



CENTER FOR ADVANCED AVIATION SYSTEM DEVELOPMENT (CAASD)

Improving Information Exchange Supporting National Security in the Maritime and Airspace Domains

*L. Michael Klinker
Dr. Dennis W. Rowe
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SIMEX Introduction

- **Naval Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance (C4ISR) Experimentation Lab (NCEL)**
 - Navy/Marine Corps-sponsored lab:
 - Federated with MITRE, Industry, and Service labs to conduct experiments focusing on Navy and other DoD C4ISR systems and concepts.
 - Focuses on Improved capabilities for the warfighter
 - NCEL Experiments may range:
 - From dynamic sensor control and target development to mission planning and automated target dissemination to strike platforms.

**The FAA Participated in
3 Human-In-The-Loop
NCEL Simulation
Experiments (SIMEXes)**





Maritime Domain Definitions

- **Maritime Domain (MD)** is all areas and things of, on, under, relating to, adjacent to, or bordering on a **sea, ocean, or other navigable waterway**, including all maritime related activities, infrastructure, people, cargo, and vessels and other conveyances.
- **Maritime Domain Awareness (MDA)** is the effective understanding of anything associated with the global maritime domain that could impact the **security, safety, economy, or environment of the United States** threats to our Nation's maritime security and to prevent terrorist attacks
- MDA is to the safety and security of the MD as **Air Domain Awareness (ADA)** is to the safety and security of the NAS. **The intersection of MDA and ADA occurs when air assets are used to support MDA missions in the vicinity of the NAS.**



SIMEX VALUE

- **Highlights Maritime Domain Awareness (MDA) operations in the vicinity of the National Airspace System (NAS)**
 - Supports homeland security and national defense operations
 - Supports FAA requirement to maintain the safety and security of the NAS
- **Focuses on Information Sharing and Collaboration for Operational Decision-Making**
 - DoD, DHS, other agencies/organizations and the FAA
 - Highlights coordination between FAA and DoD
- **Addresses the effects of DoD security related operations on air traffic and aviation commerce**



SIMEX GOALS

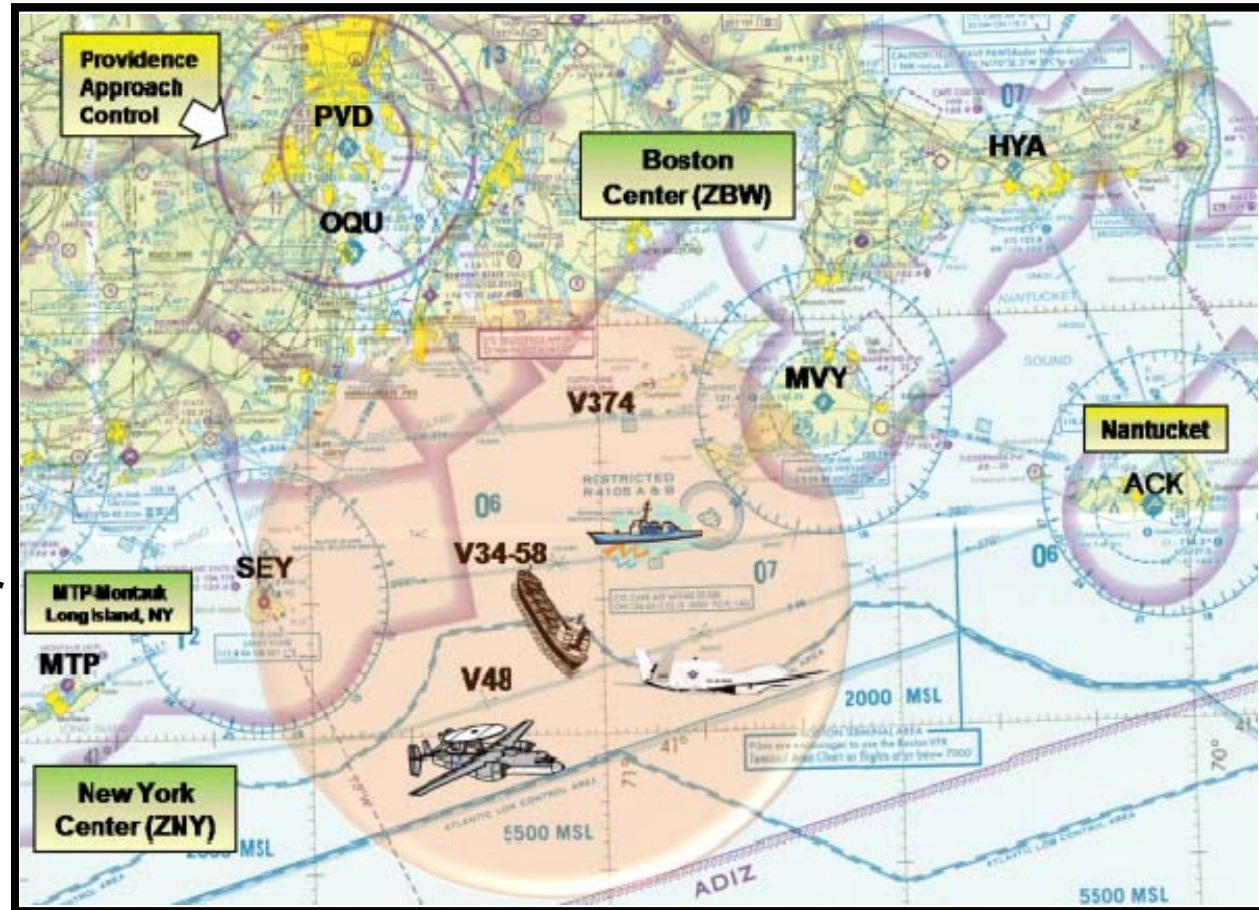
- **Investigate FAA and DoD coordination in the vicinity of the National Airspace System (NAS)**
 - Ensure NAS operations harmonization with the Navy's Intelligence, Surveillance, and Reconnaissance (ISR) plans for Maritime Domain Awareness (MDA) missions.
- **Examine technical and procedural means to share information between the FAA and DoD**
 - E.g., Common Operating Picture (COP) using legacy automation systems
- **Improve communication and surveillance tools and processes**
 - Maximize the availability of airspace for civilian use
 - Facilitate the successful accomplishment of the Navy's ISR missions.



