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Enhancing Airspace Security in the Washington ADIZ

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Agenda

- ***Current operations of the National Capital Region Coordination Center (NCRCC)***
  - *Post 9/11 Changes to the Washington DC airspace*
  - *NCRCC Mission and Objectives*
  - *Current Operations Concept and Limitations*

- ***Enhanced Airspace Security (EAS) Program***
  - *Program objectives and schedule*
  - *EAS Design approach, Concept and Features*

- ***EAS NCRCC Proof of Concept Conclusions***
  - *Improved communications and reaction time*
  - *Less chance of error*
  - *Cost savings*

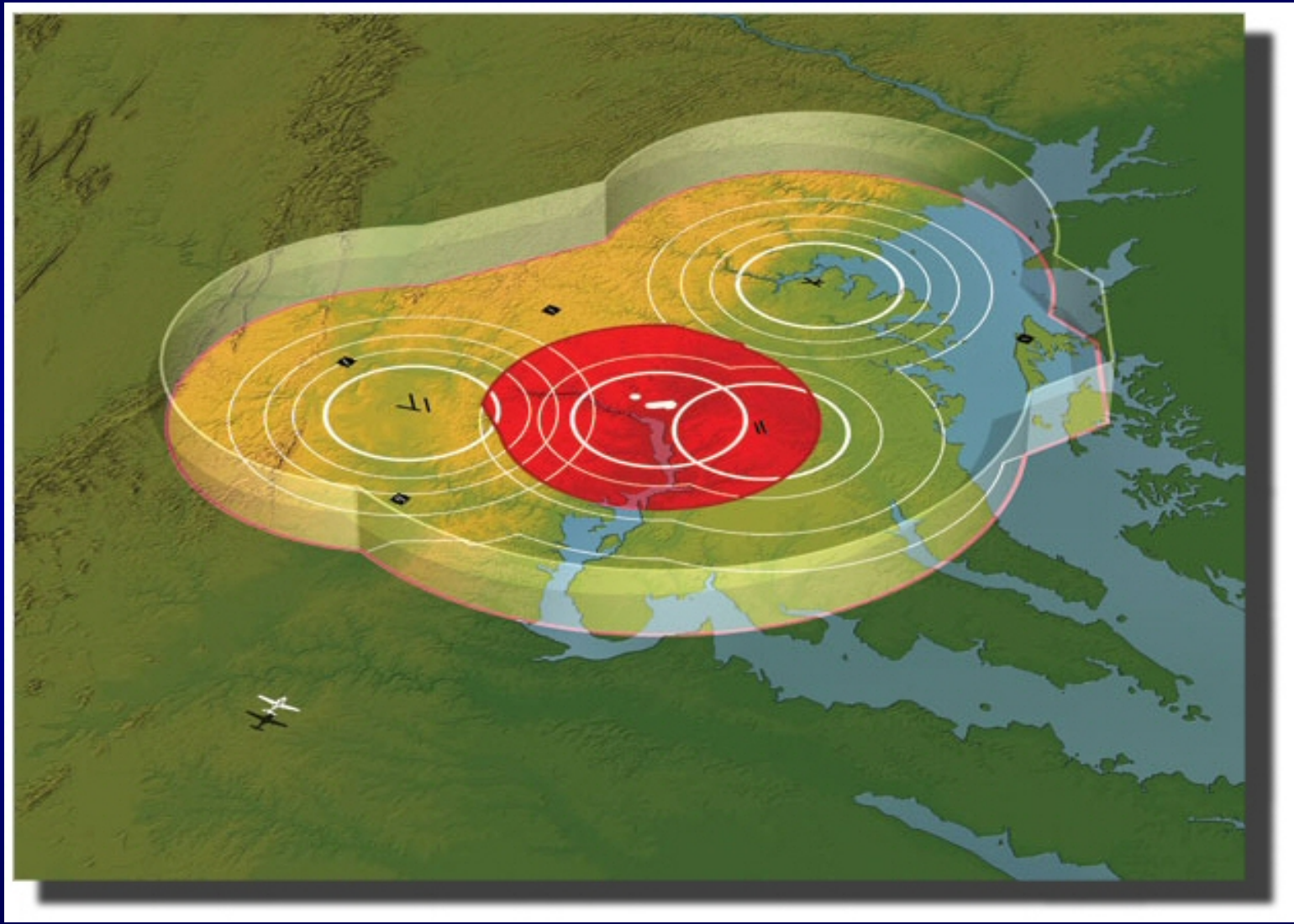
- ***EAS Vision and Future Direction***
  - *Integration of other security and communication systems*
  - *EAS applicability to NCRCC and other operations centers*

Post 9/11 Changes

- ***National Capital Region Airspace Changes***
  - *National Capital Region Air Defense Interdiction Zone (ADIZ)*
    - *All flights within the ADIZ must have flight plan and coordination with air traffic control*
  - *Flight Restricted Zone (FRZ)*
    - *Area in and around the Capitol, White House and Mall further limited*

- ***Numerous Infrastructure Changes Made***
  - *National Capital Region Coordination Center (NCRCC)*
    - *Center established to share and coordinate data among government agencies*
      - *DOD, FAA, Customs and Border Protection (CBP)*
  - *Increased access to sensor data*
    - *More sensor data sources available and shared*

