NLOS-LS
Non-Line of Sight Launch System

NLOS-LS Overview

- Program is on track
- NLOS-LS fully funded in the POM 08-13
- Recognized as a critical capability
- Fielding to Army Evaluation Task Force in 2008 with Spin out 1- full fielding starting in 2010.

NLOS-LS
SO1 System Components

NLOS-LS Capability

Precision Attack Missile (PAM)

- 40 km range
- Automatic Target Acquisition
- Laser Guided and GPS engagement modes
- Sealed canister – "Wooden round"
- Missile in canister less than 163 pounds

Computer and Communication System (CCS)

- Computes Technical Fire Data
- Manages Missile Launch
- C4I:
  - Compatible with Current and Future Tactical Radio Systems
- Self-Location and Orientation
- Self-Powered via Battery

CCS

CLU

Container/Launch Unit (CLU)

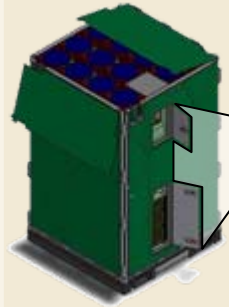
- Contains 15 Missiles and CCS
- Transportable by Air (C-17, C-130, V-22, UH-60, CH-47) Ground (FMTV and Other Vehicles) and Shipboard
- Not Platform Dependent
- Remotely or Locally Operated
- Weight Approx 3150 lbs (with Missiles)

Container/Launch Unit (CLU)

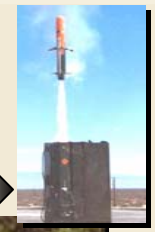
Threshold Capabilities:

- ✓Not Platform Dependent
- ✓Self-Locating to 10 meters
- ✓C-130 Roll-on/Roll-off
- ✓Vertical Launch
- ✓20 Second Response Time
- ✓72 hour Battery Life
- ✓Reconfigurable

Tamper Resistant



CCS



CLU Contains 15 Missiles, Battery, Fire Control and Communications System

PAM

GPS/INS Navigation System

Data Link
- Network Radio
- JTRS Surrogate
- Software Progr

Automatic Target Acquisition (ATA)

Requirement	ORD Threshold
Maximum Range	40 km
Minimum Range	500m
Target Set	High Value Targets
Updates in Flight	2-Way Network Comms

Multi-Mode Seeker
- Infrared (IR)
- Laser Guided

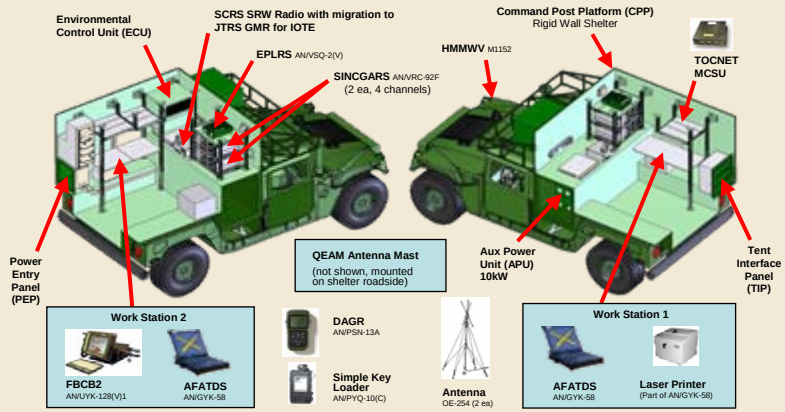
Laser Guided PAM

IR Image

IR Image

PAM Provides A 40km Precision Kill Capability Against Moving Targets Using Laser Guidance or Automatic Target Acquisition

Control Cell

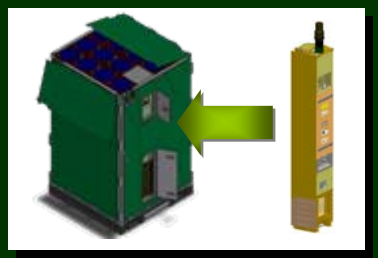


The Control Cell Provides NLOS-LS Future Force Capability To Modular and Current Force Organizations

Container/Launch Unit (CLU)

Capabilities

- **Network Radio/Node**
- **15 Missiles**
- **C-130 Roll-On/Roll-Off**
- **Not Platform Dependent**
- **Self Aligning, Self Locating, Reloadable, Reconfigurable**
- **Determines Vertical, North and GPS Location**



Requirements

Function / Component	Remarks
Container/ Launch Unit (CLU)	• Not Platform Dependent • Dimensions: Ht ~69", LxW 45", Wt ~3150 lbs • Remote and Local Launch Operations • On-Board Technical Fire Control • Intrusion Detection • Self-Diagnostics: Performed on Entire System Upon Utilization and Afterwards On-Command
Strategic Mobility	• Air: C5, C-17 • Sea: RO/RO; Container Ship; Break Bulk
Operational and Tactical Mobility	• Air: C-130, CH-47; UH-60, V-22 • Ground: FMTV, HEMTT
C2	• Organic to HBCT and NLOS Battalion • JTRS Surrogate Radios • GPS Anti Jam and SAASM compliant • Current Force (AFATDS) and Planned Compatibility with Battle Command System

