Sea Trial / LTE

For ADS – B STIMS 21-22

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NAVAL AVIATION TECHNOLOGIES

NAVAIR

Sea Trial Process

- CNO says:
  - I'm expecting this to formalize experimentation
  - I'm expecting this to be "Fleet led"
  - I'm expecting the Fleet and R&D to work together
  - I'm expecting the timelines to shrink (i.e. "speed to capability")

CNS Staff Brief to 2nd Fleet, 2003

Sea Trial

- CFFC will incorporate concept development and technology insertion into the experimentation process
- CD&E Plan will **mature pillars**, codify to doctrine, plug into acquisition via a POR
- Sea Trial Emphasis on:
  - Speed - rapid transition into doctrine and programs
  - Comprehensive - single point for Navy experimentation
  - Jointness - Max incorporation of JCD&E
  - Relevance - Applicability to mission capability gaps
  - Economy - Max effectiveness/efficiency from CD&E

CFFC - Commander Fleet Forces Command
CD&E - Concept Development and Experimentation
POR - Program of Record
JCD&E - Joint Concept Development and Experimentation

ADS-B LTE Vision

- PMA209's Limited Technology Experiment (LTE) is anticipated to demonstrate the military utility of Automatic Dependant Surveillance Broadcast – (ADS-B) in supporting Common Operational Picture within FORCEnet under Sea Power 21

- If the LTE succeeds in receiving a positive military utility endorsement, then ADS-B technology would provide dual use military / civil common functionality, as funded via the CNS/ATM program. This would support digitization for Naval Aviation

Statement of Objective:

Perform a Sea Trial experiment which will generate metrics enabling the NNWC Fleet Collaborative Team to determine the military utility of ADS-B

Secondarily, complete a scenario to demonstrate AIS technology and record data for future use

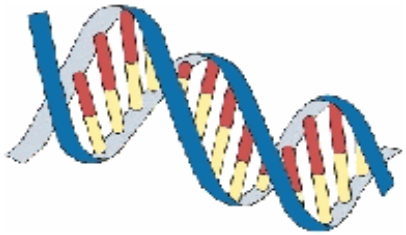
Other Positive Aspects of ADS-B LTE

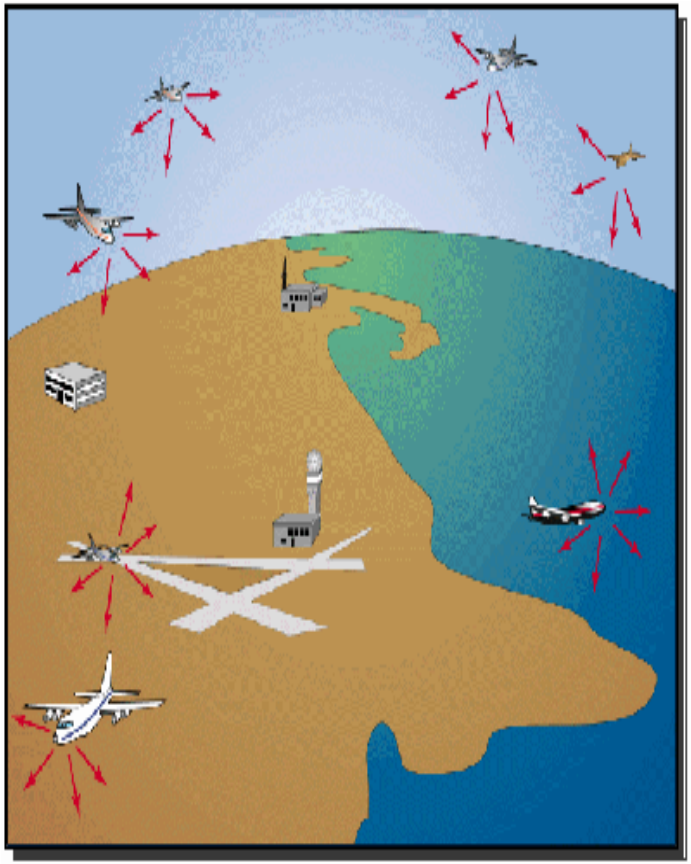
- Fleet process for supporting CNO Charter for CNS/ATM
- Collaboration with FAA will support GWOT
- ADS-B LTE metrics/data may assist BAMS SAA development
- LINK16 EMI compatibility test during 978MHz transmissions
- Risk reduction for ADS-B participation within TW06

What is ADS-B ?