SIMEX 06-3

MDA Operations Long Island to Nantucket

- SIMEX 06-03 provided a view of the NAS to improve the Navy's overall situational awareness of activity in the air domain.





SIMEX 06-3

BOTTOM LINE

- **Highlighted the need for high-quality coordination and communication between the FAA and the Navy during MDA operations**
 - **View of NAS operations raised the Navy's level of awareness**
 - **Showed that coordination and communication are paramount in fluid situations**

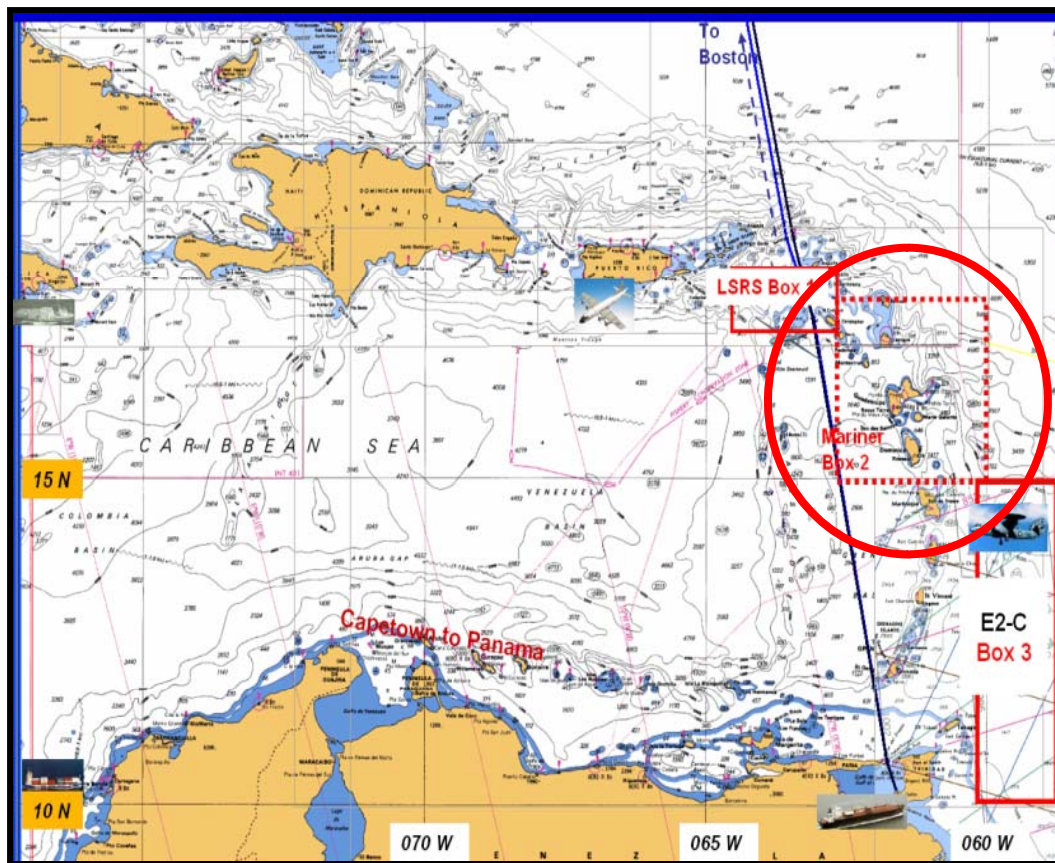
- **Showed the need for the FAA and the Navy to develop better procedures and automation tools**
 - **Expedite coordination**
 - **Facilitate timely and accurate airspace management to support MDA operations**