Precision Attack Missile (PAM)

Capabilities

Length: Allows C-130 RO/RO
Weight: Each Missile in Canister Less than a Two-Man Lift


MBT Defeating Warhead

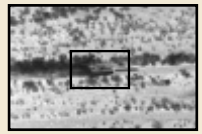

Boost/Sustain Propulsion


MEMS IMU


Network Radio


IR Seeker (640x480 Array)


Moving Target Tracker


Automatic Target Acquisition


SAASM GPS

- Target Image Prior to Impact Supports Battle Damage Assessment
- Multiple Seeker Modes Provide Target Acquisition Performance Under a Wide Variety of User Defined Tactics, Techniques and Procedures

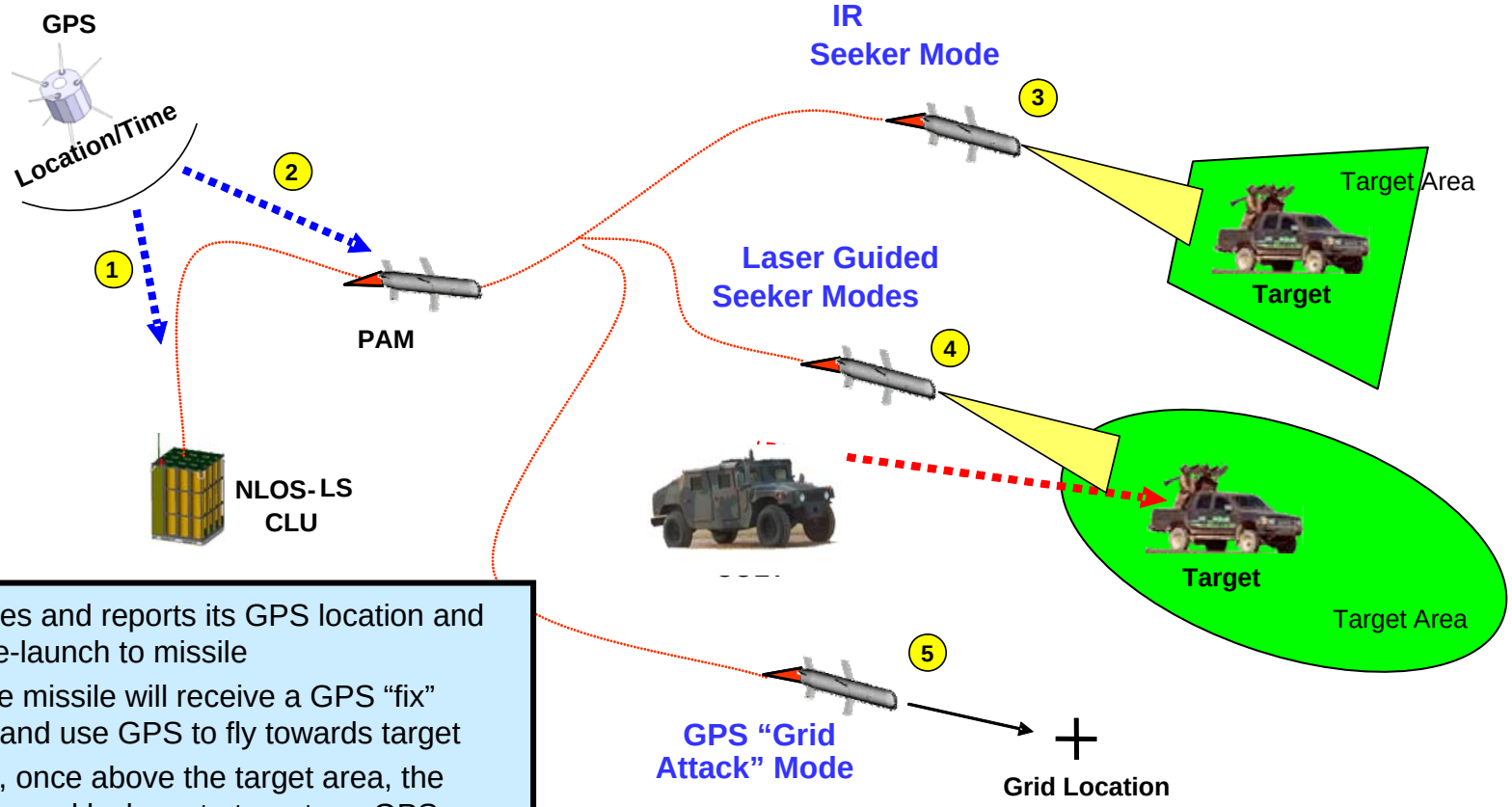
Flexible Engagement Options

IR Mode	Laser Designate Mode
• Observer provides Target Location and Target Type • Moving targets may require update of target location • IR Seeker selects Target and Best Aimpoint	• User Designation of Selected Targets in Cluttered Environment • User Designates Impact Point • Works with Airborne and Ground Based Designators • System Will Always Guide Off of Laser Returned, If Detected
Laser Anoint Mode	**Laser Offset Mode**
• Uses both IR and Laser Seekers • Laser Cues Missile to Attack Desired Target • IR Seeker Selects Best Aimpoint • Default Mode for Moving and Stationary Vehicles	• Similar to Laser Anoint Mode Except Laser is Used to Designate an Object in Close Proximity to Target • IR Seeker Selects Target/Aimpoint • May Avoid Triggering Laser Warning Receivers