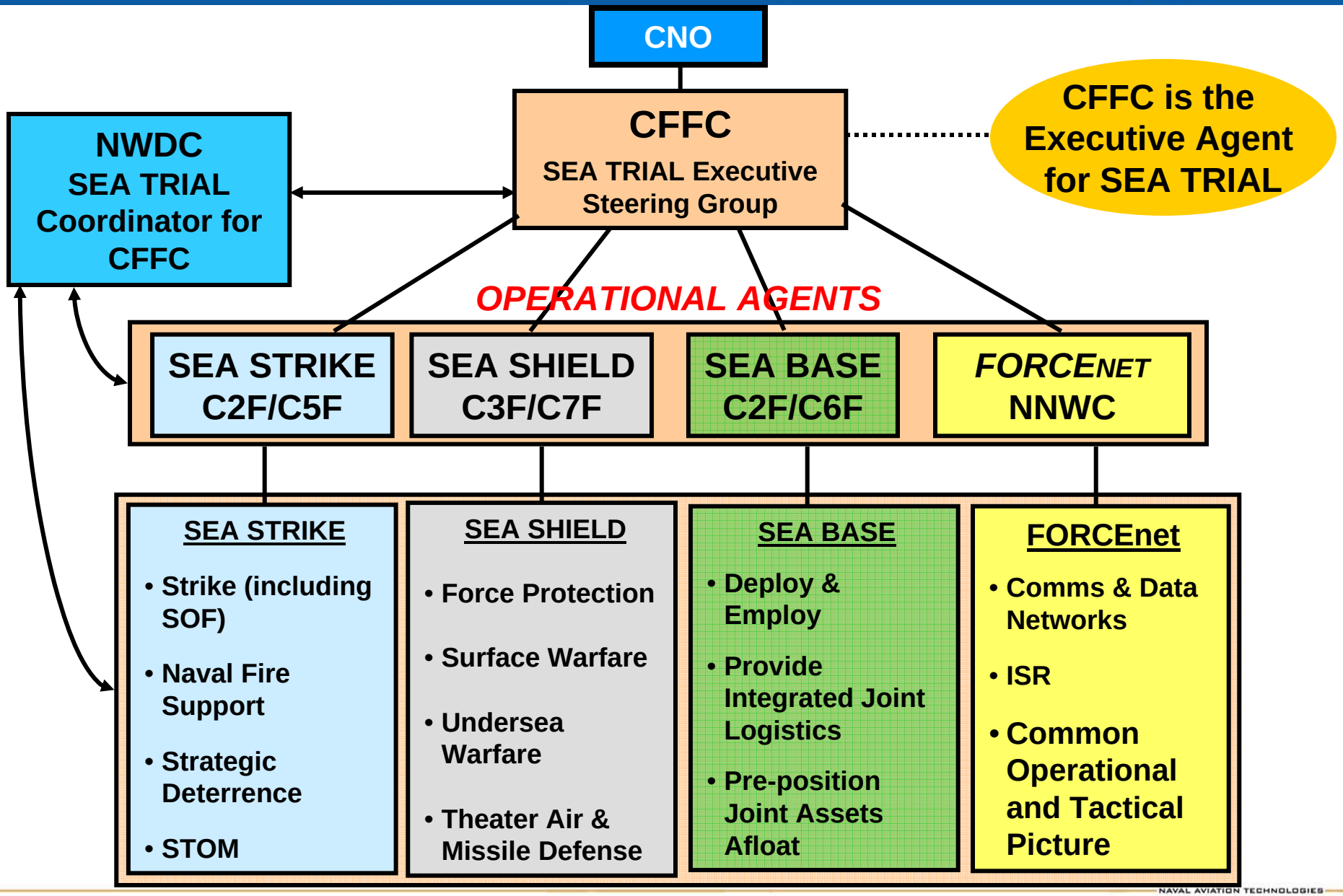
- **A**utomatic
  - No interrogation by external system, and no pilot input required
- **D**ependent
  - Position dependent on own ship's navigation - Global Positioning System (GPS)
- **S**urveillance -
  - Provides aircraft call sign, position, type, heading, altitude, velocity vector, emergency status, plus other information
- **B**roadcast
  - Data transmitted to all ground and airborne receivers, nominally once per second

"Aircraft DNA"





SEA TRIAL Organization Today



FLEET COLLABORATIVE TEAMS

CNS/ATM Requirements

For Military Aircraft

NAS

- 2005 RVSM
- 2012 RNP-2 FL290
- 2012+ ADS-B

ATLANTIC

- 1999 RVSM (NAT)
- 2001 RVSM (All)
- 2008 RNP-4

EUROPE

- 1998 BRNAV (RNP-5)
- 1999 8.33 kHz VHF
- 2001 Protected ILS
- 2002 RVSM
- 2004 P-RNAV in TMA
- 2005 ACAS II (Transports)
- 2009 Mode S with EHS
- 2010 RNP RNAV
- 2012+ ADS-B

PACIFIC

- 1998 RNP-10
- 2000 RVSM
- 2005 RNP-4
- 2012+ ADS-B

ADS-B

- 2006

LEGEND
ACAS – Airborne Collision Avoidance System
ADS-B – Automatic Dependent Surveillance - Broadcast
BRNAV – Basic Area Navigation
ELS -- Elementary Surveillance
EHS – Enhanced Surveillance
ILS – Instrument Landing System
kHz – kilohertz
Mode S – Mode Select
NAT – North Atlantic
NEXCOM – Next Generation Air-Ground Communication System
RNP – Required Navigation Performance
VDL – Very High Frequency Data Link
VHF – Very High Frequency
WATRS – West Atlantic Route System
RVSM – Reduced Vertical Separation Minimum

- Mandate In Effect
- Mandate Pending

More on ADS-B

- Civil transition to ADS-B over the next few years
- Broadcast self report of ID, posit, vector
  - Cockpit Display of Traffic Information (CDTI)
- Two data links selected for the National Airspace System
  - Mode S 1090 MHz (Air Carriers & Commercial)
  - UAT (978 MHz) (General Aviation & Flight Information)
- Mode S 1090 is interoperable with TCAS II v7
- Navy CXP can do 1090ES, ADS-B – Out, and ADS-B – In with upgrade of a 1090 Receiver
- UAT and AIS could be waveforms within JTRS

