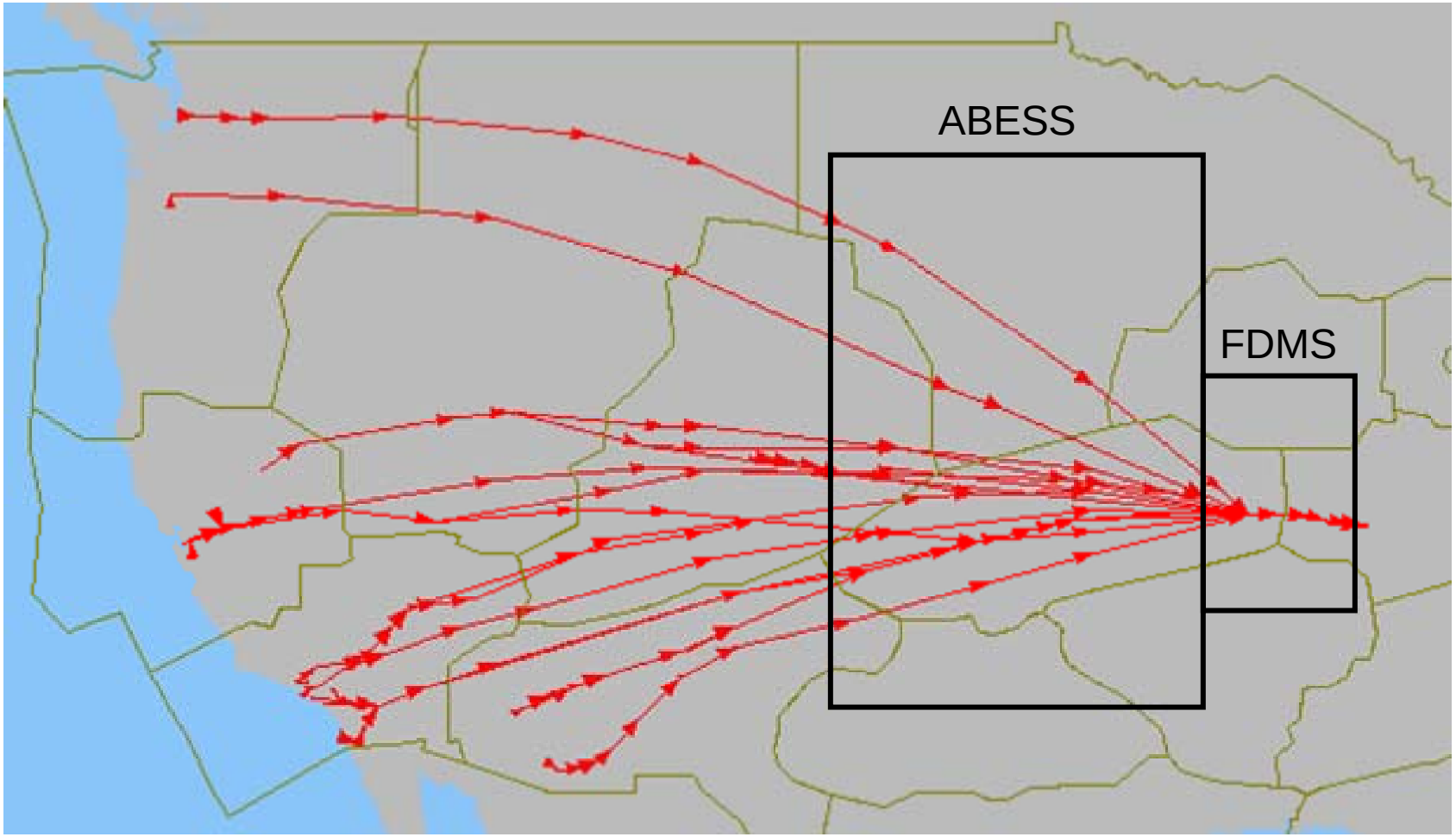
Agenda

- Section 1: ADS-B Overview
- Section 2: ADS-B Infrastructure
- Section 3: Program Governance and Structure
- Section 4: NPRM Status and Rulemaking Overview

- **Section 5: ADS-B Supported Future Applications**
  - Merging & Spacing (ATM-based & aircraft-based)
    - Vintage 2008 and Vintage 2018
  - ADS-B In-Trail Procedure (ITP)
  - Surface Indications and Alerts (SURF-IA)
  - “Third-party” Identification
  - Future Applications Challenges

- Section 6: Questions and Answers

M&S Vintage 2008 (UPS @ SDF)



