU-48 / LGTR
	EW Pods

### Weapon

### IOC/Remarks



AIM-120 C5/6

Deployed



AGM-154 C JSOW Glide Bomb

Deployed



GBU-12 Paveway II 500-lb LGB (MK-82 Warhead)

Deployed



GBU-24B/B Paveway III 2,000-lb LGB

Deployed



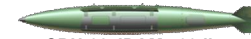
GBU-16 Paveway II 1,000-lb LGB (MK-83 Warhead)

Deployed



AIM-9X Sidewinder

Deployed



GBU-38 JDAM 500-lb (MK-82 Warhead)

Deployed



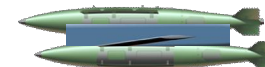
GBU-32 JDAM 1,000-lb (MK-83/BLU-110 Warhead)

Deployed



AIM-120D

2008



BRU-55 Dual Carriage Rack 1760 & Non 1760 Capable

2008



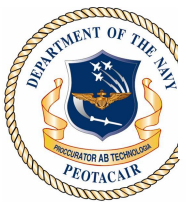
Dual Mode LGB (GBU-12/16)

2008



AGM-88E AARGM

2009



# Weapons in the Fight

- AIM-9X
- GBU-12 OB
- GBU-38
- BRU-55
- SLAM-ER

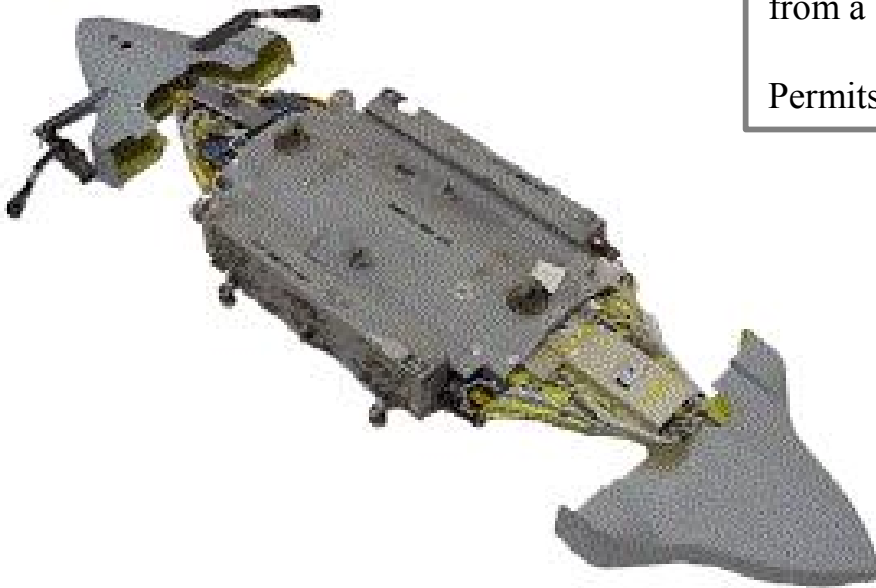




# BRU-55 Smart Rack

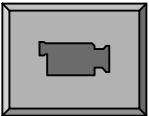
**Description:** BRU-55 is a BRU-33/A with electronics upgrades which allows carriage and release of two MIL-STD-1760 weapons from a single aircraft station.

Permits carriage of two 1760 weapons off single wing pylon



## Status / Accomplishments:

- F/A-18C/D – successful SCS 19C1 DT Flight Tests. 8 x J-82s dropped.
- BRU-55 Production contract awarded to EDO
- PMA-201/265 agreed to implement BRU-55 Dual Mode (1760 and conventional weapons)
  - Rewiring EBF power supply to support conventional weapons.
- BRU-55 Dual Mode SCS implementation for F/A-18A+/C/D is (21X) & F/A-18E/F is (H-4E)