Requirements

Length:	**67” (with Canister)**
Diameter:	**7”**
Weight:	**162.5 lbs (with Canister)**
Range:	**Approximately 40 Km+**
Altitude:	**Variable, Non-Ballistic**
Velocity:	**Subsonic**
Seekers:	**IR and Laser Guided**
Warhead:	**Shape Charge/Blast Frag**
Guidance:	**GPS/INS**
In Flight Update:	**For Moving Target Location**
Employment:	**Moving and Stationary Targets**

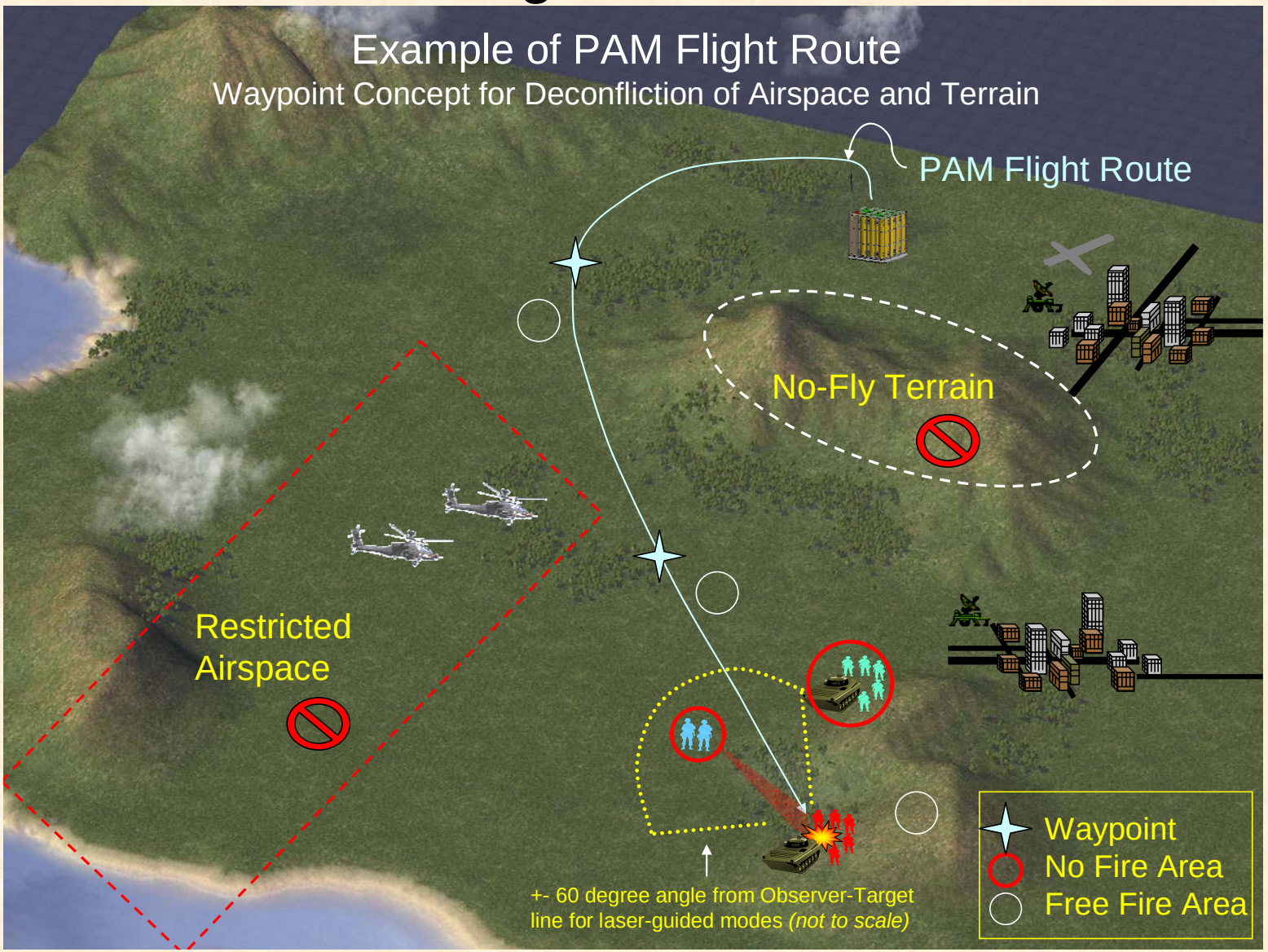
PAM Seeker Modes

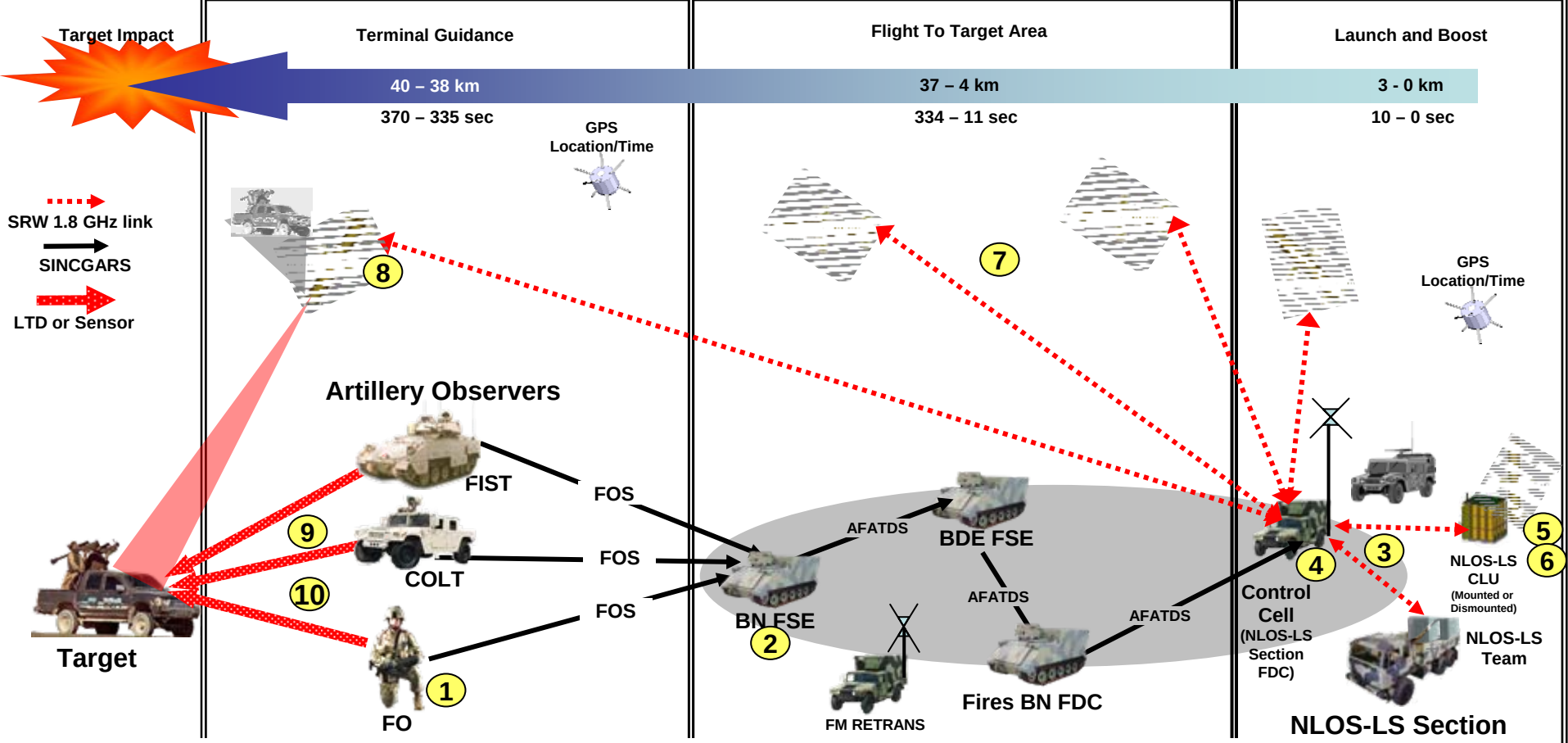


1. The CLU establishes and reports its GPS location and passes Attitude pre-launch to missile
2. Once launched, the missile will receive a GPS "fix" within 15 seconds and use GPS to fly towards target
3. In IR seeker mode, once above the target area, the missile searches for and locks onto target: no GPS needed now
4. In Laser Guided seeker modes, the missile searches for reflected laser energy from designator (3 modes: Designate, Anoint and Offset)
5. In GPS "Grid Attack" mode, the missile uses GPS signals received in-flight to fly directly to specified grid location and detonate on impact