SIMEX 07-1

FAA-DoD Coordination: Tactical Actions

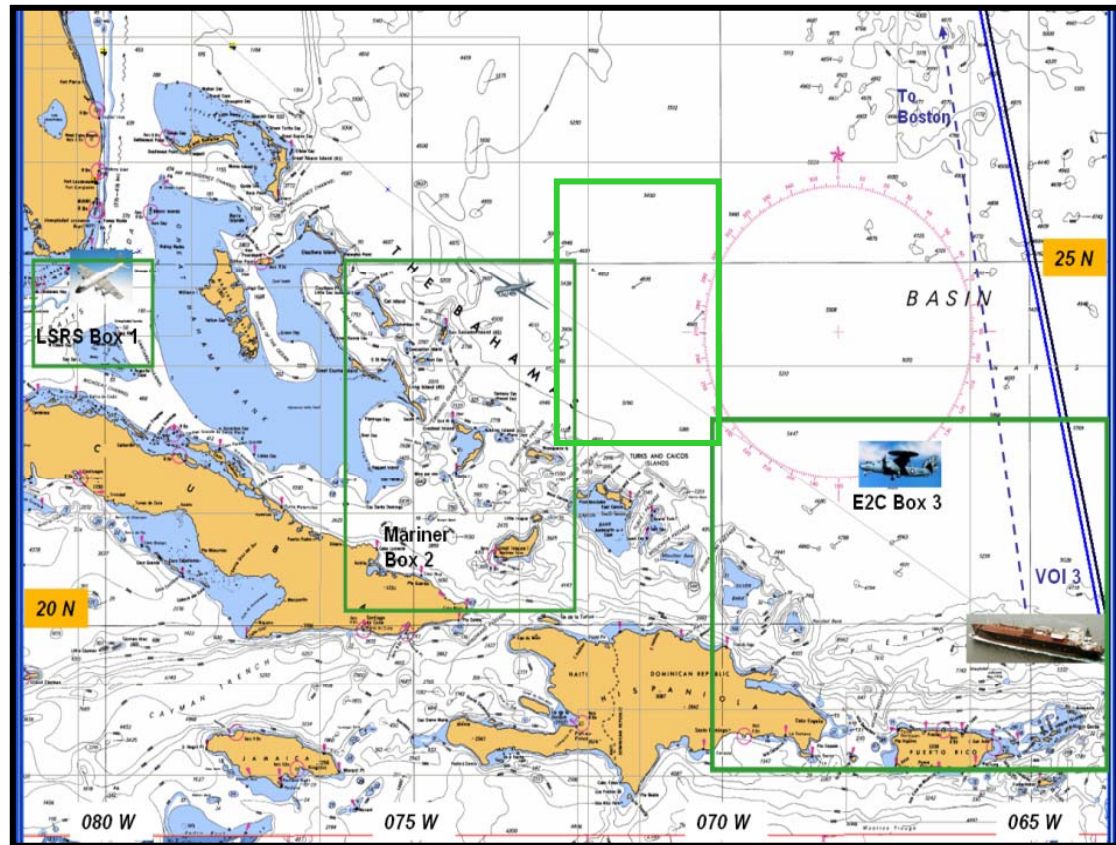
- **Caribbean Atlantic Scenario:**
 - The FAA worked with the Navy ISR manager to evaluate, and if needed, modify military airspace requests to ensure safe operations within and close to the NAS (CONUS)