# SLAM-ER

## Improvements over SLAM

### Tomahawk-Derivative Penetrating Warhead

- ◆ With 3 Fuze Delays
- ◆ Improves Concrete Penetration

### Tomahawk-Derivative High Lift-to-Drag Planar Wings

- ◆ >150 NM Standoff Range

### Advanced Weapon Data Link

- ◆ Improves Control Standoff
- ◆ Man In The Loop

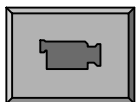
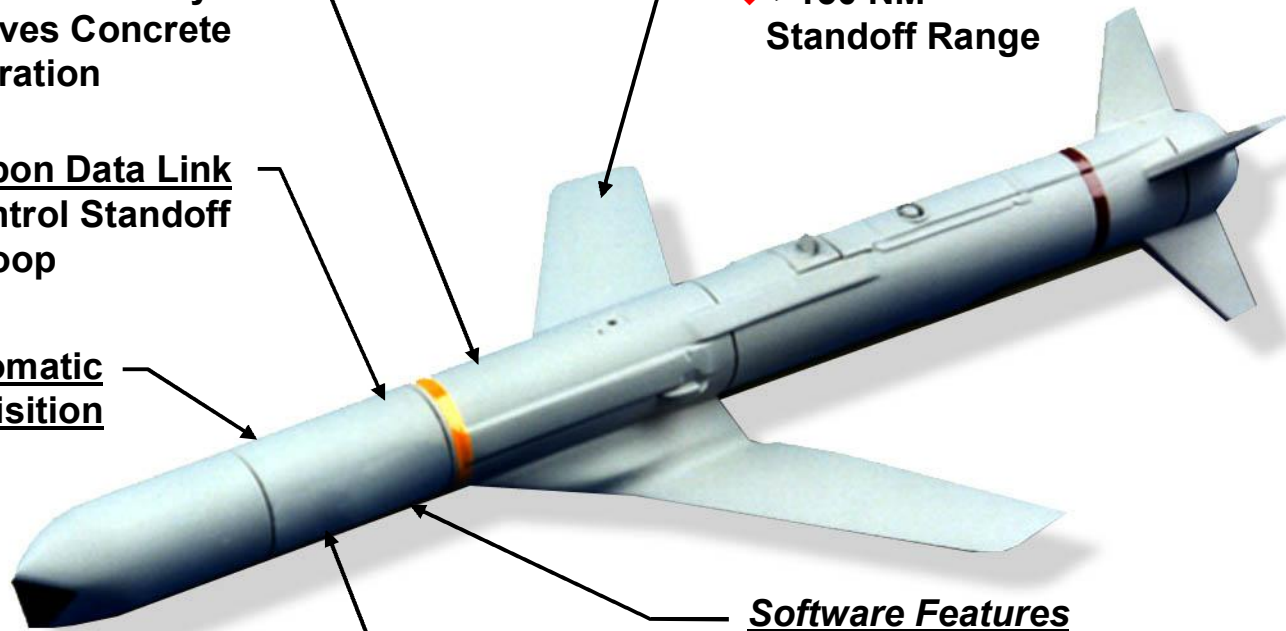
### Automatic Target Acquisition