PAM's Multiple Targeting Modes Increase Flexibility, Improve Lethality

Waypoints for PAM Flight Path





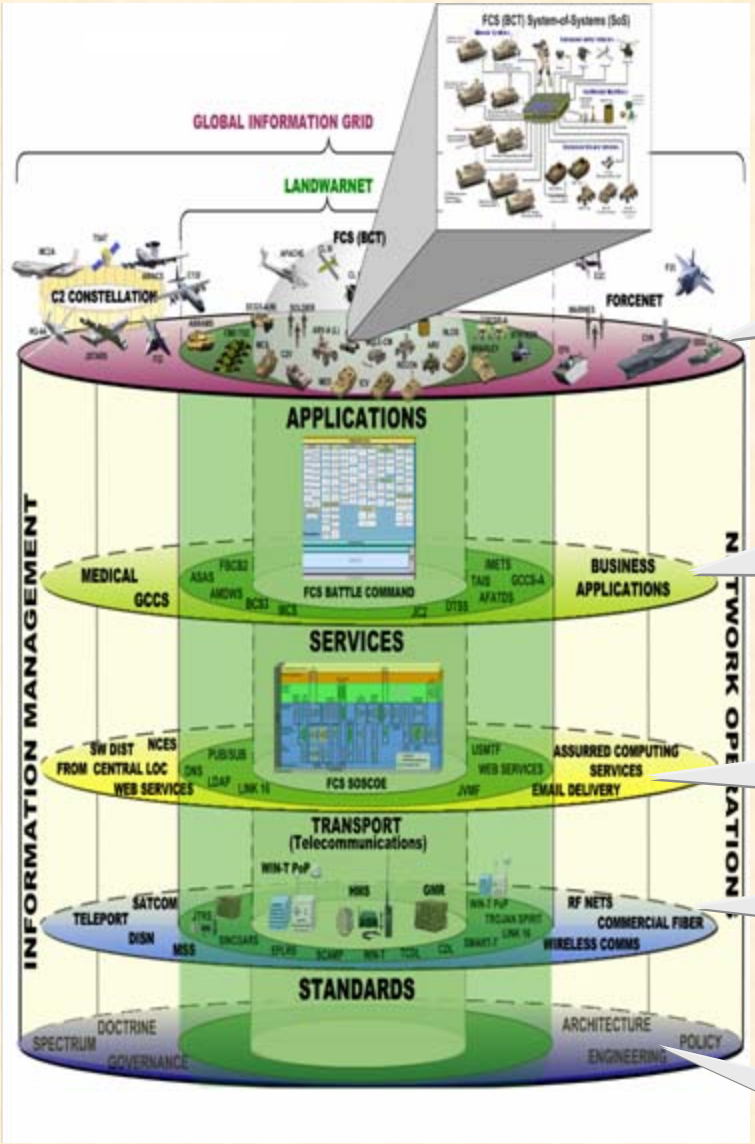
NLOS-LS Concept of Employment for Spin Out 1 / Modular Force

SEQUENCE:

1. Observer sends a Call for Fire to the Maneuver Battalion FSE AFATDS. **(FOS to AFATDS via SINCGARS)**
2. Battalion FSE AFATDS processes the fire mission and sends a Fire Mission thru BDE and Fires Battalion FDC to the NLOS-LS CC AFATDS **(AFATDS to AFATDS to AFATDS via SINCGARS)**
3. NLOS-LS CC AFATDS processes the fire mission and sends a Fire Mission to CLU(s) that it directly controls **(AFATDS to CLU via SRW)**
4. CC AFATDS sends Observer response message to the Bn FSE AFATDS who forwards the message to the Observer **(AFATDS to FOS via SINCGARS)**
5. CLU fires the mission and sends a "Shot" message to the AFATDS which forwards it to the Observer. **(CLU to AFATDS via SRW then FOS via SINCGARS)**
6. CLU sends an operational status including rounds remaining to the CC AFATDS. **(CLU to AFATDS via SRW)**
7. PAM sends position reports to the NLOS-LS CC AFATDS during flight. **(PAM to AFATDS via SRW)**
8. NLOS-LS CC AFATDS relays the "Designate" command from PAM (only on Laser guided missions) to the FO/COLT/FIST to laze the target prior to impact. **(AFATDS to FOS via SINCGARS). AFATDS and FOS also have internal countdown timers for redundancy.**
9. Observer lazes the target for the PAM to acquire (only on Laser guided missions).
10. Observer sends an End of Mission & Surveillance to the AFATDS **(FOS to AFATDS via SINCGARS)**

NOTE: FM Retrans deployed by battalion to fill SINCGARS network gaps for voice and data.

FCS Layered Network Architecture



Platforms & Sensors

Suite of ground/air, manned/unmanned platforms, with a diverse set of sensors tailored to the warfighters needs

Applications

Battle Command and Control, Intelligence, Surveillance, and Reconnaissance (ISR), Embedded Training, and Sustainment

Services

Common toolset of infrastructure services, (i.e. information assurance, interoperability, etc.)

Transport

Multi-Tiered (Ground, Air, Space), Dynamic, On the Move Communications Network

Standards

Common set of standard to enable interoperability and end-to-end performance metrics