SIMEX 07-1

FAA-DoD Coordination: Tactical Actions

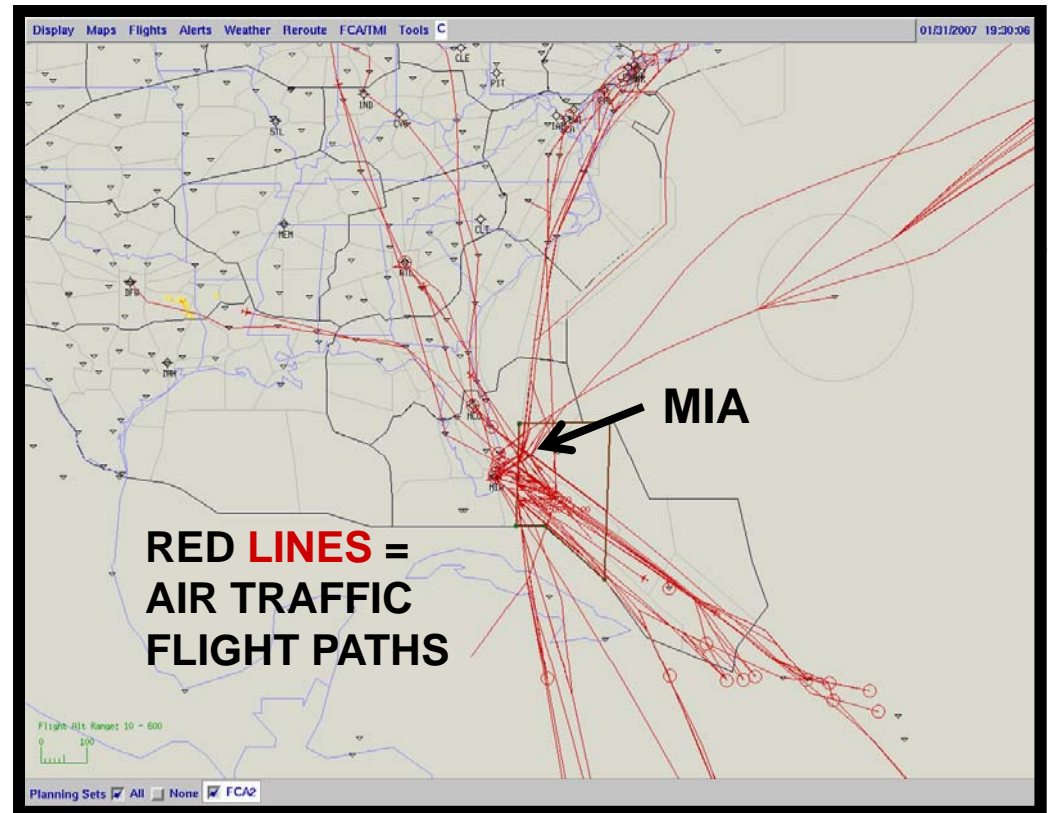
- **Caribbean Atlantic Scenario:**
 - FAA coordinated with ISR manager and modified the airspace to move it north

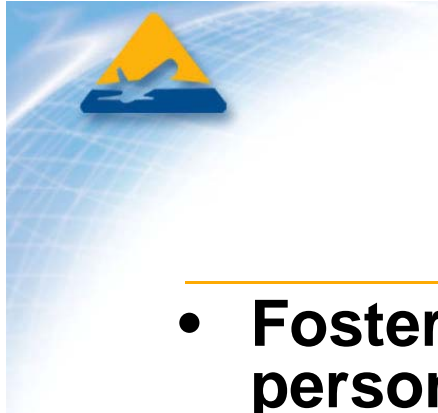


SIMEX 07-1

FAA-DoD Coordination: Tactical Actions

- **CONUS Scenario:**
 - Using the ETMS/CRCT automation tool FAA personnel were able to clearly define the number of flights affected by DoD airspace boxes from 1930-2130Z:
 - E-2C: 31 flights,
 - LSRS: 56 flights,
 - Mariner UAS: 58 flights