### Guidance Navigation Unit

- ◆ 5 Channel GPS
- ◆ RLG Based INS
- ◆ MIL-STD 1760 Interface

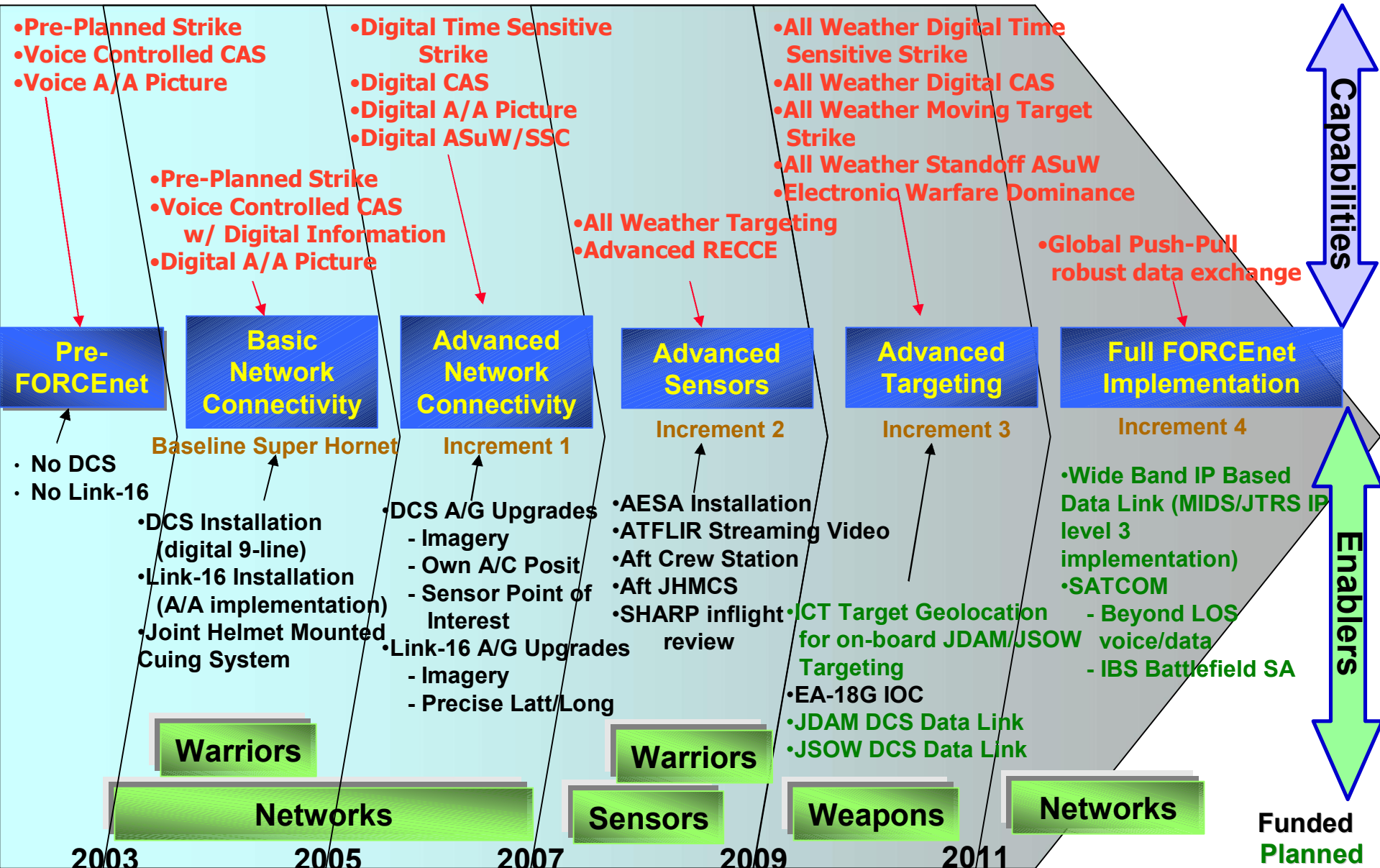
### Software Features

- ◆ Adaptive Terrain Following
- ◆ Improved Terminal Guidance
- ◆ Energy Management
- ◆ Improved Ship Target Acquisition
- ◆ Smart Mission Planning
- ◆ Re-locatable Targets (2003)
- ◆ Moving Land Target (2005)





# Incremental F/A-18 FORCEnet Implementation





# NCO Demonstrations



✓ **VMF Imagery**  
Sent targeting data and imagery to FAC using DCS radio and ACASS  
Dec 2002

✓ **Link 16 Imagery**  
Passed targeting and imagery between C<sup>2</sup> node and the F/A-18  
4 Sept 2003

✓ **VMF-Link 16 Gateway**  
Data received on one Link (VMF, Link-16), retransmitted over the other  
Sept, Nov 2003

✓ **RAIDER**  
Link 16 imagery from Raider ground system gateway  
27 Jan 2004

✓ **Onboard Target Geolocation**  
Automated Target coordinate mensuration  
April/June 04

✓ **MADD**  
Maintenance Data Downlink via Link 16  
June 2004

✓ **JEFX'04**  
VMF/ Link16 Digital TST  
2004

**JDAM Data Link**  
Inflight updates using VMF  
2005

**TW'05**  
Maritime Digital TST  
2005

**TTNT**  
Wideband IP Connectivity  
2005

**JSOW Data Link**  
Inflight Updates using VMF  
2005

**JEFX'06**  
DTST using Battlespace Network  
2006

**SATCOM**  
UHF with VMF & voice  
2006





# Joint Digital Time Sensitive Targeting (JEFX-04 Experiment)

**Find**

**Fix**

**Track**

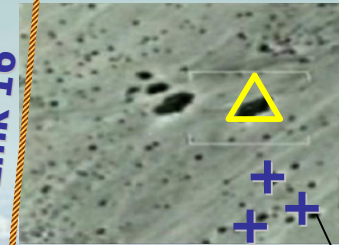
**Target/Engage**

**Assess**



3) F/A-18 Sends ATFLIR Image to CAOC(J16)