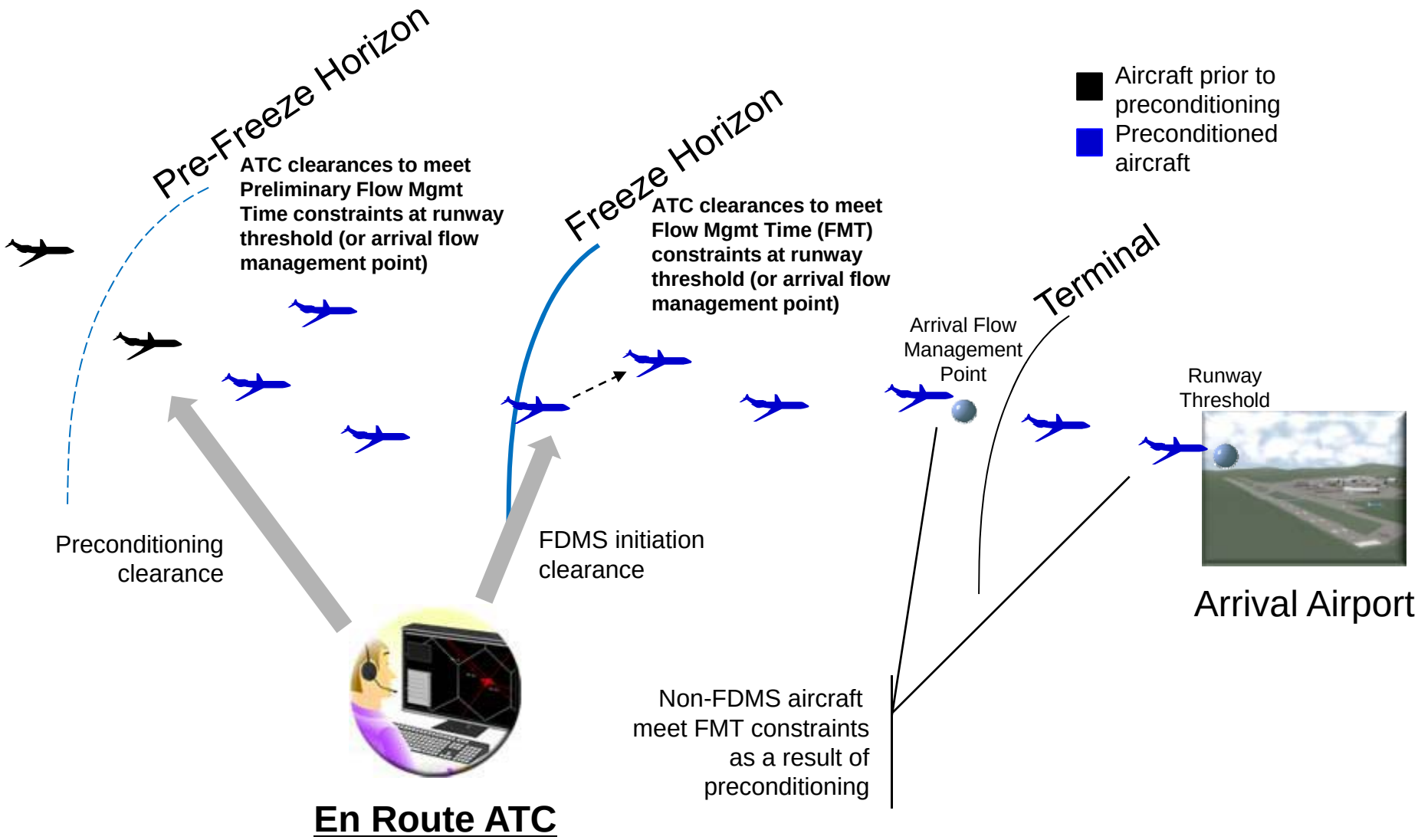
M&S Vintage 2018 ConOps

- **Develop an M&S concept of operations to support an SBS "analysis of alternatives" for the ATM-automation functionality**
  - Facilitate Continuous Descent Arrivals (CDAs)
  - Support aircraft-based Merging and Spacing capabilities
  - Accrue SBS NAS-wide benefits for ATM-based M&S beginning in 2014
  - Be consistent with operational evolution through 2018 (end of NextGen mid-term)

M&S 2018 Expected Benefits

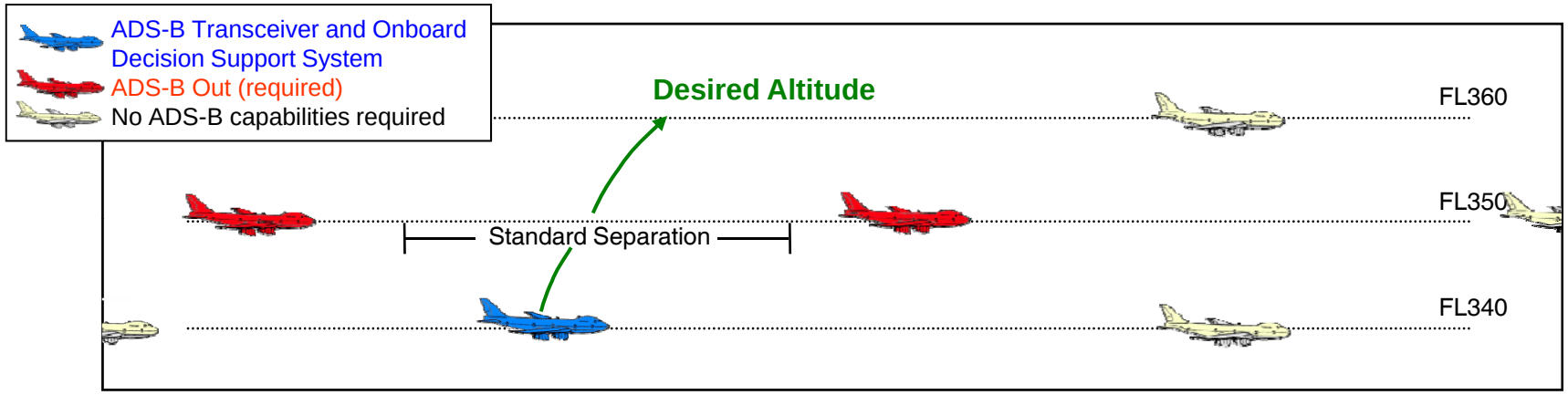
- **Early speed advisories should remove requirement for later path-lengthening**
  - Expected reduction in fuel burn
  - Expected reduction in controller workload for merge
- **Increase metering effectiveness by improving flow fluidity**
  - Flights are preconditioned, requiring less severe adjustments by ATC
- **Create earlier spaces for "internal departures",**
  - Earlier creation of gaps in an arrival stream for departures
- **Facilitates optimized arrival procedures (e.g., CDAs, FDMS)**