SIMEX 07-1

The Bottom Line

- **Fostered greater interaction between DoD and FAA personnel**
- **Informed FAA and DoD personnel of the Maritime Domain Awareness (MDA) Common Operational Picture (COP) challenges**
- **Validated the need for an integrated “Common Air Picture” containing both NAS traffic and DoD ISR assets**
 - **Overlay blue (friendly) assets on NAS traffic for future SIMEXes**
- **Yielded “lessons learned” input/feedback from participants for inclusion in MITRE/CAASD research for the FAA**



SIMEX 08-01 GOALS

- **Build upon results and lessons learned in the previous two SIMEXes**
- **Create and evaluate the efficacy of a COP using data supplied by FAA and DoD legacy, or “system of record” systems**
- **Evaluate the effectiveness of three automated decision support tools in mitigating the effects of DoD operations on the NAS**
 - **Flow Constrained Area (FCA) capability**
 - **Future Traffic Display**
 - **Rerouting and NAS Impact tool**



SIMEX 08-1 January 08



DoD
Navy ISR
Manager

NAS Traffic



Blue Air



Maritime AIS Targets



Intelligence, Surveillance, Reconnaissance (ISR) Plans



NAS Impact of ISR Plans



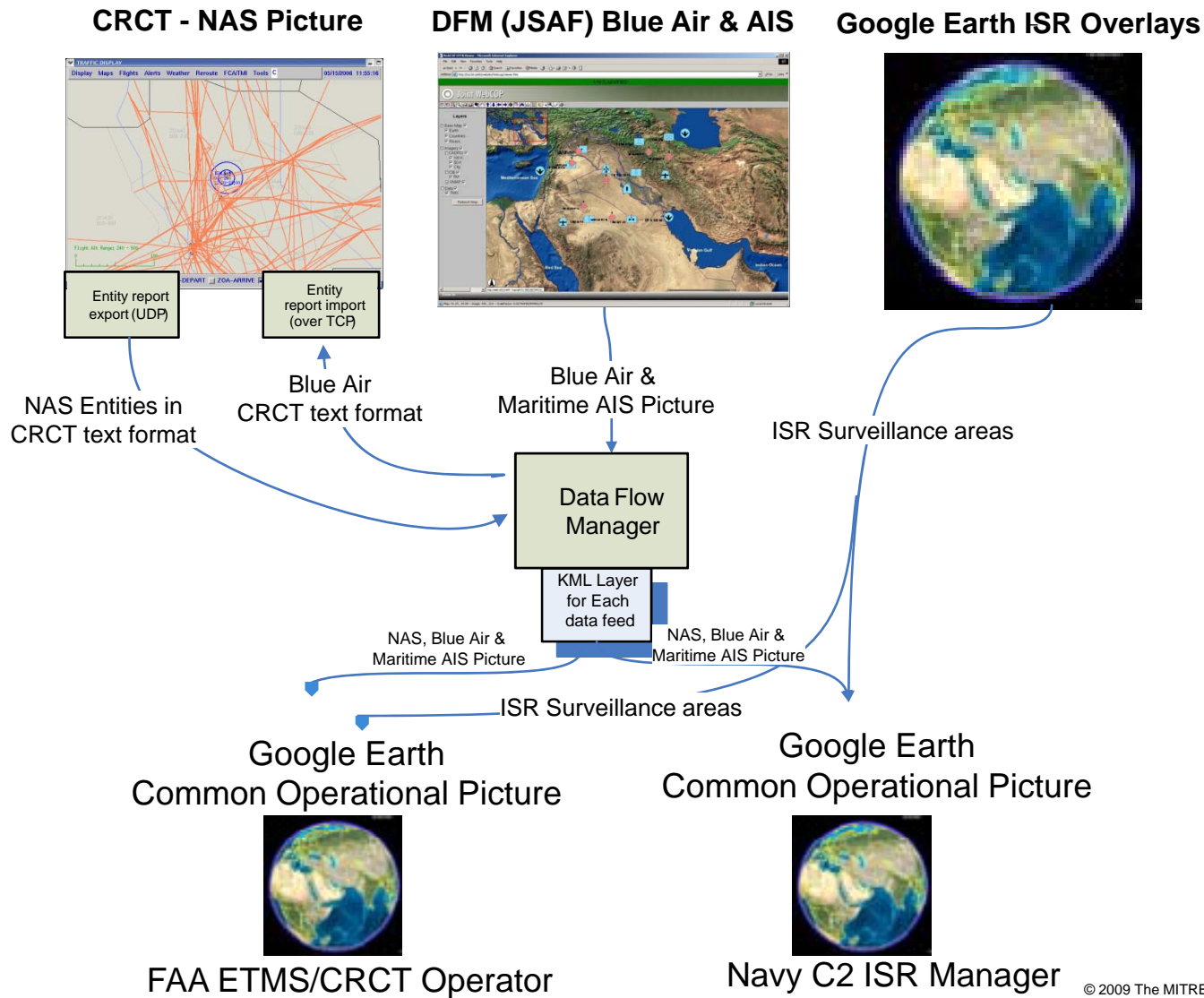
FAA Suggested Modifications to ISR Plans