Link 16



Link 16

5) CAOC Tasks F/A-18 to Attack and Provides Blue Force SA (J12,J16,J3.5)



Link 16

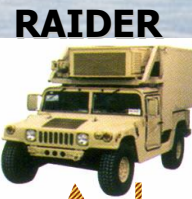


6) F/A-18 Attacks and sends BDA ATFLIR Image to CAOC (J16)



CAOC indicated Blue Force Location on original ATFLIR image (X symbols) as well as intended target (Triangle symbol)

2) CAOC Tasks F/A-18 to Investigate Contact (J12)



LAN

4) Internal CAOC TGT Decision Process



CFACC / CAOC

**SOF**



1) Cueing of possible mobile scud launcher





# Digital Close Air Support (Army Fort Dix Sep 04 Demonstration)

1. FAC Sends CAS 9-Line Tasking

2. ATFLIR Target Image Sent to FAC

5. A/C Sends BHA Image

UHF-VMF

IP

Contact Point

3. FAC Annotates Image w/ Target and BFA

Forward Air Controller

4. FAC Directs the Attack and Monitors A/C Position and Target Designation

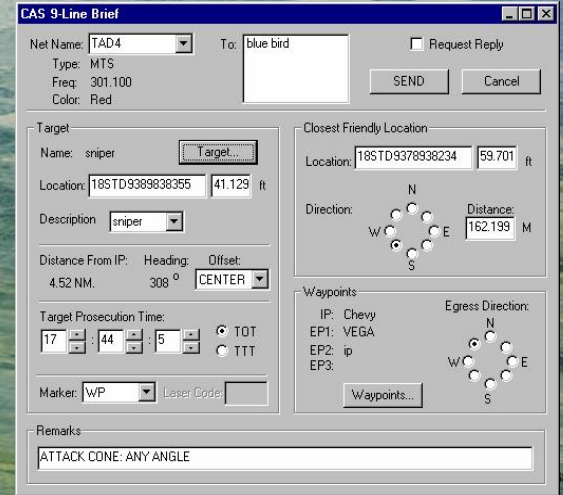
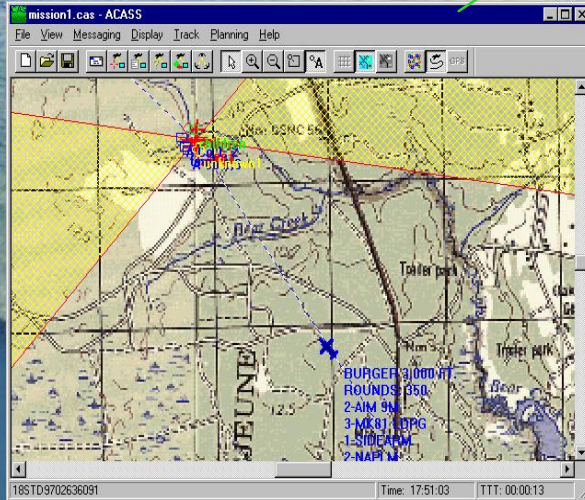
ACASS  
Ground System



ATFLIR image Annotated by FAC

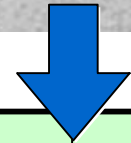
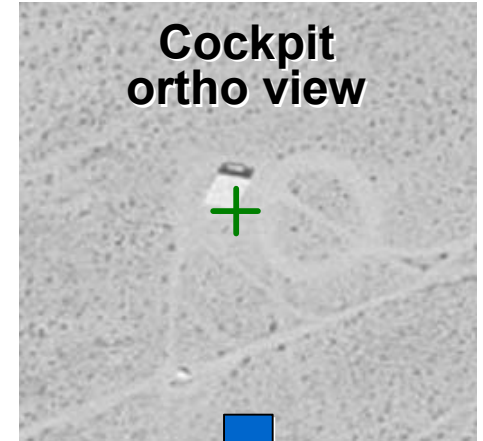
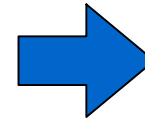
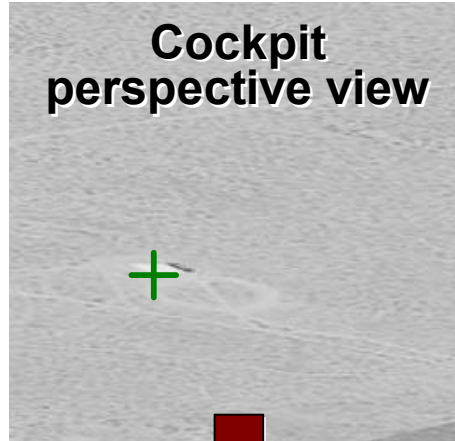
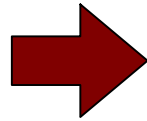
FAC Display Showing A/C Location and Sensor Point of Interest