M&S 2018 Concept for Sample Arrival Flow



ADS-B ITP

ADS-B In-Trail Procedures (ITP) - ADS-B enabled climbs and descents through altitudes where current non-ADS-B separation standards would prevent desirable altitude changes



Flight Crew Responsibilities

- Use ADS-B information to evaluate ITP opportunities
- Request ITP with ATC
- Complete ITP*

* No airborne monitoring during climb required

Air Traffic Control Responsibilities

- Receives ITP request
- Ensures ITP possible and required separations exist with surround traffic
- Approves ITP**

** Controller retains responsibility for separation

Operational Evaluation

Goals

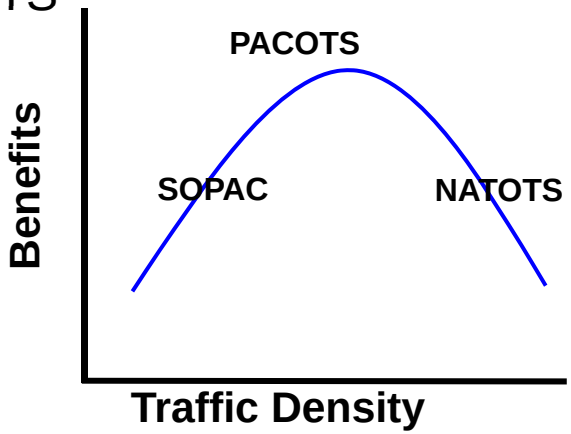
- Employ ADS-B ITP in limited, oceanic air carrier operations in 2010

Objectives

- Validate operational performance of ADS-B ITP
- Validate economic benefits of ADS-B ITP
- Establish framework for global implementation of ADS-B ITP and follow-on airborne ADS-B applications

Location

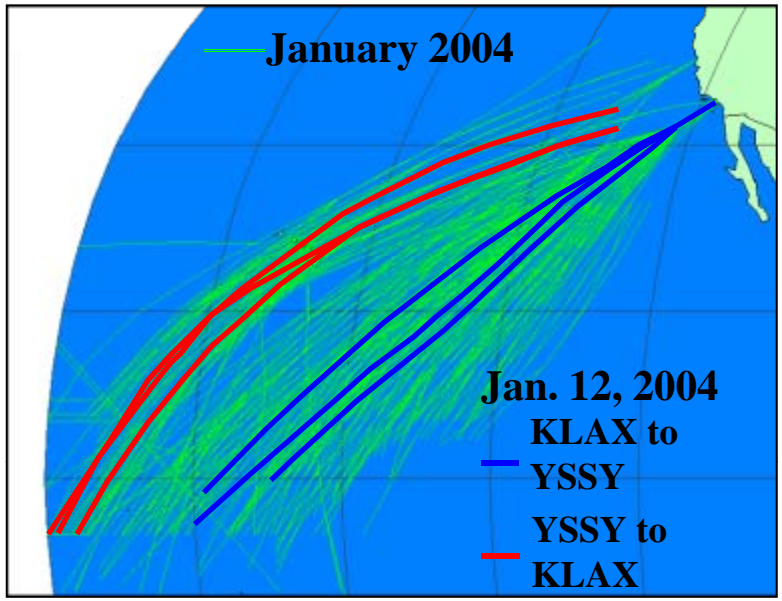
- Potential locations include SOPAC, PACOTS, NATOTS
- SOPAC appears to be a good initial implementation region
  - Favorable business case
  - Straight forward implementation
- Future migration to the PACOTS



SOPAC Business Case
Characteristics and Benefits

Operational Characteristics

- Traffic interactions are infrequent and very hard to predict
- Variations in fuel burn can be significant
- Pilots and dispatchers add contingency fuel to avoid unplanned fuel stops
- Aircraft often operate at MTOGW



Typical flight track in SOPAC

ADS-B ITP Benefit Mechanisms

- Increased ability to reach optimal aircraft performance altitude
- Reduced contingency fuel on ***all equipped flights***, allowing more high value cargo to be carried (SOPAC specific)

Planned ITP Partnership

Partner characteristics

- In-kind resources
- Influence
- Risk sharing

Partners

- Airline (SOPAC operator)
- Avionics vendor(s)
- FAA

FAA resources

- Help with equipping appropriate number of aircraft with certified ITP systems
- Additional in-kind resources (people, influence, etc.)