FAA
ATCSCC NOM
ATSC



Integration of FAA and DoD Systems Information Exchange





Common Air Picture

- **Research Questions**

- **FAA**

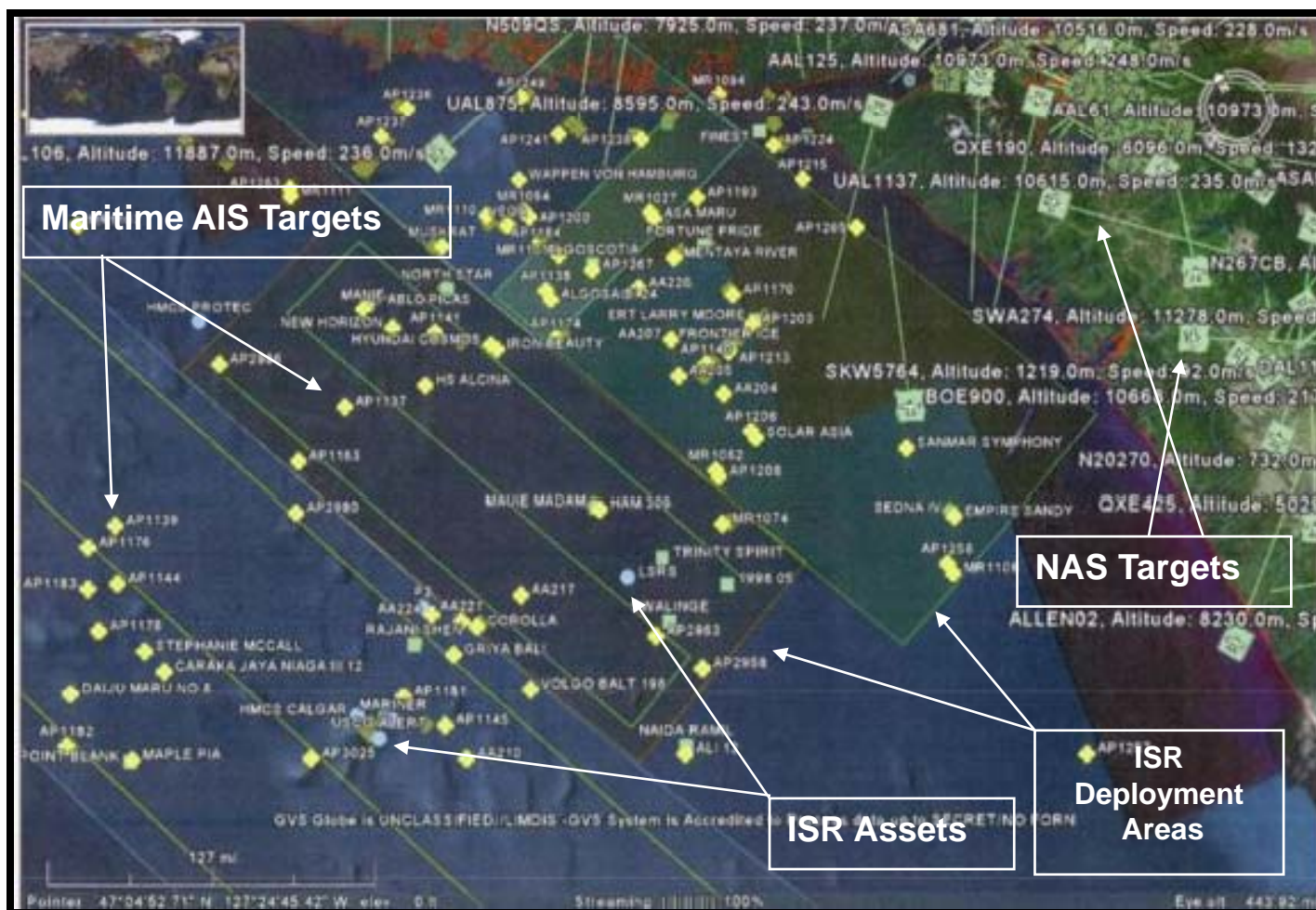
- **Common Air Picture adequate for the FAA to mitigate DoD's ISR effects?**
 - **Common Air Picture informed the DoD of NAS traffic flows?**
 - **Effectiveness of automated decision support tools in coordinating with the DoD on airspace usage?**