FAC 9-line Display to Populate 9-Line Message

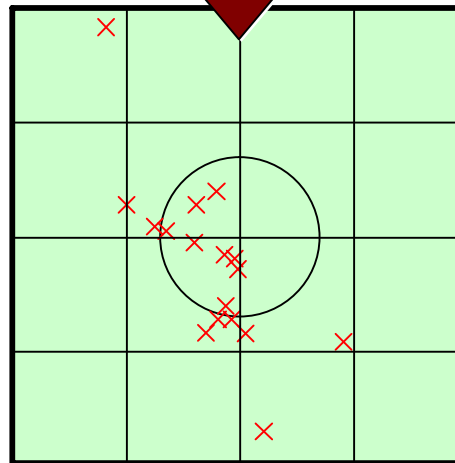




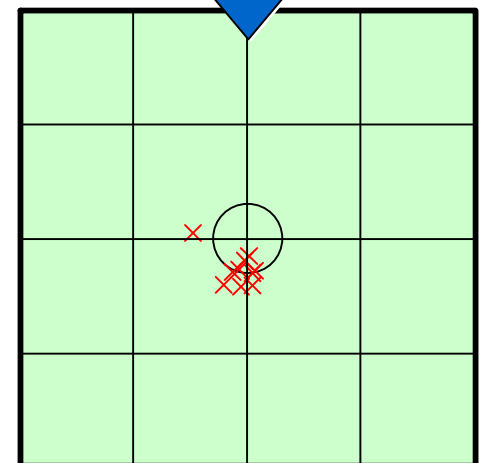
# ICT Flight Test Results Against ALAST Board



*Note: Tested against over 12 different target sets, but truth data was only available for the ALAST target board shown here*



Geo-registration results



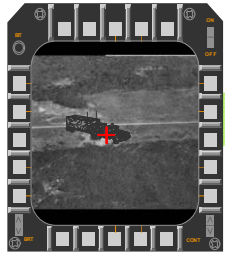
Pilot updated designation from ortho view

**Proposed ICT Memory: 125 - 500 GB**  
**Proposed ICT Processing: 32 GFLOPS**  
**Geolocate, Moving Tgt, Target Cueing, ATR**



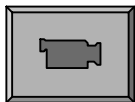


# F/A-18 F-1 JDAM MTE Demo



ATFLIR single MTT

- Hornet tracks moving target with ATFLIR and transmits In-Flight Target Updates (IFTUs) to JDAM via DCS VMF K02.57 APTD modified msg
- MK-84 2000 lb JDAM with Harris UHF Weapon Data Link T/R



F/A-18 F-1  
ATFLIR and ARC-210

JDAM UHF  
Weapon Data Link

UHF  
IFTUs

- JDAM steers out updated target coordinates (Relative Targeting Mode)

- Weapon transmits back IFTU message acknowledge

Moving Target

- Constant speed and heading target



# Guided Release Results

<u>Parametric</u>	<u>Objective</u>	<u>G-1 Results</u>
WDL IFTU update rate	> 1.5 Hz	1.5 Hz
WDL data latency	< 1.0 sec	< 1.35 sec
WDL message reception (drop rate)	< 2%	< 2%
WDL 2-way communication	performed	Yes
WDL reception range	> 40 nm	38 nm*



## MTE System Miss Distance

Objective < 8 m CEP(50%)