Airline resources

- Install and operate aircraft with certified ITP systems
- Influence with avionics vendor(s)
- Additional in-kind resources (simulator time, OMC support, etc.)

Surface Indications and Alerts (SURF-IA) Acquisition

On November 3, 2008 the FAA announced awards to two different vendors

Honeywell

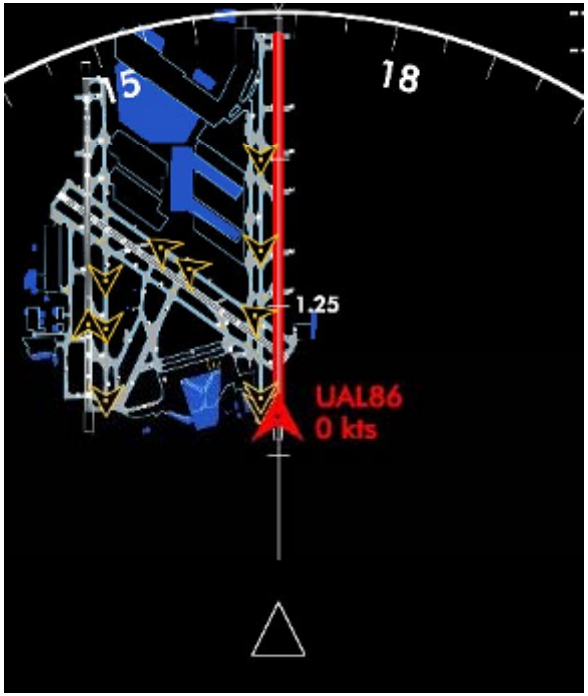
ACSS™

Operational Concept: Indications

- **Facilitate pilots' perception and processing of runway safety relevant traffic information to reduce likelihood of conflicts**
- **Consist of highlighted, or otherwise emphasized relevant traffic and runways on a CDTI**
- **Two types:**
  - Primary: e.g. runway unusable
  - Secondary: e.g. for additional flight crew awareness only
- **Intended for normal operational conditions**

Operational Concept: Alerting

- Facilitate pilots' appropriate compensatory response once a conflict is imminent
- Consist of highlighted traffic and runways on a CDTI and an auditory signal
- <u>Cautions</u> require subsequent pilot response
- <u>Warnings</u> require immediate response (draft FAA AC 25.1322)
- Intended for non-normal operational conditions



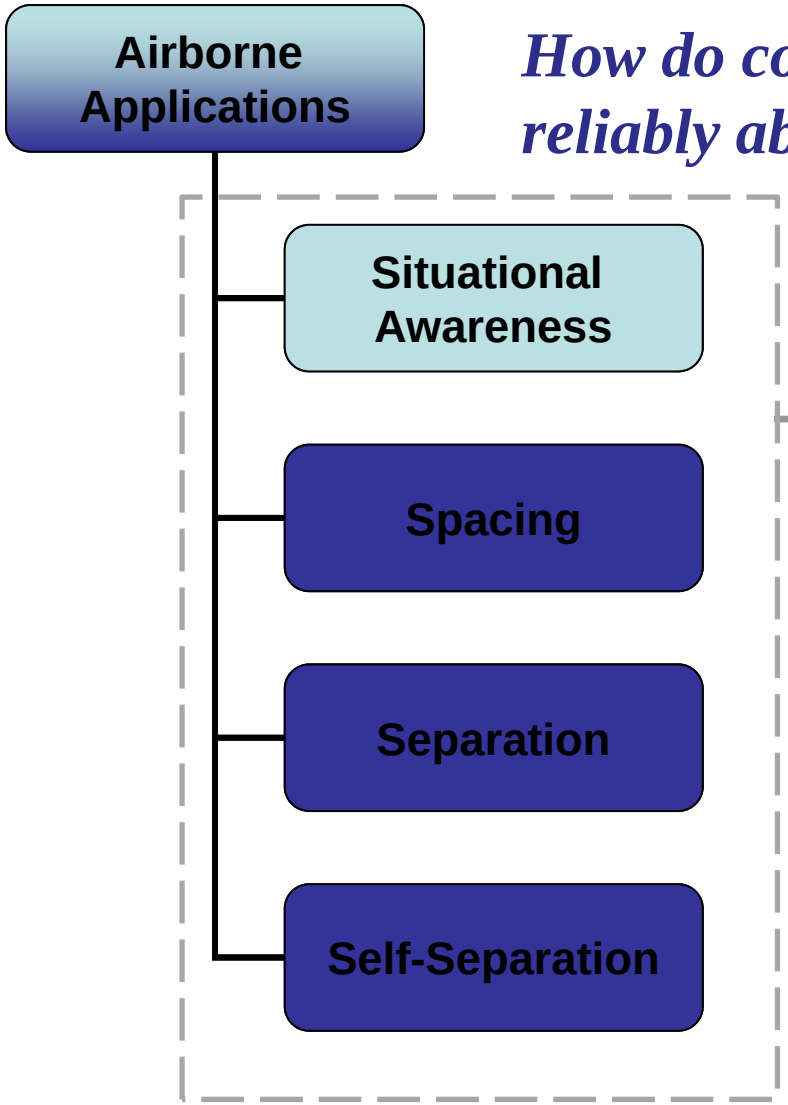
SURF-IA Timeline

- **Preliminary Design Review (PDR): Draft OSA/OPAs completed January 2009**
- **Critical Design Review (CDR): Final OSA/OPAs (Planned May 2009)**
- **Demonstrations: Complete no later than February 2010**

Success in approach may lead to replication for future applications

3rd Party ID Issue

How do controller and pilot communicate reliably about another aircraft (a "3rd party")?