- **DoD**

- **Common Air picture adequate for showing NAS flows?**
 - **Effectiveness of Common Air Picture in coordinating with the FAA?**
 - **Effectiveness of automated decision support tools in coordinating with FAA on airspace usage?**



Common Operational Picture West Coast Scenario





FAA Post Scenario Questionnaire

West Coast Scenario

- **Common Air Picture**

- Mitigation of DoD ISR effects
- DoD informed of NAS traffic flows
- CRCT Tool effectiveness
- Effectiveness of Google Earth COP to coordinate with DoD
- Usefulness of chat function
- Usefulness of email
- Usefulness of voice Communication
- Extent to which COP increases SA

Very low	1	2	3	4	5	6	7	8	9	Very high	N/A
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Very low	1	2	3	4	5	6	7	8	9	Very high	N/A
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Very low	1	2	3	4	5	6	7	8	9	Very high	N/A
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DoD Post Scenario Questionnaire

West Coast Scenario

- **Common Air Picture**

- Google Earth COP provided NAS flows

Very low	1	2	3	4	5	6	7	8	9	Very high	N/A
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- Effectiveness of Google Earth COP to coordinate with FAA

Very low	1	2	3	4	5	6	7	8	9	Very high	N/A
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- Effectiveness of JSAF/DFM tool to coordinate with FAA

Very low	1	2	3	4	5	6	7	8	9	Very high	N/A
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- Usefulness of chat function

Very low	1	2	3	4	5	6	7	8	9	Very high	N/A
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- Usefulness of email

Very low	1	2	3	4	5	6	7	8	9	Very high	N/A
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- Usefulness of voice Communication

Very low	1	2	3	4	5	6	7	8	9	Very high	N/A
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Next Steps

- **Explore automated capability for seamless sharing of plans between FAA and DoD during MDA operations.**
 - The state of the practice during the SIMEXes
 - Use of phones and email messages with attachments containing graphical depictions of proposed plans
 - Improve usability factors
- **Integrate the COP with Navy and FAA mission planning tools**
 - Reduce the requirement for multiple displays
- **Identify specific roles and responsibilities**
 - FAA's Air Traffic Organization improvements needed to support MDA CONOPS
 - Roles and responsibilities development and exercised periodically



Questions

Mike Klinker

mklinker@mitre.org

Dr. Dennis Rowe

drowe@mitre.org



Back-up Charts



Progression of CAASD/FAA Involvement in MDA SIMEXes

MDA SIMEX 06-3

MDA SIMEX 07-1

MDA SIMEX 08-1

FAA Participation

**None
(CAASD
Participation
Only)**

**ATO System Ops
ATCSCC NOM
ATSC Mgr**

**ATO System Ops
ATCSCC NOM
ATSC Mgr**

Automation Systems

**ETMS/CRCT
(Stand alone)**

**ETMS/CRCT
On C2 Network**

**ETMS/CRCT
Google Earth
Common
Operational Picture
On C2 Network**

**Automation System
Integration**

None

**ETMS/CRCT
On C2 Network
One-way Interface
to E2C Simulator**

**ETMS/CRCT
ETMS two-way interface
with ISR Manager
NAS, Blue Air, Maritime AIS
targets available**