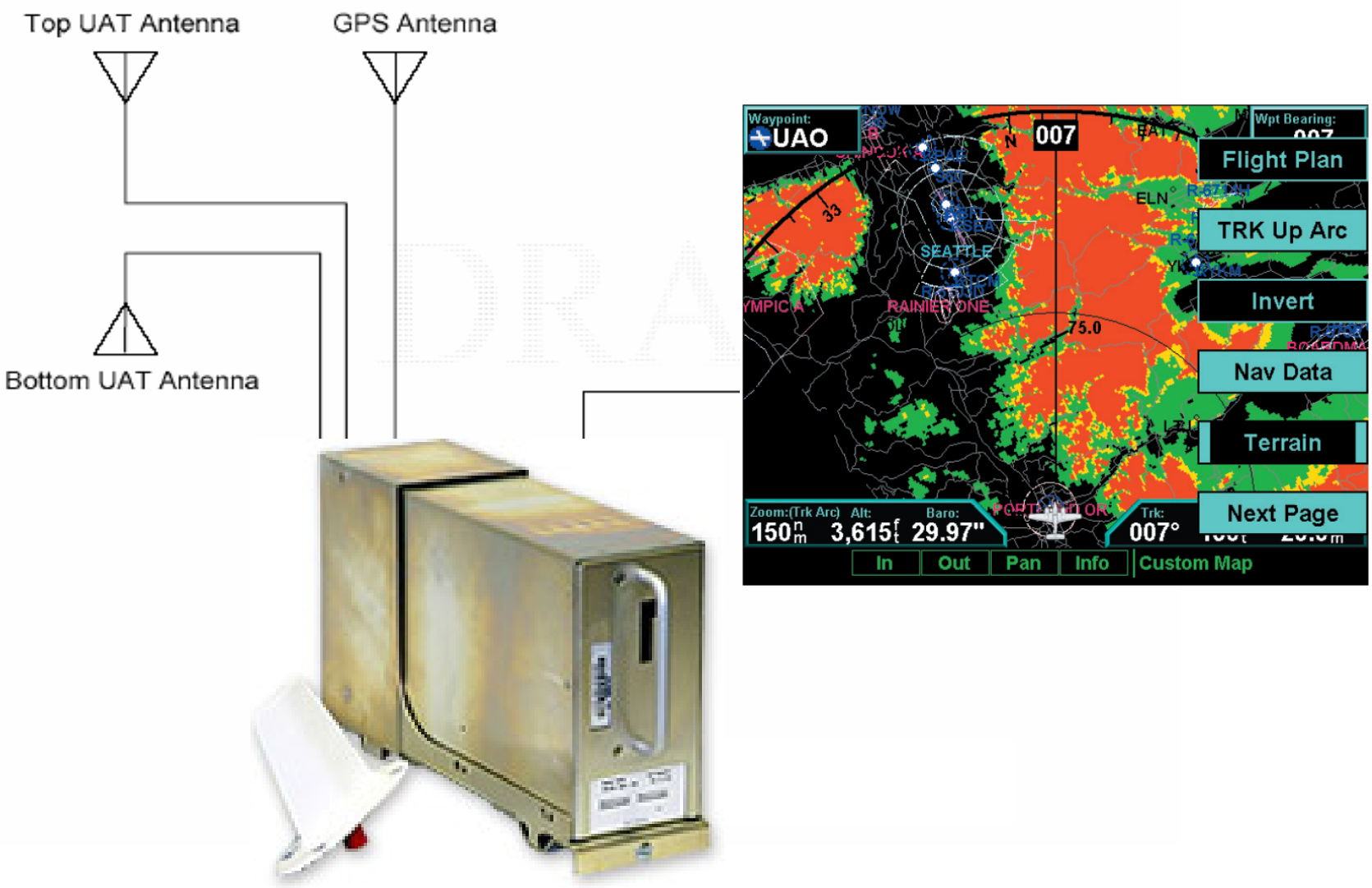
ADS-B (Traffic) Depiction

http://www.alaska.faa.gov/capstone/

Military Utility of ADS-B and AIS

- **Cockpit Situational Awareness (ADS-B-Line of Sight)**
  - Enhanced visibility of civil and military air traffic
  - Enables use of civil data link information services
  - Useful ADS-B applications:
    - Conflict Mgmt (Detection, Avoidance, & Resolution)
    - Low Visibility RDZUs
    - CDTI Enhanced Flight Rules (CEFR)
- **Bridge Situational Awareness (AIS-Line of Sight)**
  - Visibility of civil and military maritime traffic
  - Improved conflict resolution
- **Command Center Situational Awareness (ADS-B & AIS)**
  - Precision Ocean Surveillance

Basic UAT ADS-B Aircraft System



Selected Participants Architectures

T34

- UAT transceiver, backseat display and U/L 978 MHz and a GPS antennas

P3C

- UAT transceiver, 5x5 display plus 978 MHz antennas.

CSIL

- UAT transceiver with interface to a display for ground station recording/ receipt of ADS-B, TIS-B air picture as well as emulation of aircraft CDTI. Metrics data collection and incorporation into video presentation for leadership

NAS PAX

- DASR-11 radar feed to Potomac TRACON to the FAA for broadcast via St Mary's UAT GBT

FAA ADS-B Implementation Strategy

	FY 2007-2012	FY 2013-2018	FY 2019-2023
Segment	**Spiral 1**	**Spiral 2**	**Spiral 3**
1	• En Route Airspace Program (CONUS)	• En Route Airspace Program (Gulf / Caribbean)	• En Route / Oceanic Cockpit Applications Program
2	• Terminal / Surface Airspace Program	• Terminal / Surface Airspace Program (enhanced functionality)	• Terminal Cockpit Applications Program
3	• Broadcast Service Program (basic functionality)	• Broadcast Service Program (enhanced functionality)	
4	• Technology Application Development	• Technology Application Development	