**G-1 Results < 2 m \*\***

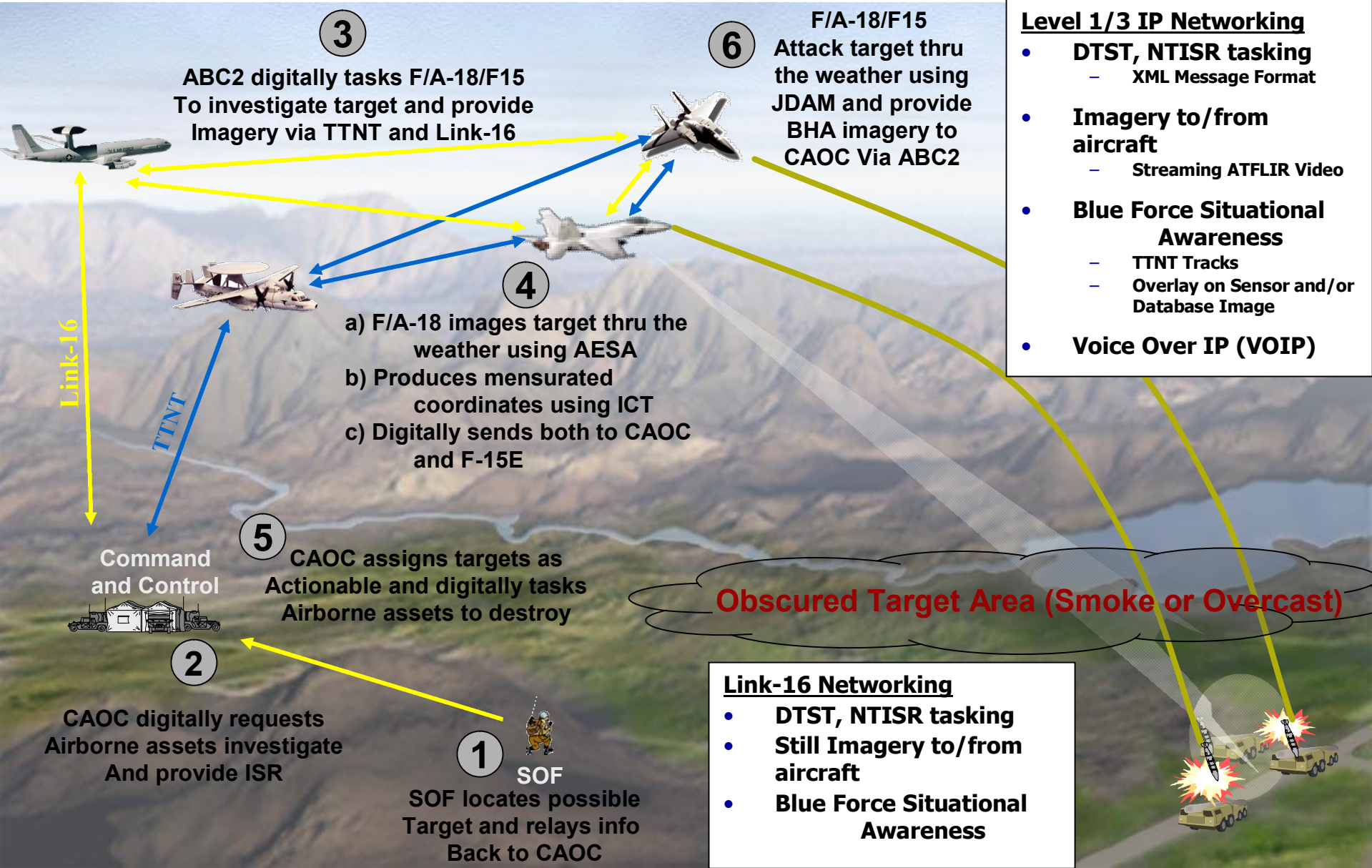
\* Local flight data

\*\* Target Miss Distance is < 2 m;  
MTE System Miss Distance relative to  
targeting point is TBD



# Joint All Weather DTST

(Proposed JEFX-06 Experimentation using today's Link-16 and tomorrow's IP Network/TTNT)



3

ABC2 digitally tasks F/A-18/F15  
To investigate target and provide  
Imagery via TTNT and Link-16

6

F/A-18/F15  
Attack target thru  
the weather using  
JDAM and provide  
BHA imagery to  
CAOC Via ABC2

4

a) F/A-18 images target thru the  
weather using AESA  
b) Produces mensurated  
coordinates using ICT  
c) Digitally sends both to CAOC  
and F-15E

5

CAOC assigns targets as  
Actionable and digitally tasks  
Airborne assets to destroy

2

CAOC digitally requests  
Airborne assets investigate  
And provide ISR

1



SOF  
SOF locates possible  
Target and relays info  
Back to CAOC

### Level 1/3 IP Networking

- DTST, NTISR tasking
  - XML Message Format
- Imagery to/from aircraft
  - Streaming ATFLIR Video
- Blue Force Situational Awareness
  - TTNT Tracks
  - Overlay on Sensor and/or Database Image
- Voice Over IP (VOIP)