Washington DC ADIZ



Key NCRCC Mission Objectives

- ***Monitor the traffic***
  - *Surveillance data plus associated flight information*
  - *Common view eliminates ambiguity / confusion / errors*

- ***Identify "Problem" aircraft***
  - *Identify aircraft not adhering to restrictions*
  - *Highlight discrepancies in the set of integrated data*
  - *Assess risk / threat to determine where to focus*

- ***Communicate/Collaborate about "Problem" aircraft***
  - *Combine voice and data for content / speed / accuracy*
  - *Variable number of participants*

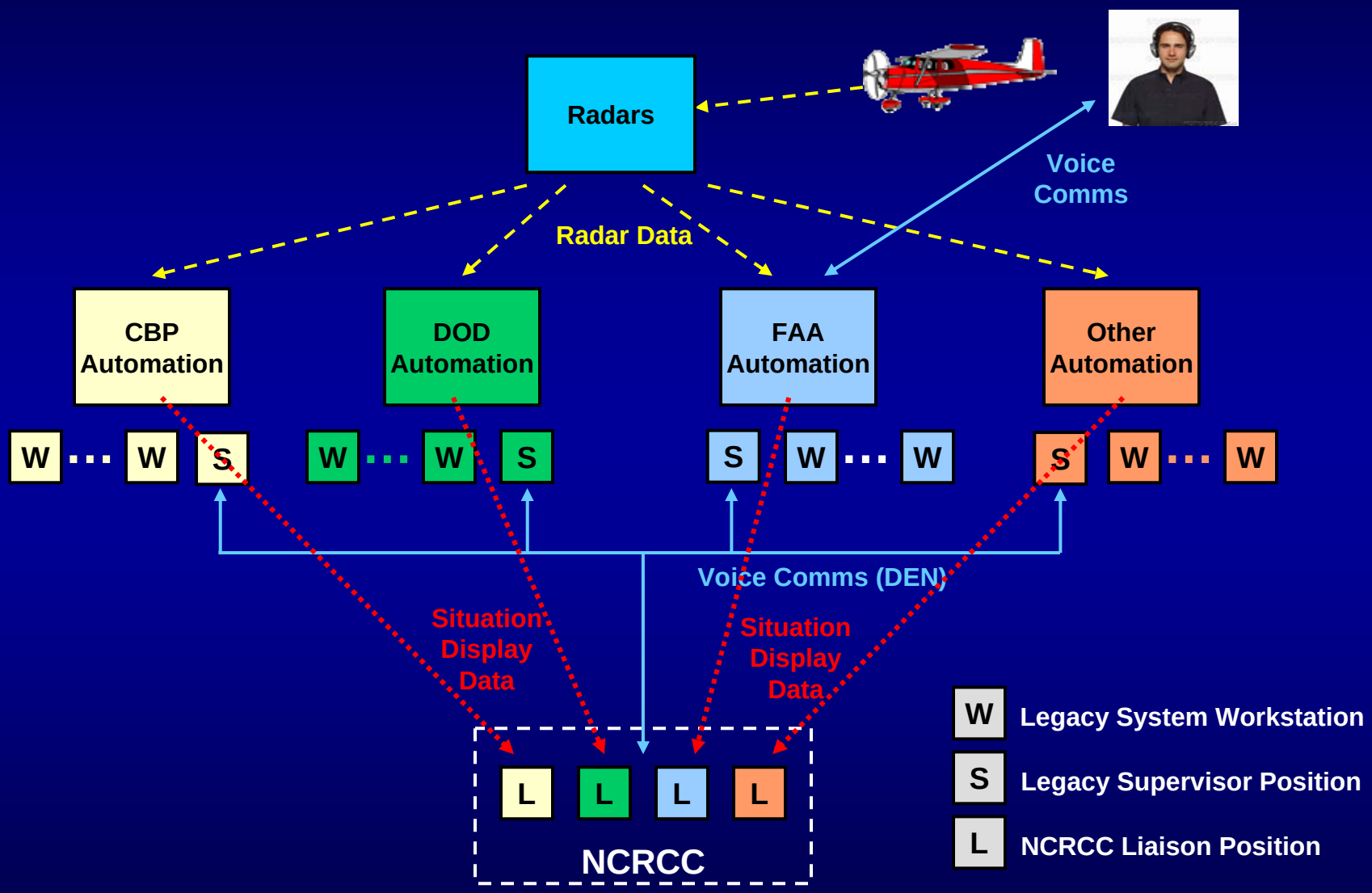
- ***Validate / authenticate information used to make decisions***
  - *Critical decision making assumes good data*
  - *Assurance preferable to assumption*

- ***Provide data to Law Enforcement***
  - *Archive of data for the prosecution of violators*

Current NCRCC Concept

- ***Systems and liaison positions established***
  - *Use of legacy FAA Air Traffic Control, Department of Defense and Customs and Border Protection Systems*
    - *Systems manned and operated by personnel familiar with their unique missions*
      - *FAA Safe Separation and Control of Aircraft*
      - *DOD Security of the Washington airspace*
      - *CBP Drug and Law enforcement*
    - *Personnel are trained and familiar with the system operation*
      - *No extensive new development or training*
  - *Co-located positions at the NCRCC to facilitate communications*
    - *Liaison operators sit "side by side" to facilitate communication*
    - *Communication by voice*
    - *Less chance of confusion or error*

Current NCRCC Concept



Airspace Security Statistics

- ***Statistics on US Restricted Airspace (9/11 through end of 2004) from a recent GAO Report:***
  - *3400 reported violations*
  - *88% involved general aviation*
  - *43% were in the National Capital Region*

- ***NCRCC Statistics for the same time period:***
  - *2-3 ADIZ incursions per day*
  - *FRZ incursion every 5-6 days*
  - *Alert aircraft launched/diverted 5 times a week*

Airspace security related activity in the NCRCC is significant and occurs at consistent levels!