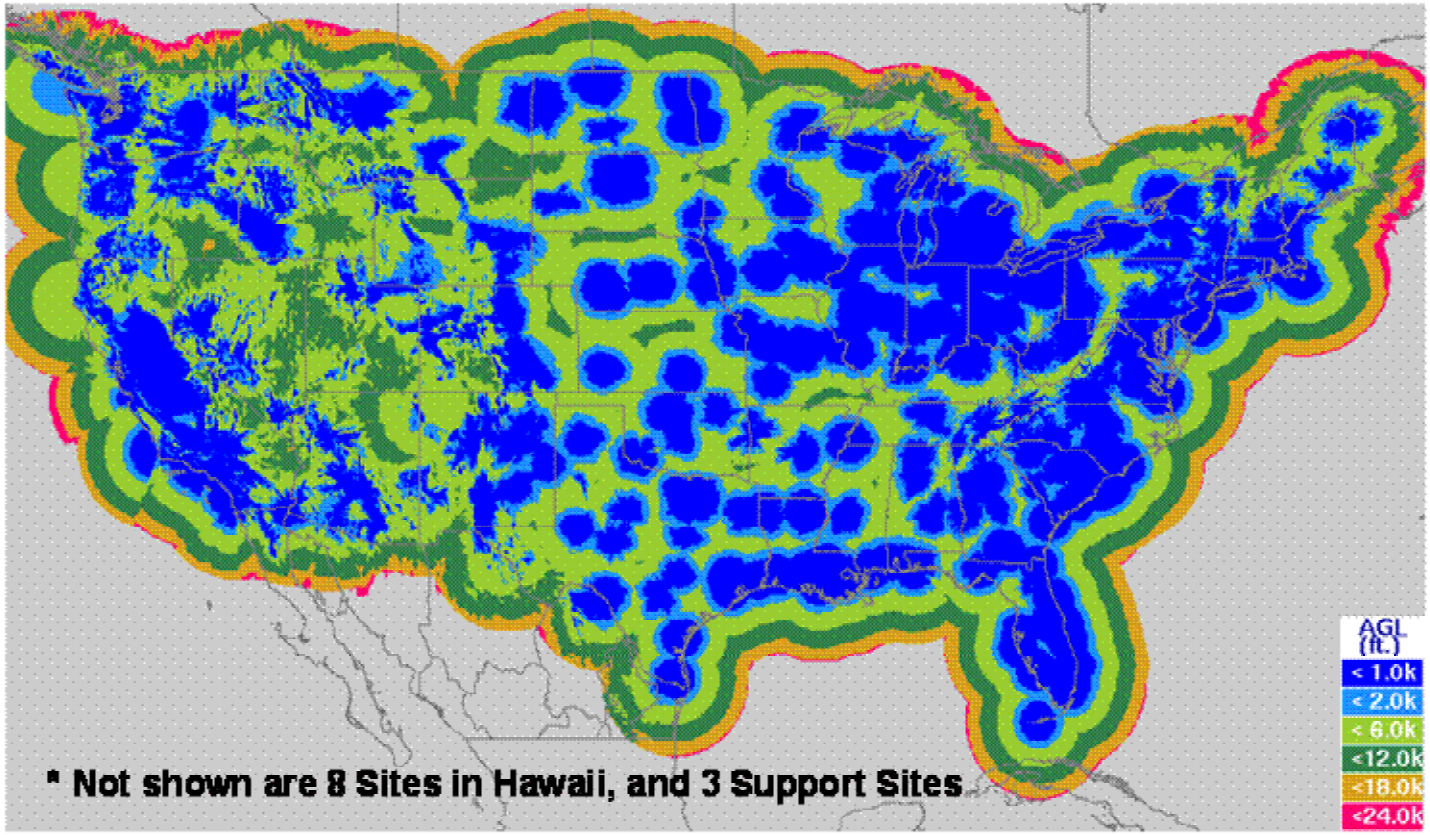
FAA Spiral 1 Implementation Strategy

Segment 1

Name	Strategy	Dependencies	Benefits	Risks	Supporting Rational
• Upper Airspace Program (Domestic) • 2007 – 2012	• Requires Installation of 1090/UAT ground stations at 183 sites – UAT enables Segment 3 Broadcast Services • Mandate ADS-B in Class A airspace – Contained group, many already in "latent" state • ADS-B Backup – Retain 113 LRR per existing MOA – Retain 100 Terminal radars at top airports	• Forward fit Mandate 2008 • Class A Mandate 2013 • Integration of ASD-B into ATOP / ERAM / Micro EARTS • Control Facility – Provides ADS-B to DOD / DHS – Provides back-up to FAA • Completion 5 mile separation standard	• Defer remaining ASR 7/8 replacements with ASR-11	• ERAM timeline • Avionics Implementation • Mandate Implementation	• Robust 1090 environment developing • Ties to Australian Mandate • European Mandate EL/ES surveillance and Package 1 applications

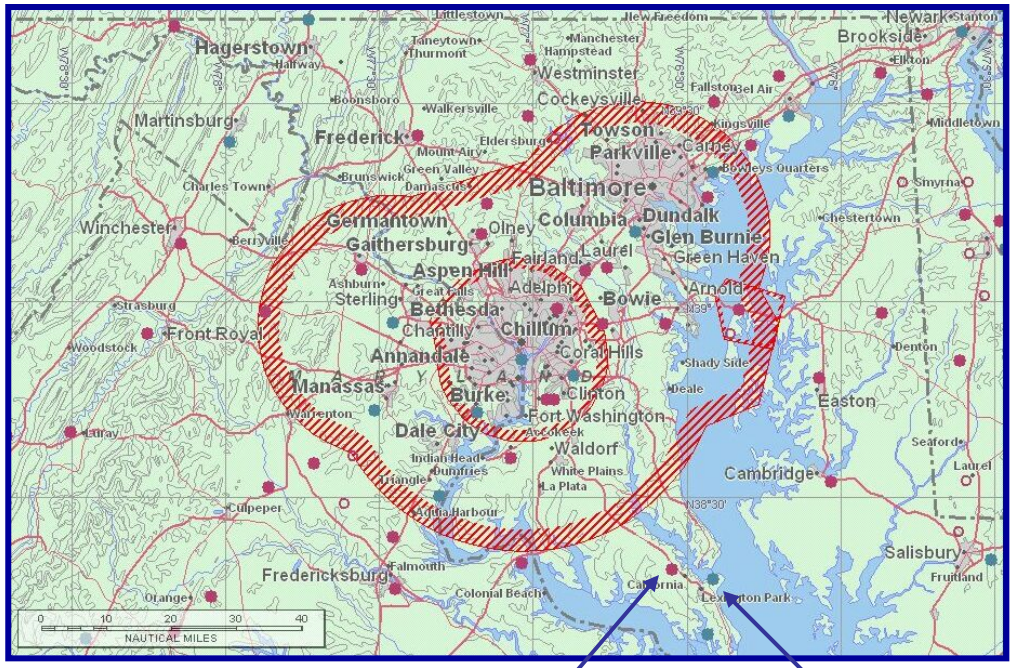
FAA ADS-B Planned GBT Coverage

Planned ADS-B Ground Station Coverage at 270 Sites* *(Located at 235 Terminal & 35 En Route Sites)*