Traffic identification integral to multiple applications

Issues to address:

- No accepted standard for message or protocol
- Little understanding of potential impact of (look-alike / sound alike) aircraft identifiers on confusion, workload, or performance

3rd Party ID Next Steps

- **Conduct large-scale Controller/Pilot Study**
  - Air and ground system components and their operators connected interactively
  - Identify system issues that cannot be addressed in simulations of the ground or aircraft systems in isolation
- **Operational evaluation of promising procedures from large-scale simulation**
  - Identify possible trials and sites
  - Develop test plan

Discussion Topics

- **DoD Memorandum of Agreement Service Delivery Points (Critical Services)**

Region	State	Facility	SDP	Military Branch
Eastern	(NC)	Pope AFB	POP-BASOP	AF/possibly joint forces site
Eastern	(MD)	Patuxent Rover NA	NHK-RATCF	Navy
Central	(MI)	Mount Clements	MTC-RAPCO	Air Force
Central	(ND)	Minot	MIB-RAPCO	Air Force
Central	(OK)	Lawton (Fort Sill AFB)	FSI-RAPCO	Air Force

* Tyndall AFB MOA – Pending

BASOP – Military Base Operations
RATCF – Radar Air Traffic Control Facility (USN)
RAPCO – Radar Approach Control (USAF)

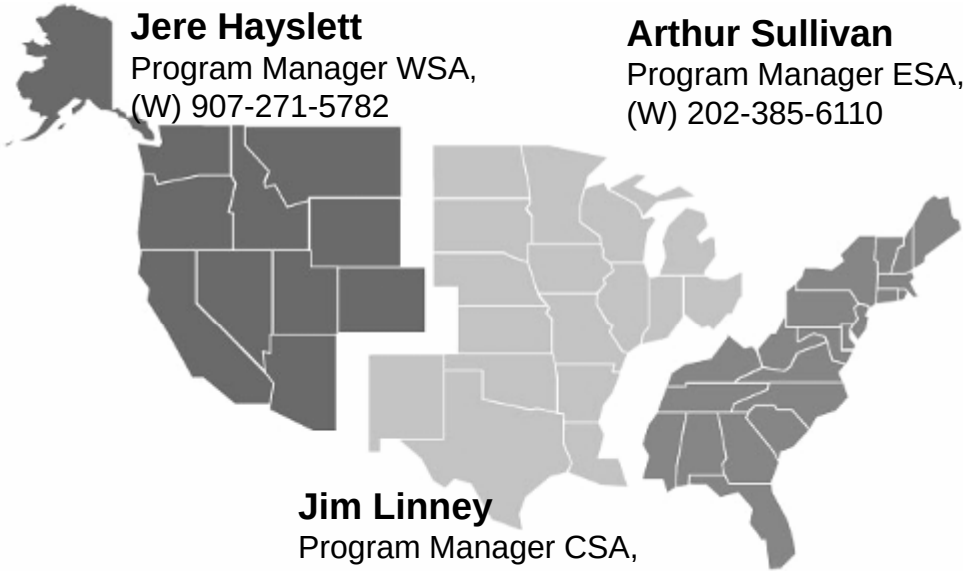
Discussion Topics (cont)

- **Access to FAA data**
  - Surveillance
  - Automation Connectivity
- **DoD Avionics Roadmap**
  - Obstacles and opportunities

ATO-E, Surveillance and Broadcast Services

Vincent Capezzuto, Director

(W) 202-385-8637



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Questions?

Benefits of Performance-based Services Acquisition

- Increased likelihood of meeting schedule, technical quality and cost targets
- Focus on intended results, not process
- No design specification or process description needed
- Contractor flexibility in proposing solution
- Shared incentives permit innovation and cost effectiveness
- Variety of solutions from which to choose

Benefits of Using a Service Contact for ADS-B

- **Contract(s) would provide for maximum flexibility in ordering coverage**
  - TIS-B/FIS-B options to be exercised as needed
  - Transportable rapid deployment service delivery capability
  - Coverage volume flexibility (Surface, terminal and en route)
  - Generic options for pop-up requirements (Olympics, International)

- **Maximizes competition by allowing the vendors the flexibility of developing solutions that fit into their current infrastructure, product line, and business models**