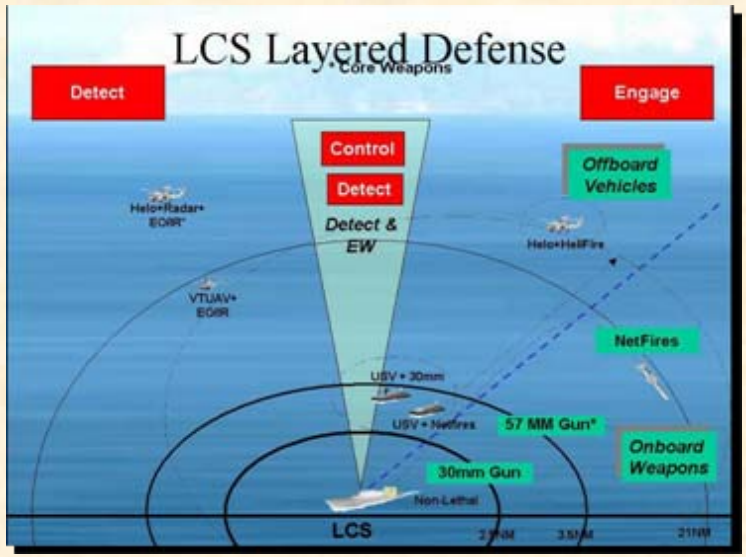
Video

Sling Load

Navy

MISSION: Defend Against Small Boat Threat

PAM Seeker Captive Flight Test, Wallops Island; November 2004



NLOS-LS Modularization for Littoral Combat Ship

Challenges

- Accelerating this capability and fielding in Spin Out 1
- Developing doctrine, organizations to implement outside FCS BCT
- Maintaining support for Army modernization
- Sustaining support for precision systems at maneuver brigade level

BACKUP

Computer and Communication System (CCS)

North Finding Module

Antenna

Navigation Unit

Removable Control Panel

Computer and Electronics Unit

Power Source

Weapon I/O Cage

Power Distribution Module

Characteristics

- Manages Missile Launch
- C4I
  - Compatible with Current and Future Tactical Radio Systems
  - Remote (Through AFATDS) and Local Operation
  - Planned Integration with FCS Battle Command System
- Self-Location & Orientation
- Self-Powered via Battery
- Facilitates Transfer of Power and Data Between Multiple CLUs

CCS is a Complete, Self Contained Fire Control System

M1084A1 FMTV

5 Ton Resupply Vehicle (RSV)

- Manufactured by Stewart & Stevenson
- Same vehicle as HIMARS Resupply Vehicle (RSV)
- Two Man Crew
- C-130 / C17 Transportable; USAF Certified
- Carries 2 CLUs
- On-board Materiel Handling Equipment: 5500 lb capacity crane
- Can be fitted with variety of cabs

NLOS-LS Control Cell for SO1 HBCT

SCRS SRW Radio with migration to JTRS GMR for IOTE

Environmental Control Unit (ECU)

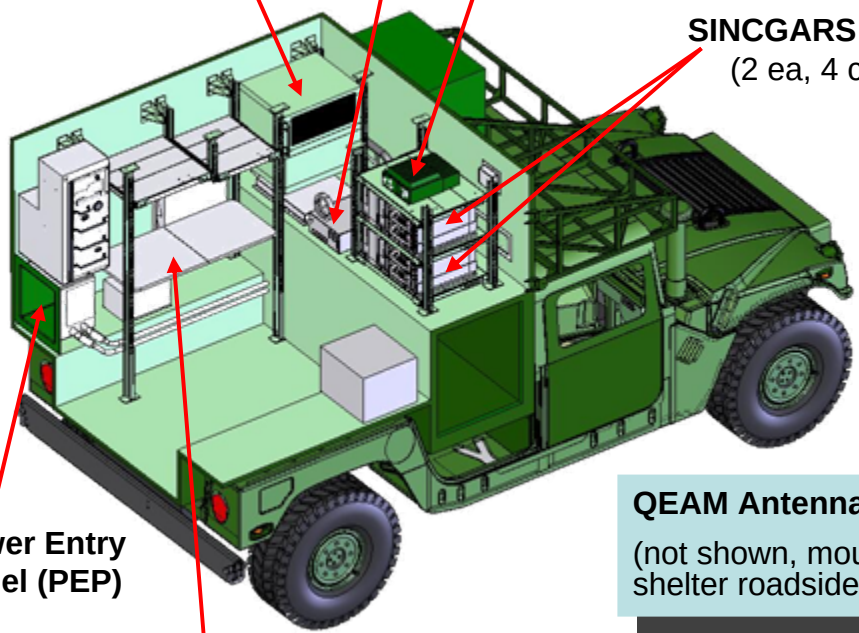
EPLRS AN/VSQ-2(V)

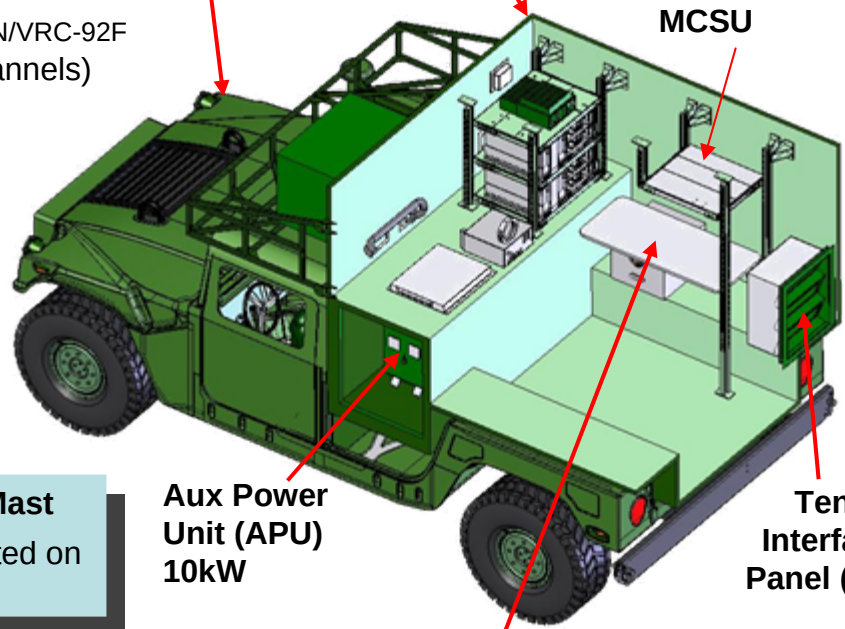
SINCGARS AN/VRC-92F (2 ea, 4 channels)