FAA Project SafeGuard

- Implementation of ADS-B infrastructure to cover Washington ADIZ
  - Less than 300 feet coverage
  - Augment existing GBTs in the Washington, DC area
- Equipage of >60 aircraft with UAT avionics
  - Garmin GDL-90
  - MX20 MFD (optional)
  - FAA provides avionics and user community installs on aircraft
- Set-up flight monitoring stations at TBD locations
- ADS-B data-feed to National Capital Region Command Center (NCRCC)



St. Mary's County Airport

NAS Pax river

- Project Safeguard GBT

- ADS-B data-feed to Potomac TRACON – 4 Defense Sectors
- Develop and execute demonstration program

USN ADS-B LTE - Scenario & Metrics

- Search and Rescue Exercise:
  - Simulated downed aircraft in southern Maryland
  - NAS Patuxent River simulated SAR assets command and conduct search
  - Search is supported by a VX-20 T-34C, P-3C, CAP, MD State Police Helicopter
  - All participating aircraft will be equipped with UAT ADS-B and Cockpit Display of Traffic Information
  - A target will be positioned in the area of operations, equipped with a UAT ADS-B transceiver
  - Conditions for the exercise are day VMC
  - The four search aircraft will have closest point of approach over a simulated target location

USN ADS-B Scenario & Metrics continued

- The simulated SAR LTE will be run twice:
  - First run is without ADS-B active
  - Second run is with ADS-B active

- Military Utility Metrics
  - Speed < 1 hour to execute SAR
  - Pilot assessment as to ADS-B situational awareness value, i.e., deconfliction, asset management/vectoring
  - Common Operational and Tactical Picture added value. Were there any targets identified via ADS-B on the second run that were not identified on the first?

PMA-209 LTE Sea Trial Involvement

Scenario(s)

- SAR*

Also ADS-B (978MHz) for:

- Coalition C4ISR **(GCCS-M) ****
- White Force Tracker
- Range Clearing
- Airspace Management
- UAS FICA
- Tanking
- Trainers
- Carrier Ops

- **AIS…****

Partners

PMA209
PMA290
VX-1
VX-20 T34
King Air A-100
CAP GA8
MD State Police
FAA (CRABS/GBT's)
Atlantic Test Range
SAIL (LINK 16)
NAS Pax Air Ops

Status

- STIMS input completed
- Funding/partnerships being established
- Scenario/test plan
- Metrics/Data Collection Plan, A/C installations
- NNWC & Fleet Collaboration