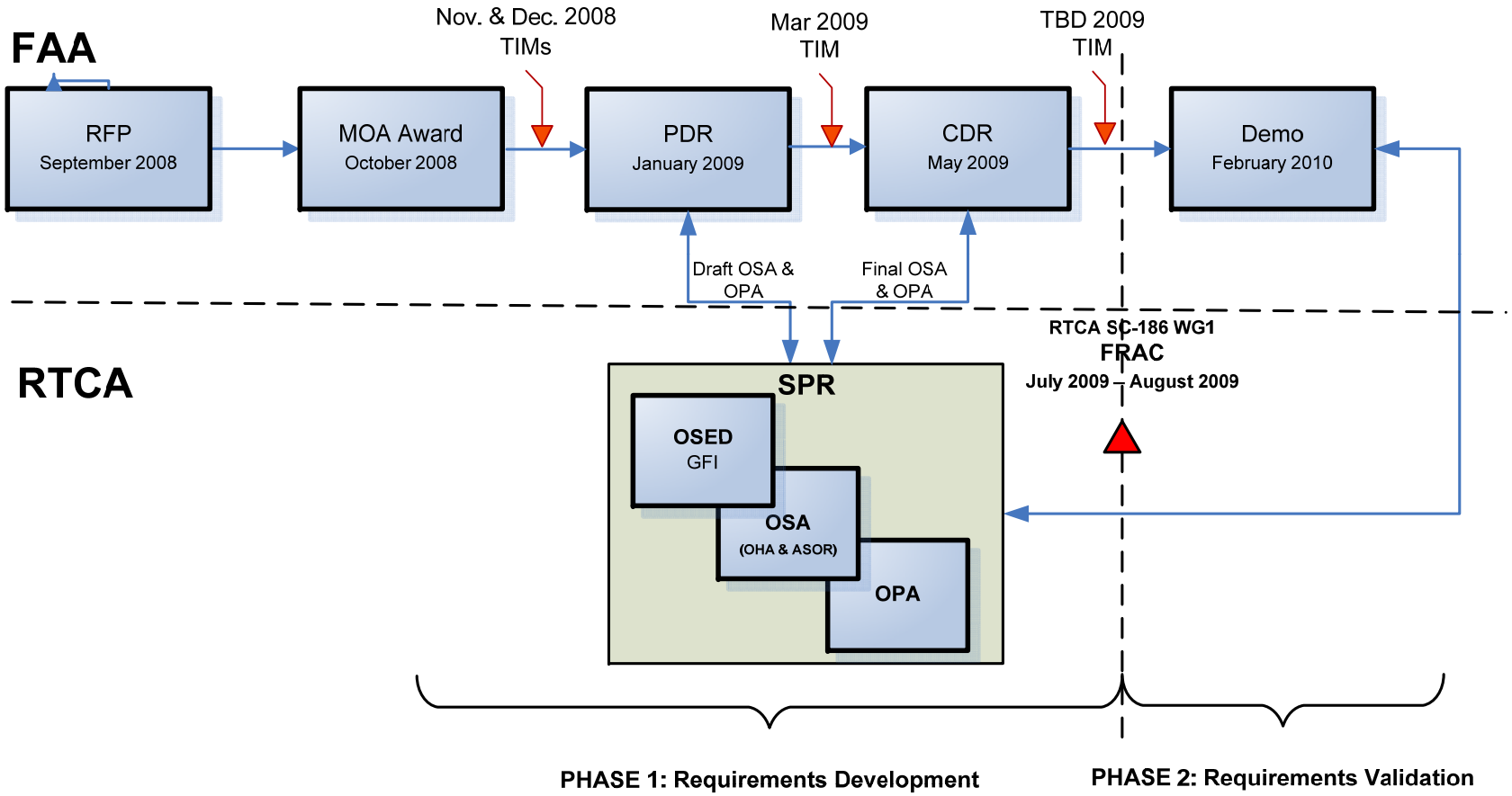
- **Gives service providers / vendors the opportunity to leverage their assets by maximizing their use of Commercial Off-The-Shelf (COTS) solutions, and by using land or services they may already own**
  - Use of existing facilities and people for a control center

- **This affords the agency a smaller operation and maintenance bill and allows the FAA to consider divestiture from land intensive leases currently used for radar sites**

Functional Area 4 Breakdown

4.1 Ops Support Management
4.2 Concept of Operations (CONOPs)
4.3 Computer-Human ATC Interface (CHI)
4.4 Current Application Development
4.5 Future Application Development
4.6 Airspace Requirements
4.7 Controller Procedures
4.8 Technician Procedures
4.9 Controller Training Requirements
4.10 Technician Training Requirements