NCRCC Limitations

- ***Common situational view of aircraft and associated information is limited by the legacy systems***
- ***Cannot unambiguously highlight and annotate aircraft needing attention***
- ***Limited automated support for identifying problem aircraft***
- ***Limited integration of flight data with surveillance data for General Aviation (GA) aircraft***
- ***Little integration of available data for validation / authentication***
- ***No automated support for assessing risk / threat profiles for aircraft***

EAS Program Objectives

- ***Develop an conceptual system to experiment and potentially improve NCRCC operations***
  - *Program administered by the FAA for Proof of Concept*
  - *Lockheed Martin the Prime Contractor*
    - *Subcontracts to Titan/L3 and Thales Raytheon Systems (TRS)*
  - *18 month program with demonstrable milestones*
    - *"Build a Little – Test a Little"*

- ***Prototype Development***
  - *Provide information exchange among surveillance systems deployed by the FAA, DoD NORAD, and CBP*

- ***Information Interoperability***
  - *Assess the operational and technical aspects of a network-centric approach*

- ***Common Situational Awareness***
  - *Enhance via real-time information sharing*

- ***Scenario Testing***
  - *Demonstrate the technology in an operational context*

EAS Proof of Concept Objectives

- ***Prototype Development***
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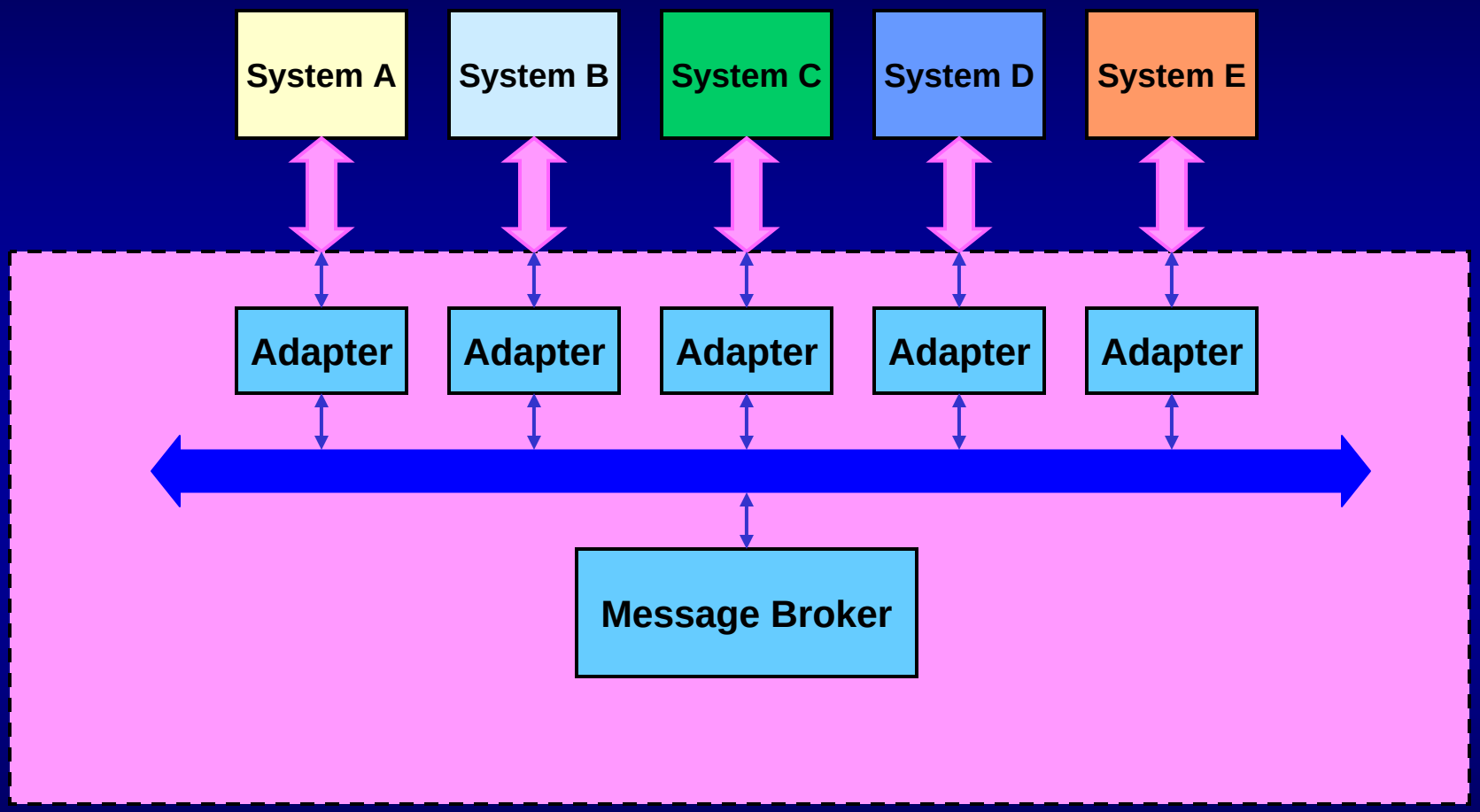
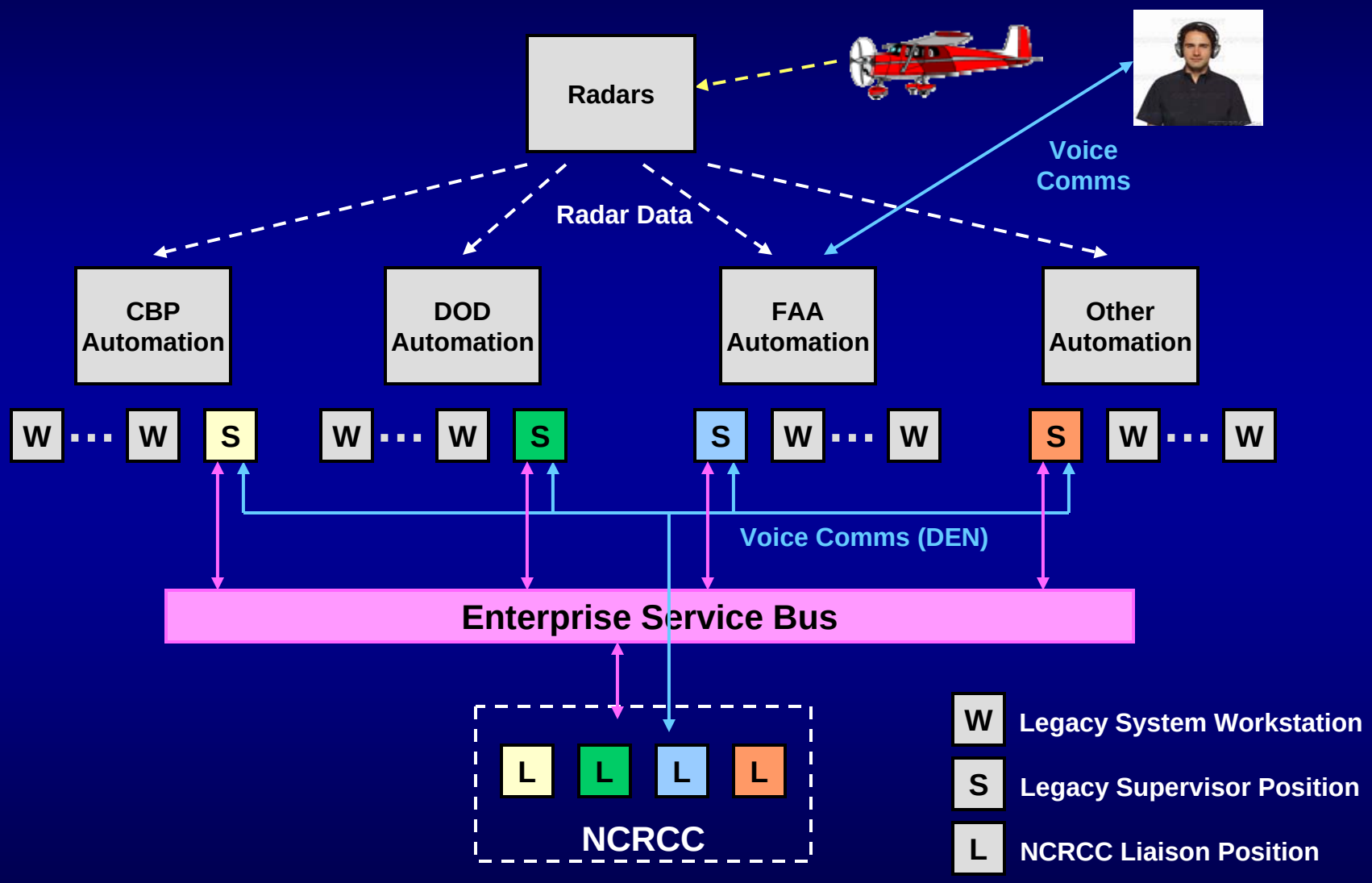
EAS Design Approach

- ***Use Net-Centric Service Oriented Architecture (SOA) to integrate a "System of Systems"***
  - *Publish/Subscribe techniques to filter and prevent information overload*
    - *Sharing of system tracks*
      - *Filter on sensor, system or geographic location*
    - *Sharing of Security events and data*
    - *Publish/Subscribe to allow for security filtering*
  - *Allowance of data transformation to ease integration of differing data formats*
    - *Use of the message broker to transform data to format acceptable to legacy systems*
  - *Ease of future systems integration*
    - *Use of SOA adapter allows legacy system integration with minimal changes*