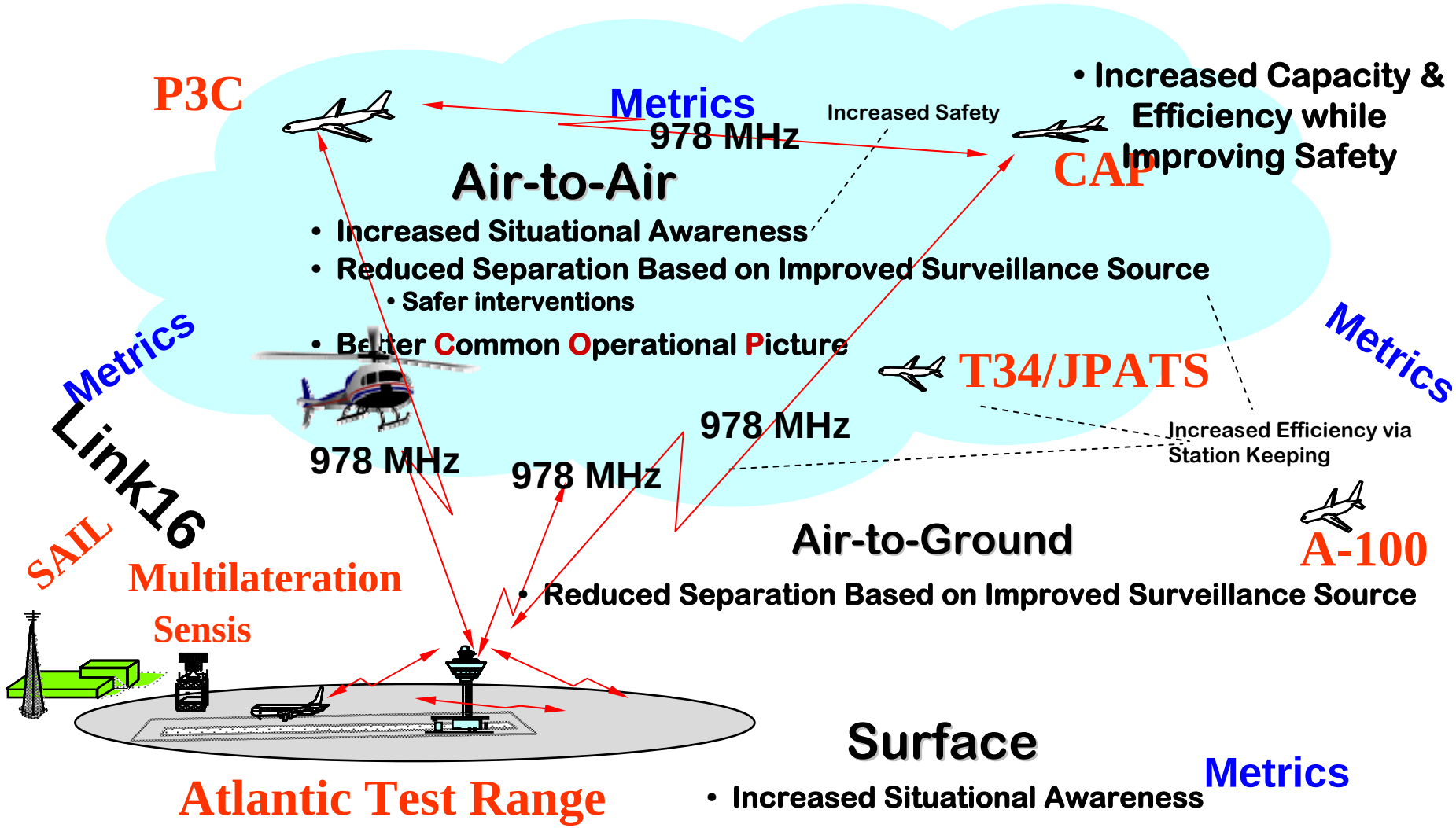
Observers

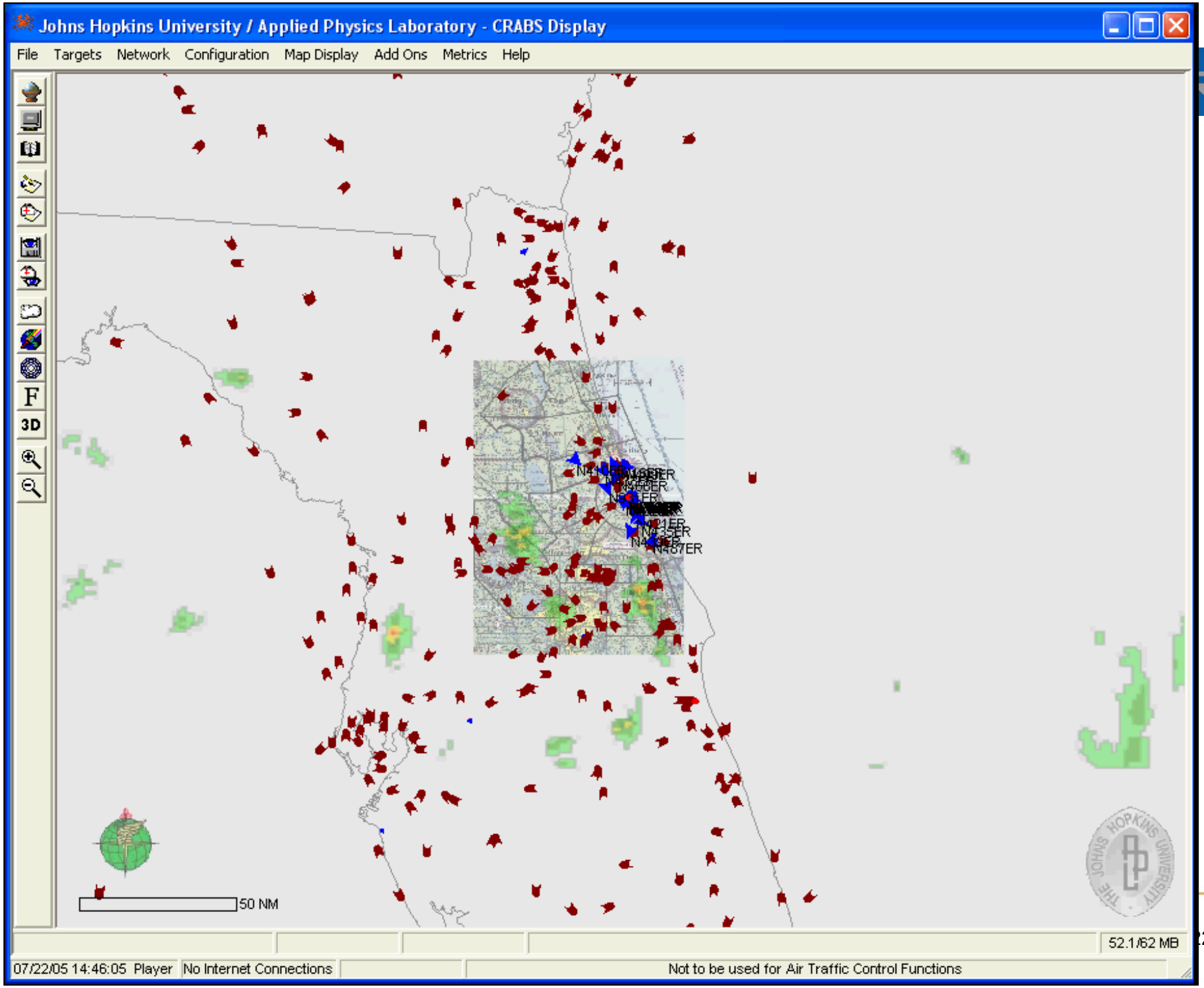
PMA263
PMA213
USCG, USAF …

* Scenario drafted by NAS Pax Air Ops SAR Unit ** NNWC area of interest for TW06

ADS-B LTE Experiment

Scenario Development




Johns Hopkins University / Applied Physics Laboratory - CRABS Display