Command Post Platform (CPP)
Rigid Wall Shelter

HMMWV M1152

TOCNET MCSU





Power Entry Panel (PEP)

QEAM Antenna Mast
(not shown, mounted on shelter roadside)

Aux Power Unit (APU) 10kW

Tent Interface Panel (TIP)

Work Station 2

FBCB2
AN/UYK-128(V)1

AFATDS
AN/GYK-58

DAGR
AN/PSN-13A

Simple Key Loader
AN/PYQ-10(C)

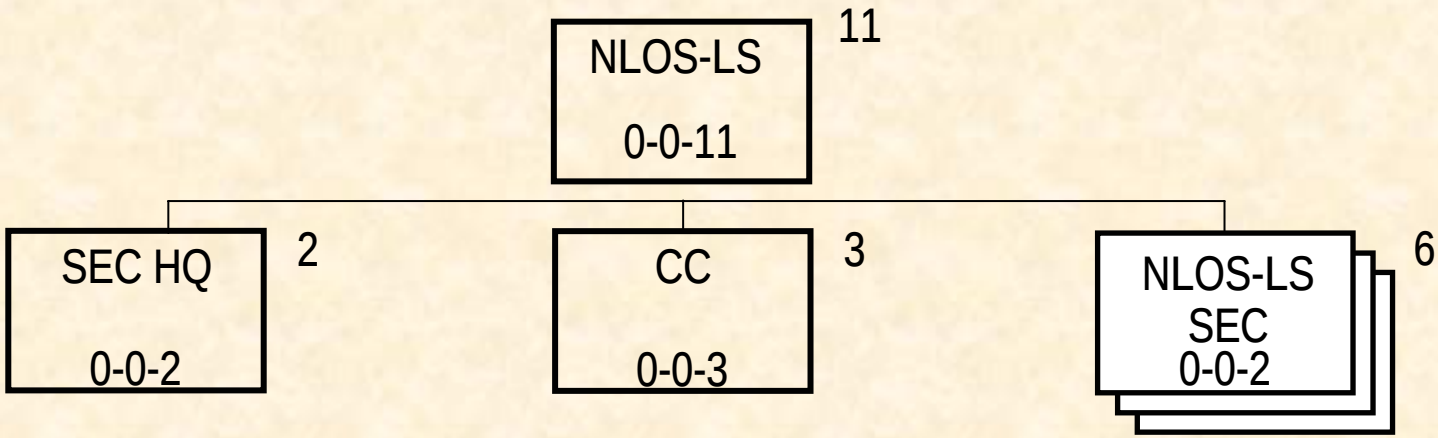
Antenna
OE-254
(2 ea)

Work Station 1

AFATDS
AN/GYK-58

Laser Printer
(Part of AN/GYK-58)

Fires BN, NLOS-LS Section



Section HQ

13D40	E7	SECTION SGT	1
13D10	E4	VEHICLE DRIVER	1

Major Equipment

C18378	CO SET AN/UYK-128(V)1	1
N05482	NIGHT VIS AN/PVS-7B	2
P49587	AN/VSQ-2C (V) 2	1
R45543	RADIO SET AN/VRC-92F	1
T11588	TRK UTIL M1152 EXP	1
T95924	TRL CGO: HI MOB 11/4T	1

Control Cell

13D30	E6	SQUAD LEADER	1
13D20	E5	FIRE CONTROL NCO	1
13D10	E4	AFATDS OPERATOR	1

Major Equipment

A79381	ANTENNA GRP OE-254	2
C18004	COMP ST AN.GYK-58	1
C18378	CO SET AN/UYK-128(V)1	1
C05541	CTR REC C-11561(C)/U	1
D78555	D T D ANCYZ-10 V3	1
N96248	NAV ST: GPS PSN-13A	1
N05482	NIGHT VIS AN/PVS-7B	2
P49587	AN/VSQ-2C (V) 2	1
R45543	RADIO SET AN/VRC-92F	2
R98145	RIGID WALL SHELTER	1
T11588	TRK UTL M1152 EXP CAP	1
Z00000	JTRS CLUSTER 1 GROUND	1