Net-Centric Concept



EAS NCRCC Concept



EAS Design Approach

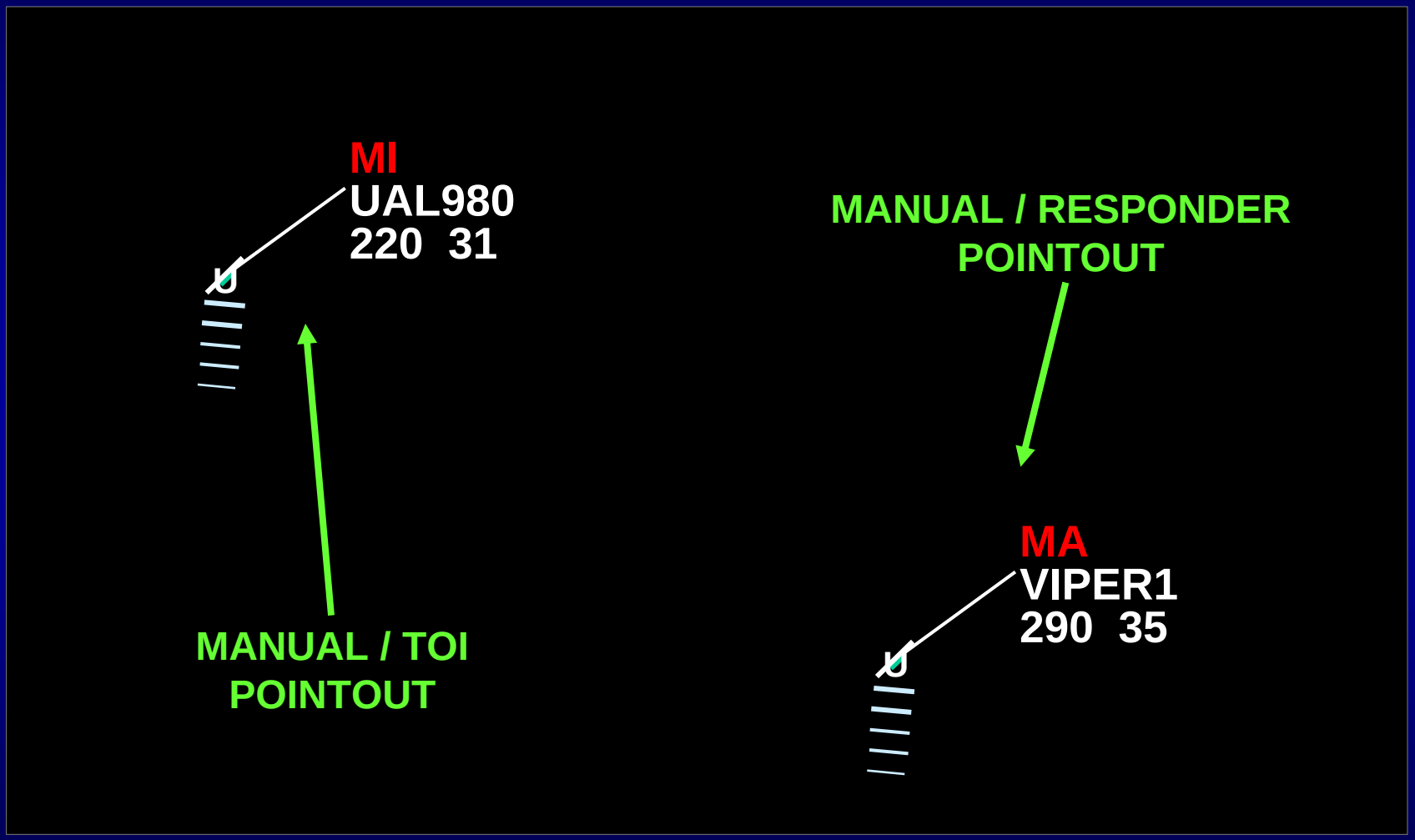
- ***Automation of Tasks to reduce reaction time and to minimize human errors***
  - *Unambiguous Identification of aircraft*
    - *Use of "pointout"*
  - *Automatic detection of warnings and violations*
    - *Automatic pointout of aircraft entering restricted zones*
    - *Airspace Volume of Interest (AVOI)*
      - *Dynamic airspace volume shared among systems*
    - *Geographic Point of Interest (GPOI)*
      - *Sharing of geographic point among systems*
  - *Decisions continue to be made by operators*
    - *Human in the loop remains constant*
      - *Track of Interest (TOI) can only be declared by a watchstander*

- ***Enhancements to each legacy system to be consistent with existing Computer Human Interface (CHI)***
  - *Minimize change and training to operators*
  - *Operational Concept to be consistent with current policy and procedures*

EAS Pointout

- ***A Pointout is the means by which an operator can highlight an aircraft and share the highlighted data with another operator***
  - *Highlight is indicated by symbology and textual indication*
  - *May be accompanied by audible alert*
  - *Optional text field to indicate additional information*
- ***Types of Pointouts***
  - *Manual*
    - *Set by an operator*
  - *Automatic*
    - *Set by the system in response to an airspace violation*
  - *Suspect*
    - *Indicates the aircraft is suspicious requiring further investigation*
  - *Track of Interest (TOI)*
    - *Aircraft requires intervention by responding aircraft assumed to be hostile*
  - *Responding Asset (RA)*
    - *Identifies friendly responding aircraft*
- ***Hierarchy of Pointout***
  - *Suspect pointout can be manual or automatic*
  - *TOI Pointout can ONLY be manually set by operator*
  - *TOI pointout "trumps" a Suspect pointout*