File Targets Network Configuration Map Display Add Ons Metrics Help
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3D
N435ER
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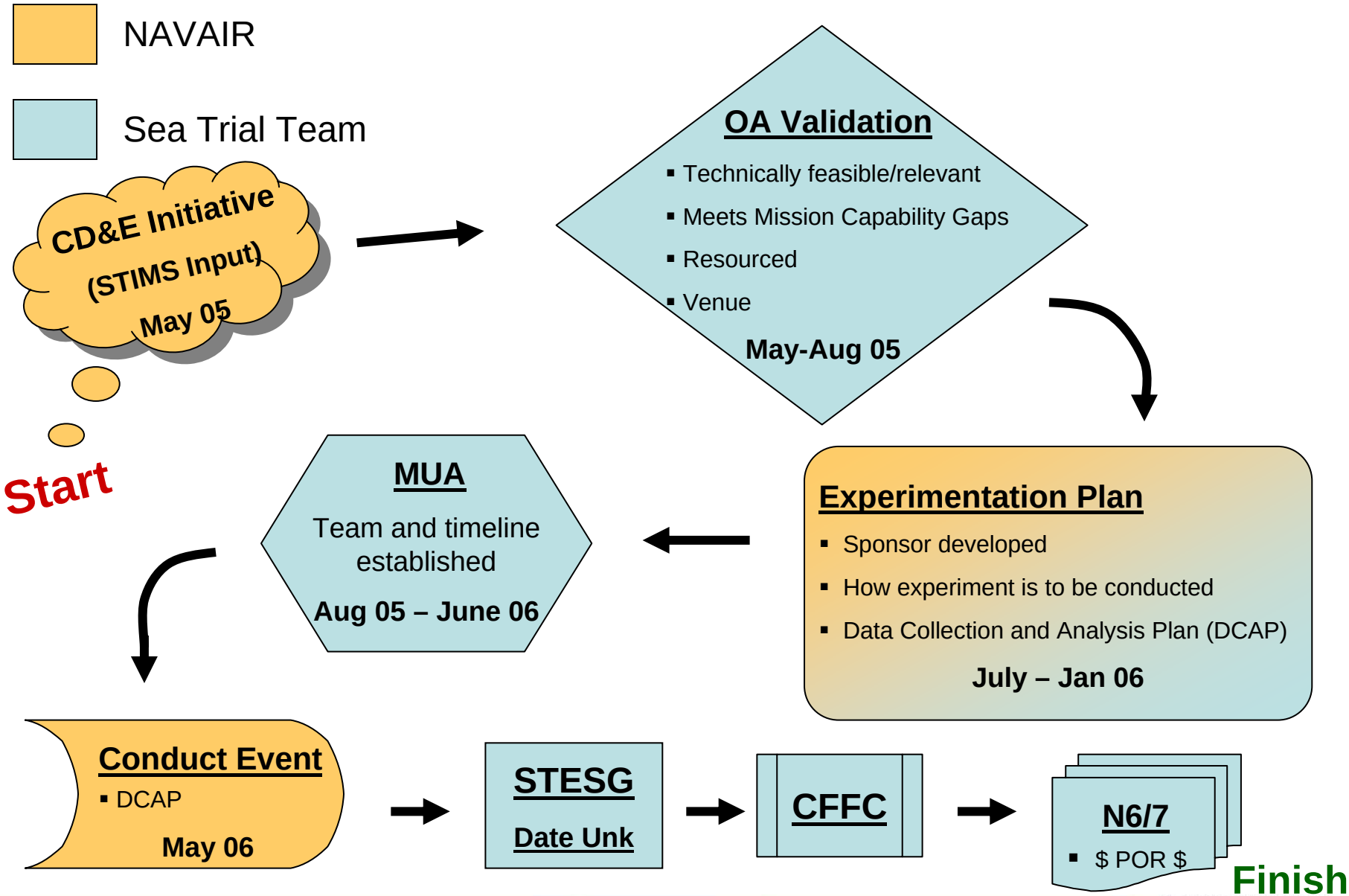
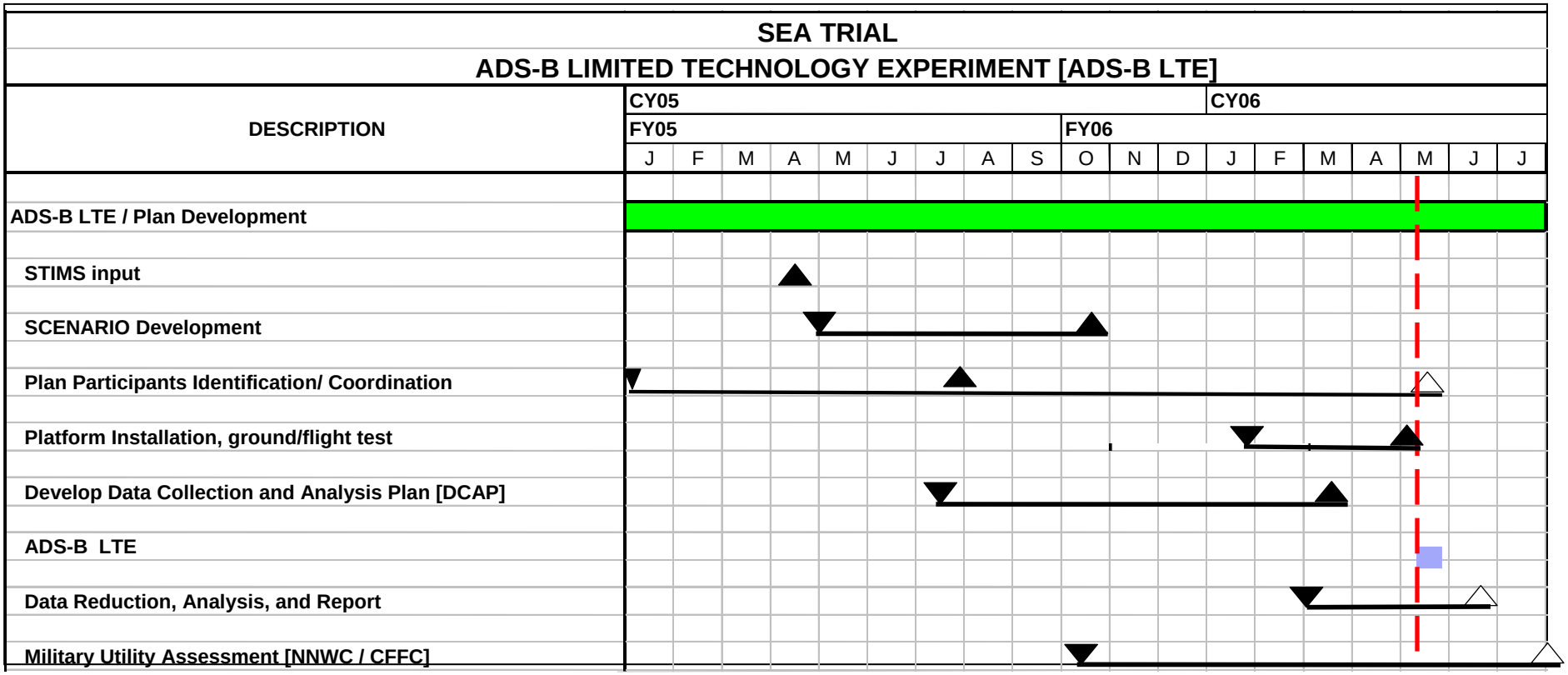
50 NM
52.1/62 MB
07/22/05 14:46:05 Player
No Internet Connections
Not to be used for Air Traffic Control Functions