SURF-IA Overview



SURF-IA Assumptions

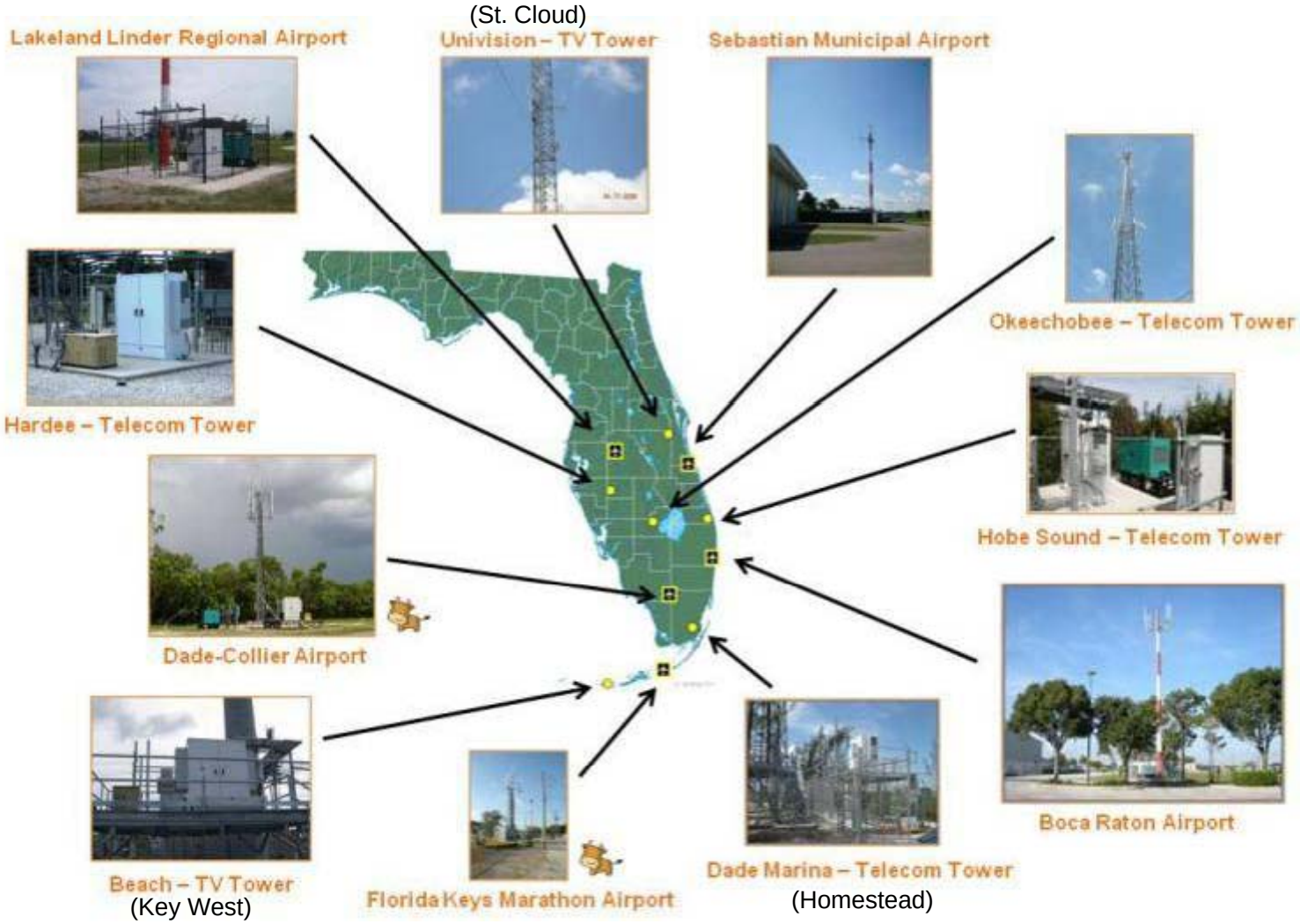
- **No ground-based surveillance requirement**
  - Application needs to be operable at all airports
  - However, ground-based surveillance such as TIS-B and ADS-R will be utilized if available
    - Expected to increase benefits significantly, especially in short term
- **Does not involve communication of alerts to ATC**
  - Alerting design is “loosely” coordinated with other ground-based solutions such as RWSL* or AMASS**
    - Coordination on functional level rather than detailed level
  - ATSA SURF alerting occurs later than controller alerting and is intended as “last safety net”

* Runway Status Lights ** Airport Movement Area Safety System

3rd Party ID
Major Findings Across Studies

1. Presence or absence of specific content at certain points in controller/pilot exchange can hinder or redeem a proposed format
2. Impact of “third party traffic comms” on frequency congestion is prominent concern of controllers and pilots, but for different reasons
3. Controller and pilot perceptions of format effectiveness not always supported by objective evidence
4. No singular prescription for optimal format; however, research is helping to guide transfer of flight ID phraseology design and evaluation
5. Findings based on existing operational concepts may require re-examination as equipment or concepts evolve