Pointout Examples



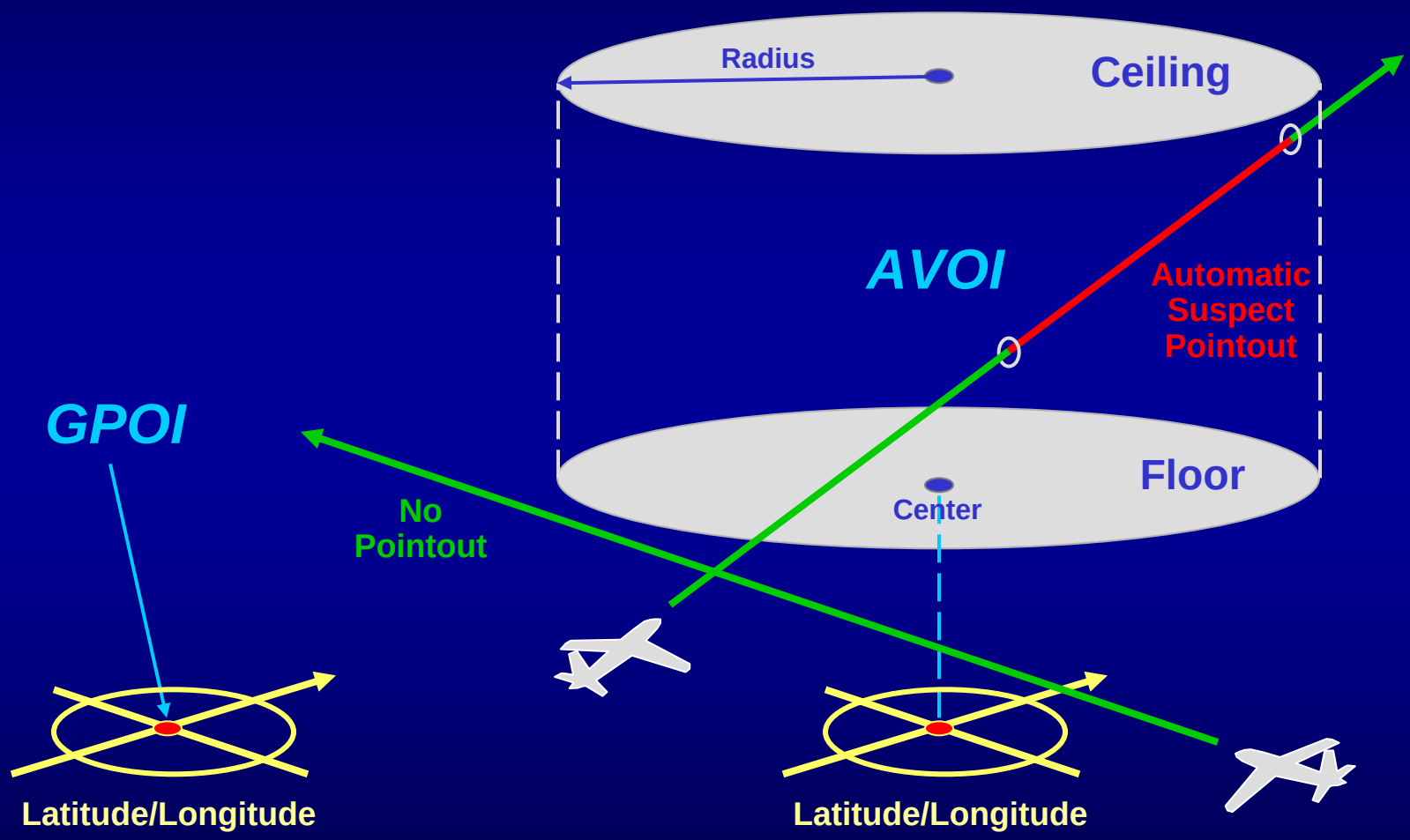
Pointout Detail

Geographic Point/Airspace Volume of Interest

- ***Geographic Point of Interest (GPOI)***
  - *Means by which data about geographic point can be shared among systems*
  - *Dynamically defined using latitude and longitude of the GPOI*
    - *Examples:*
      - *Evacuation point, Nearest Hospital, Landing Zone etc.*

- ***Airspace Volume of Interest (AVOI)***
  - *Means by which a air space volume can be designated and shared among systems*
  - *Dynamically defined using latitude and longitude, radius, floor and ceiling altitude*
  - *Automatically generates Suspect pointout of any aircraft that flies into the AVOI*
    - *Examples:*
      - *Temporary Flight Restricted Zone (TFR) or Special Use Airspace (SUA)*
      - *Super Bowl, Volcanic ash zone, nuclear incident area, etc.*