USN ADS-B LTE Process

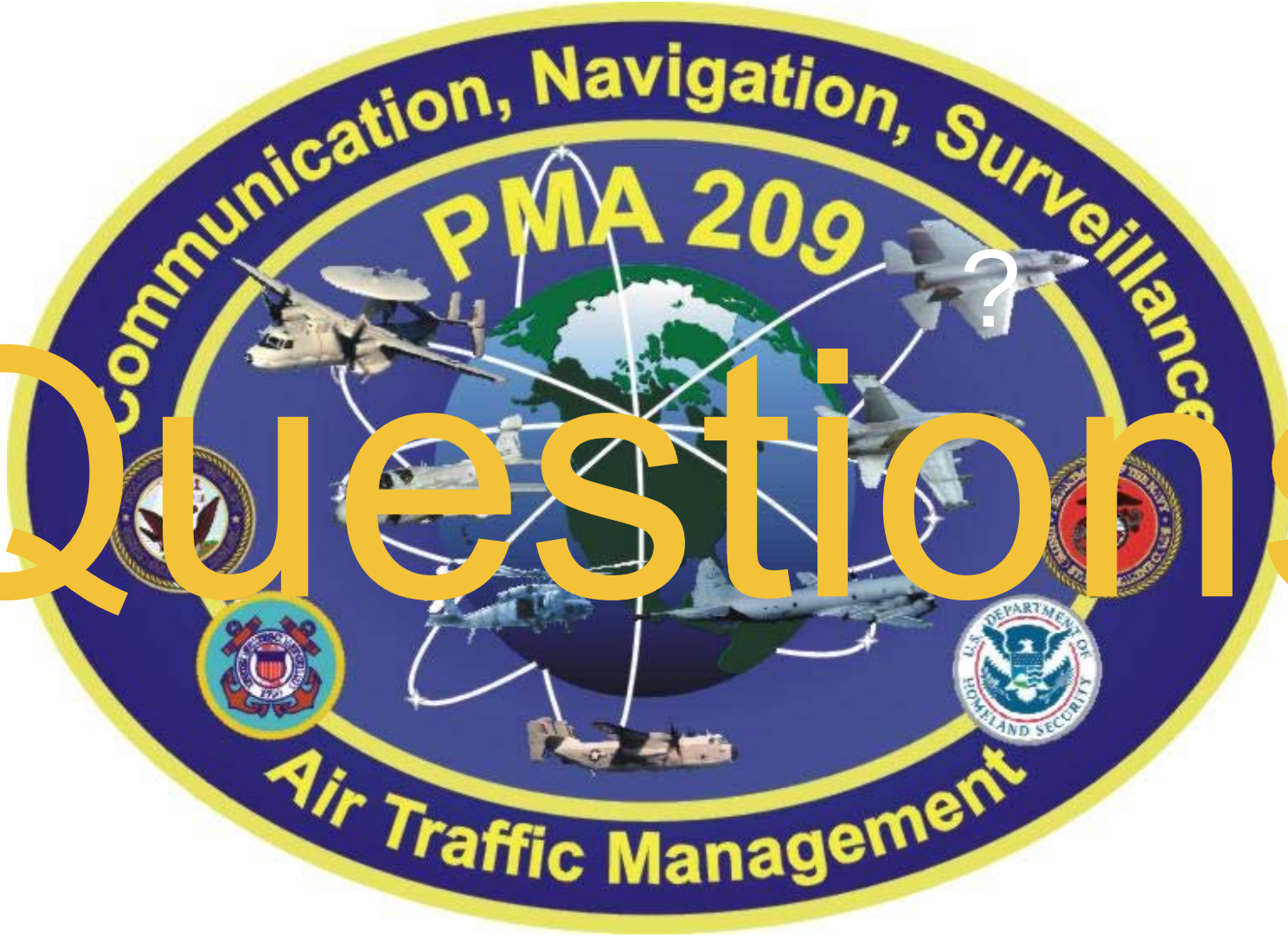


ADS-B LTE Schedule



ADS-B LTE Status

- ADS-B equipment has been received and installed
- ADS-B LTE logistics, design and installations, scenario, test plan and DCAP on track
- Working with the FCT and Operational Agent for MUA


Communication, Navigation, Surveillance
PMA 209
Air Traffic Management

Questions