NLOS-LS Sections x3

13B20	E5	TEAM LDR	1
13B10	E4	DRIVER	1

Major Equipment x3

C05541	CTR REC C-11561(C)/U	3
C18378	CO SET AN/UYK-128(V)1	3
D78555	D T D ANCYZ-10 V3	3
N05482	NIGHT VIS AN/PVS-7B	6
P49587	AN/VSQ-2C (V) 2	3
R45543	RADIO SET AN/VRC-92F	3
T41203	M1084A1 FMTV TRK	3

NLOS-LS Section

NLOS-LS Section Leader
1x M1151 HMMWV
1x M1102 ¼ ton trailer

13D40
E7 Section Ldr

13D10
E3 Veh Dvr

Control Cell
1x M1113 HMMWV with rigid wall shelter

13D30
E6 CC Chief

13D20
E5 Fire Control NCO

13D10
E3 AFATDS Opr

13B20 X 3
E5 Team Ldr

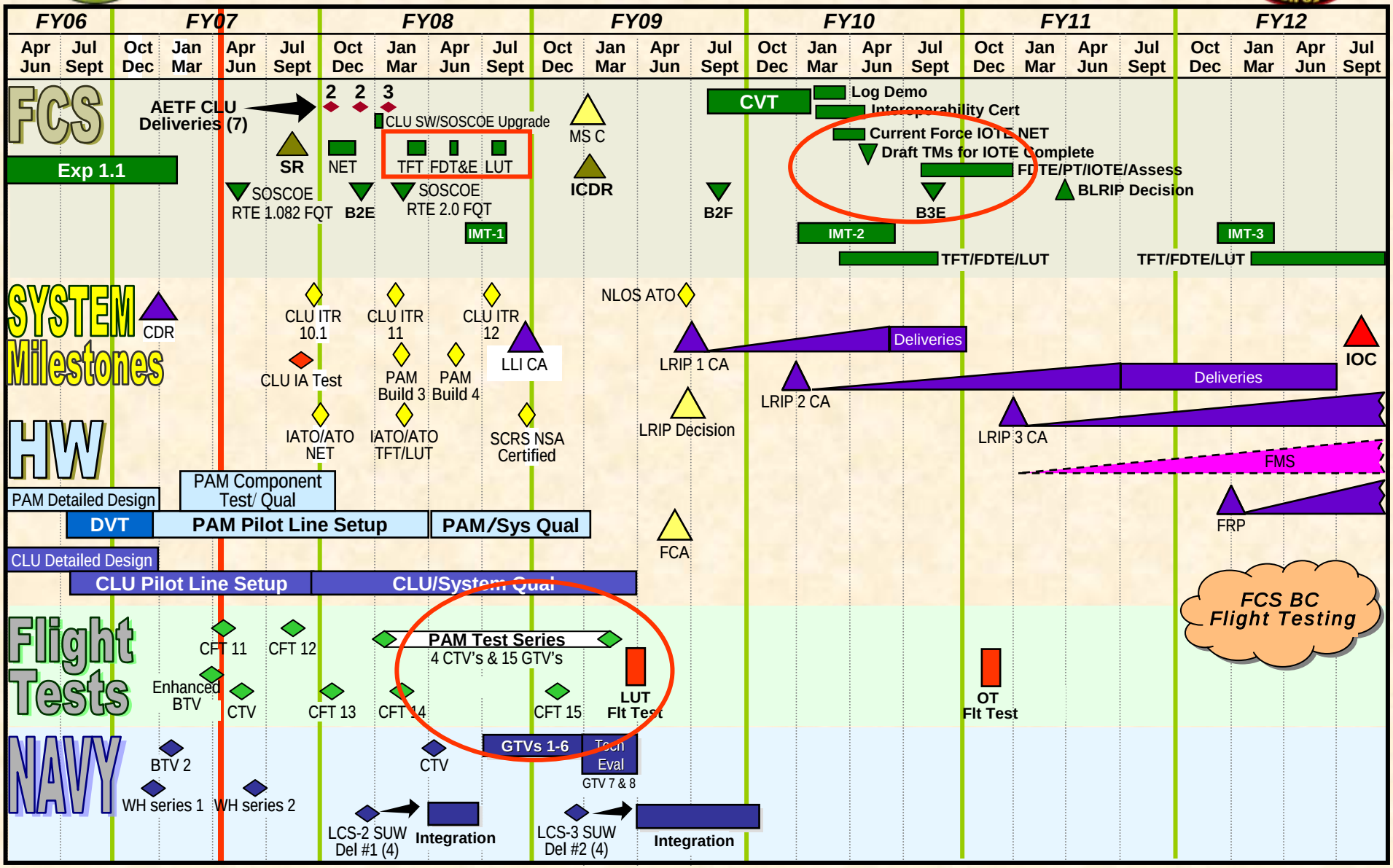
13B10 X 3
E3 Veh Dvr

Team 1
1x M1084A1R FMTV
2x CLU

Team 2
1x M1084A1R FMTV
2x CLU

Team 3
1x M1084A1R FMTV
2x CLU

NLOS-LS Schedule



Challenges

- Management of Requirements across numerous organizations
- Software development schedule to meet Spin Out testing requirements
- Facilities to support Institutional Training