Geographic Point/Airspace Volume of Interest



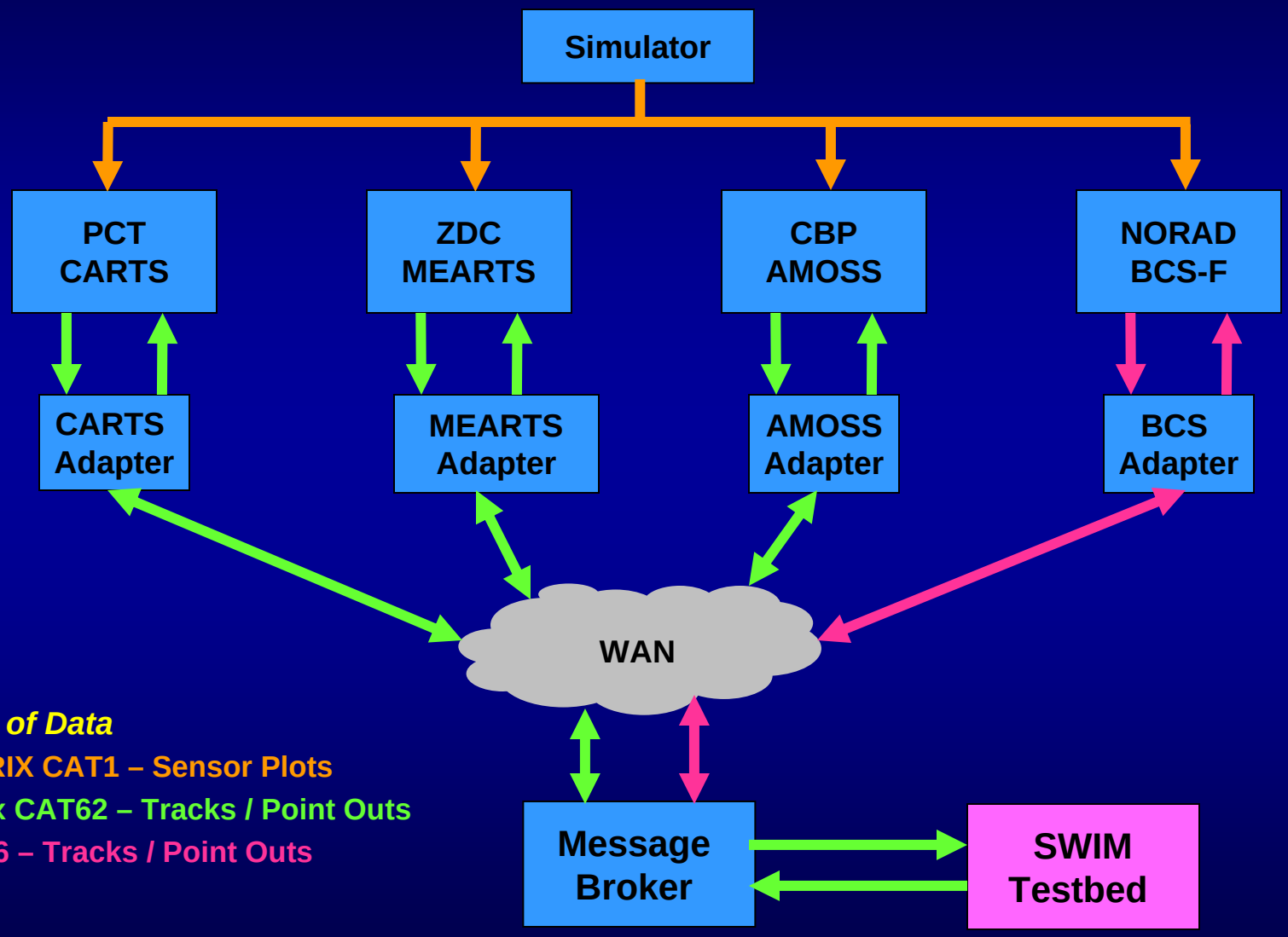
EAS Implementation

- ***Legacy Systems Used***
  - *FAA TRACON Airspace – Common ARTS (CARTS)*
    - *Terminal Area Control (TRACON) is typically 50 miles around an airport or city*
    - *0 – 18,000 feet*
    - *EAS adapted for Potomac Consolidated TRACON Area (PCT)*
  - *FAA Enroute Airspace – MicroEARTS (MEARTS)*
    - *EnRoute Airspace typically 18,000 feet or greater*
    - *Typically used by aircraft in transit between TRACON areas*
    - *EAS adapted for Washington Enroute Center (ZDC)*
  - *CBP Airspace – Air Marine Operations Surveillance System (AMOSS)*
    - *Customs and Border Protection Area encompassing the entire country*
    - *Has sensors unique to the CBP mission – Aerostats*
    - *EAS uses unclassified version*
  - *Department of Defense - Battle Control System Fixed (BCS-F)*
    - *Representation of Northeast Air Defense Sector (NEADS)*
    - *Unclassified version in use by EAS*

EAS Implementation

- ***Data types used in EAS***
  - *All-Purpose Structured EUROCONTROL Radar Information Exchange*
    - *ASTERIX CAT 1*
      - *Eurocontrol standard for Radar data*
      - *EAS uses radar simulator for sensor plots*
    - *ASTERIX CAT 62*
      - *Eurocontrol Standard for aircraft System Tracks*
      - *Legacy systems modified to publish/subscribe Tracks in this format*
  - *Tactical Digital Information **Link** (TADIL)*
    - *Link 16*
      - *NATO standard for System Track Information*
      - *Message Broker transforms CAT 62 to/from Link 16*
      - *Allows for seamless integration of DOD system*