Obscured Target Area (Smoke or Overcast)

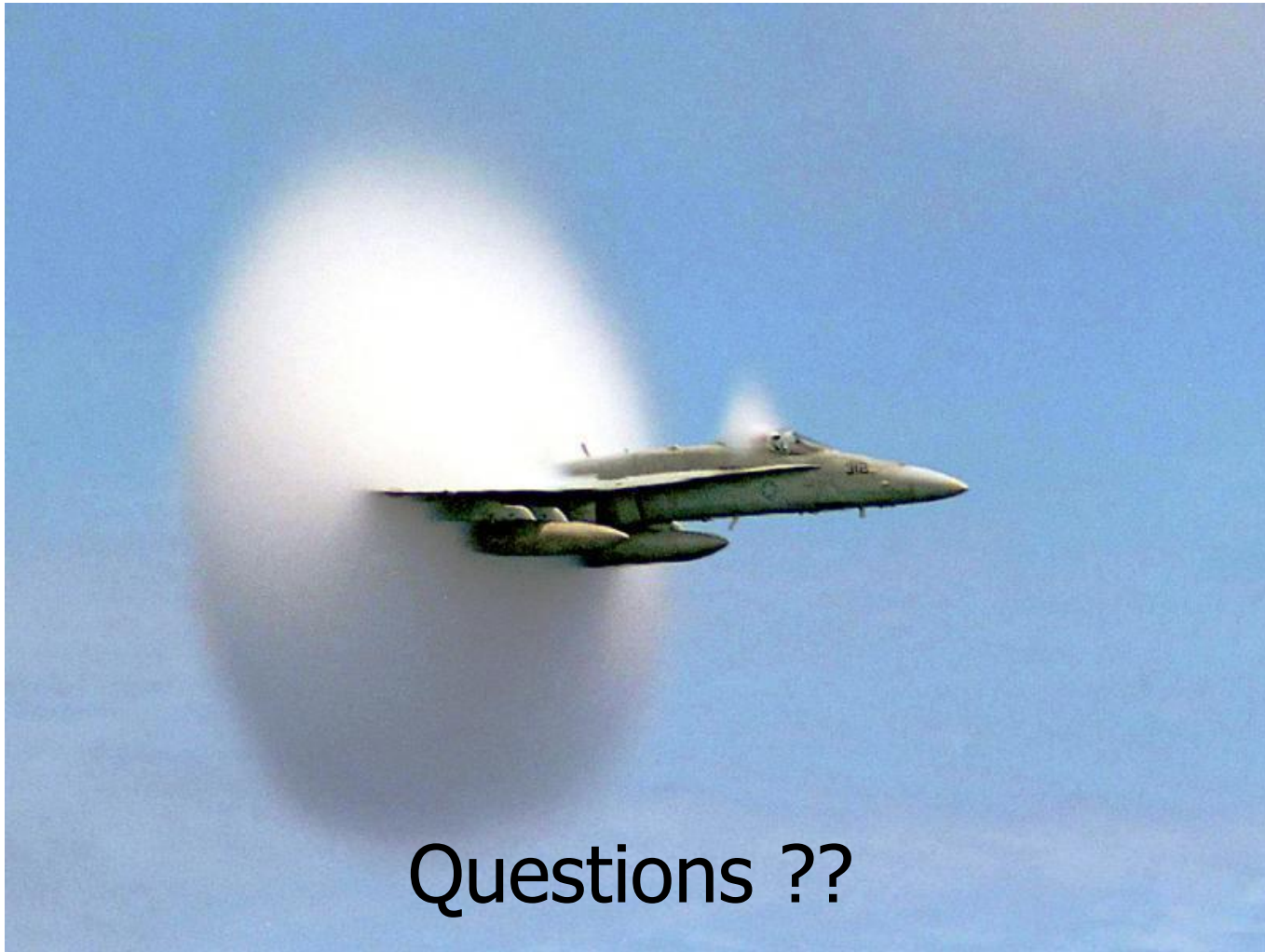
### Link-16 Networking

- DTST, NTISR tasking
- Still Imagery to/from aircraft
- Blue Force Situational Awareness





# F/A-18 & EA-18G PROGRAM



Questions ??

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cell- 240-538-3626