EAS Data Flow 2006



Types of Data

ASTERIX CAT1 – Sensor Plots

Asterix CAT62 – Tracks / Point Outs

Link-16 – Tracks / Point Outs

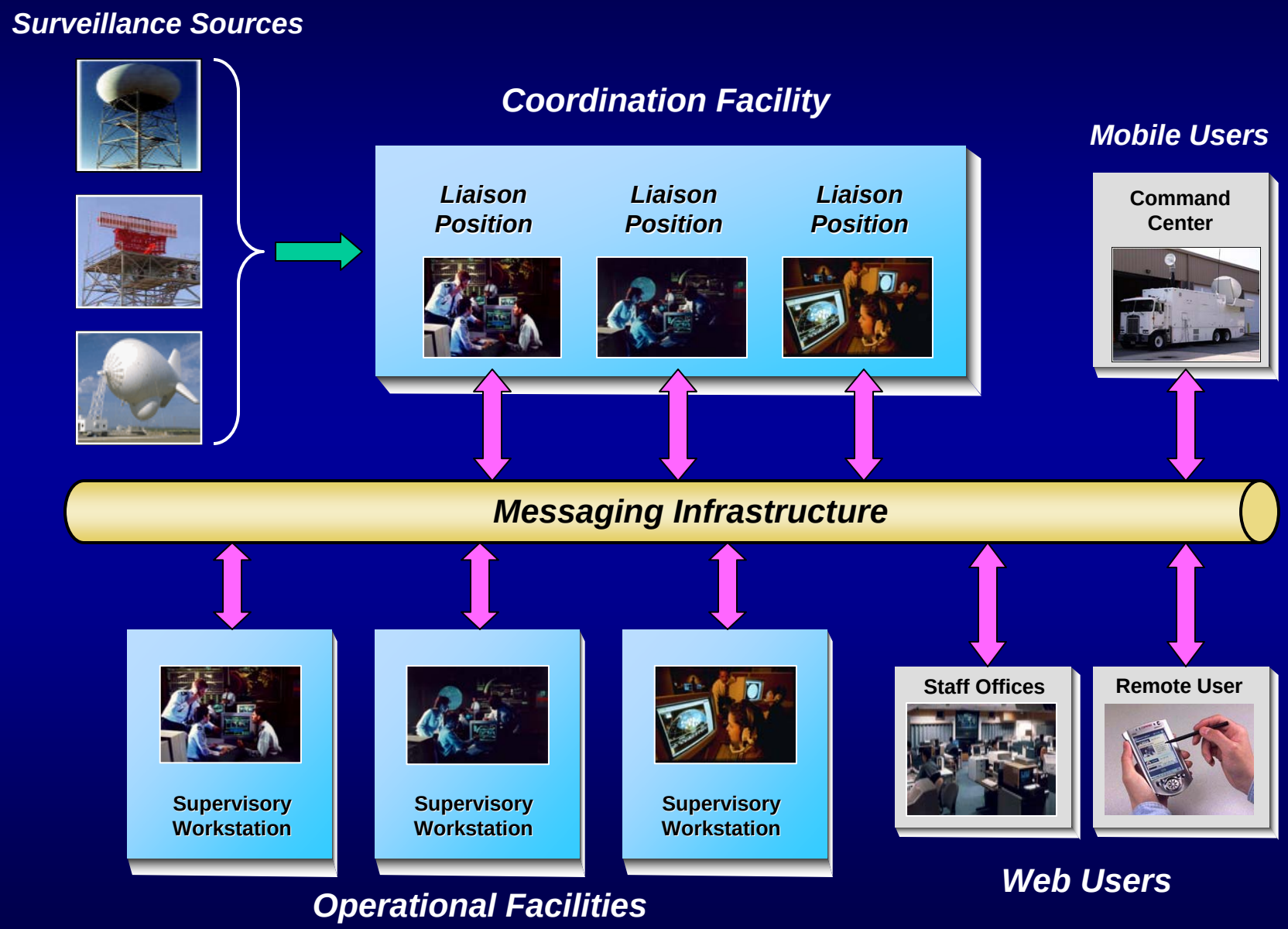
EAS NCRCC Conclusions

- ***EAS if deployed at NCRCC:***
  - *Provides common airspace representation and better airspace surveillance picture*
    - *Shared Tracks among all systems*
    - *Unambiguous pointout of aircraft among systems*
    - *Flexible methods to aid the liaison operators*
      - *Automatic pointouts*
      - *AVOI/GPOI*
  - *Estimated time saved during an security incident*
    - *Reduces identification of TOI from 10 minutes to 2 minutes*
  - *Cost avoidance*
    - *Less likely to launch responder aircraft for false alarms*
      - *EAS projected to have potential to save $5M in fuel (2001 – 2004)*
      - *Less likely to evacuate the capitol or Washington DC area*
      - *Governor of Kentucky type scenario less likely*
- ***LESS ERRORS = IMPROVED SAFETY & SECURITY + COST SAVINGS***

EAS Vision

- ***Near Term 2006***
  - *EAS installation at FAA William J Hughes Technical Center Atlantic City NJ*
    - *Continued Testing and Conceptual Experiments*
    - *Integration with FAA System Wide Information Management (SWIM) prototype testbed*
  - *Lockheed Martin Center For Innovation (CFI) Suffolk Virginia*
    - *Lockheed Martin funded R&D experiments*
    - *Experimental Integration with other Lockheed Martin Systems*
    - *Security concepts integrating DOD, Civilian and other government agencies*
      - *Unified Quest 06 – DOD, Transportation, State, Commerce and Treasury*
- ***Future (2006 - ?)***
  - *Further system hardening and capacity experimentation*
  - *Further integration with other sensors and legacy systems*
  - *Integration experiments with mobile and remote users*
  - *Installation and use at a live security Operations Center*

EAS Vision


Surveillance Sources
Coordination Facility
Liaison Position
Liaison Position
Liaison Position
Mobile Users
Command Center
Messaging Infrastructure
Supervisory Workstation
Supervisory Workstation
Supervisory Workstation
Staff Offices
Remote User
Operational Facilities
Web Users