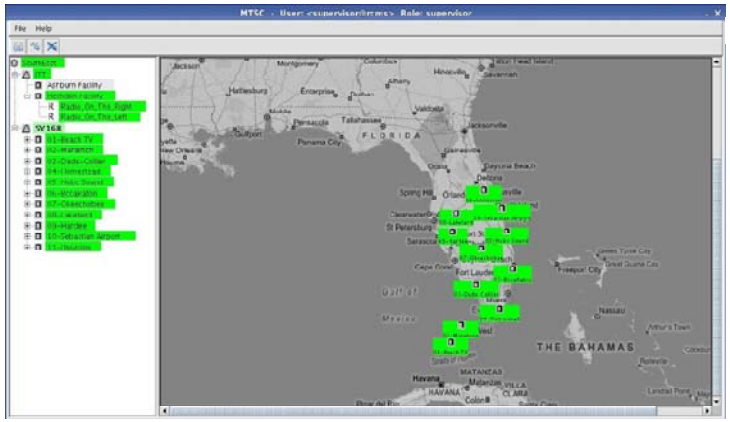
Eastern Service Area – Miami Key Site

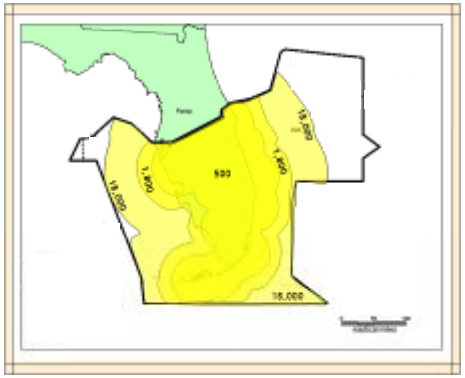


Eastern Service Area – Miami Key Site

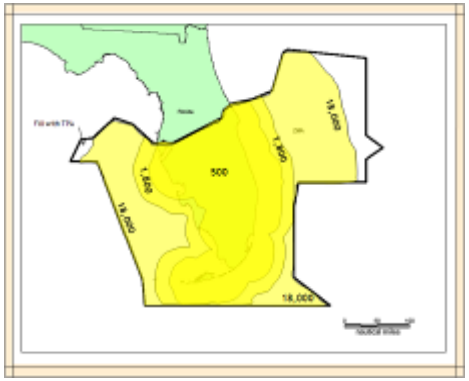
- **South Florida Broadcast Services**
  - Operational since August, 2008

Radio Station Status

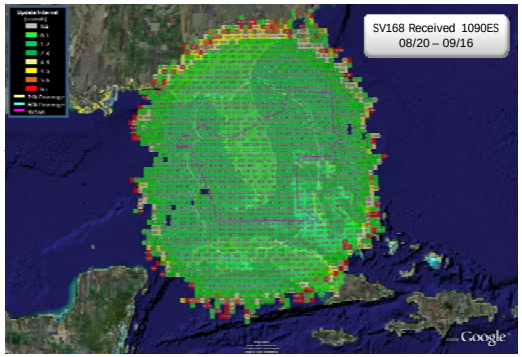


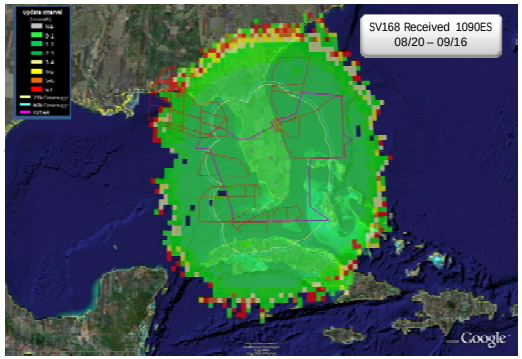


SV-168 UAT – Overview (TIS-B and FIS-B)



SV-168 1090ES – Overview (TIS-B)





Boca Raton ADS-B Radio Site

Sebastian Airport Installation

Hardee Site Tower

Hardee Radio Station

4.5 Future Application Development

UAL86 B747/R FL360 SYDNEY….DFW (ADS-B In)

ITP - Climb to requested altitude over Pacific with less than standard separation.

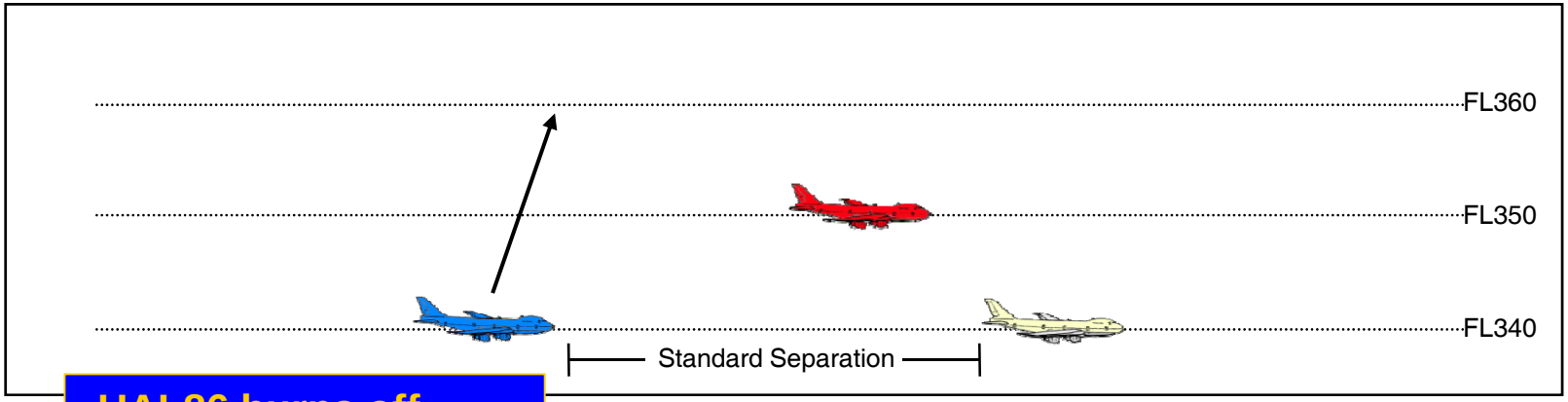
FDMS – Achieve and fine tune a time-based spacing interval from the Traffic To Follow and increase ability to conduct Continuous Descent Arrival operations.

Surface Conflict Detection and Cockpit Alert - Addresses actual or potential high speed conflicts on or near runways using uplinked traffic surveillance information from radar, TIS-B, multi-lat and ADS-B.

4.5 Future Application Development

ADS-B In-Trail Procedures

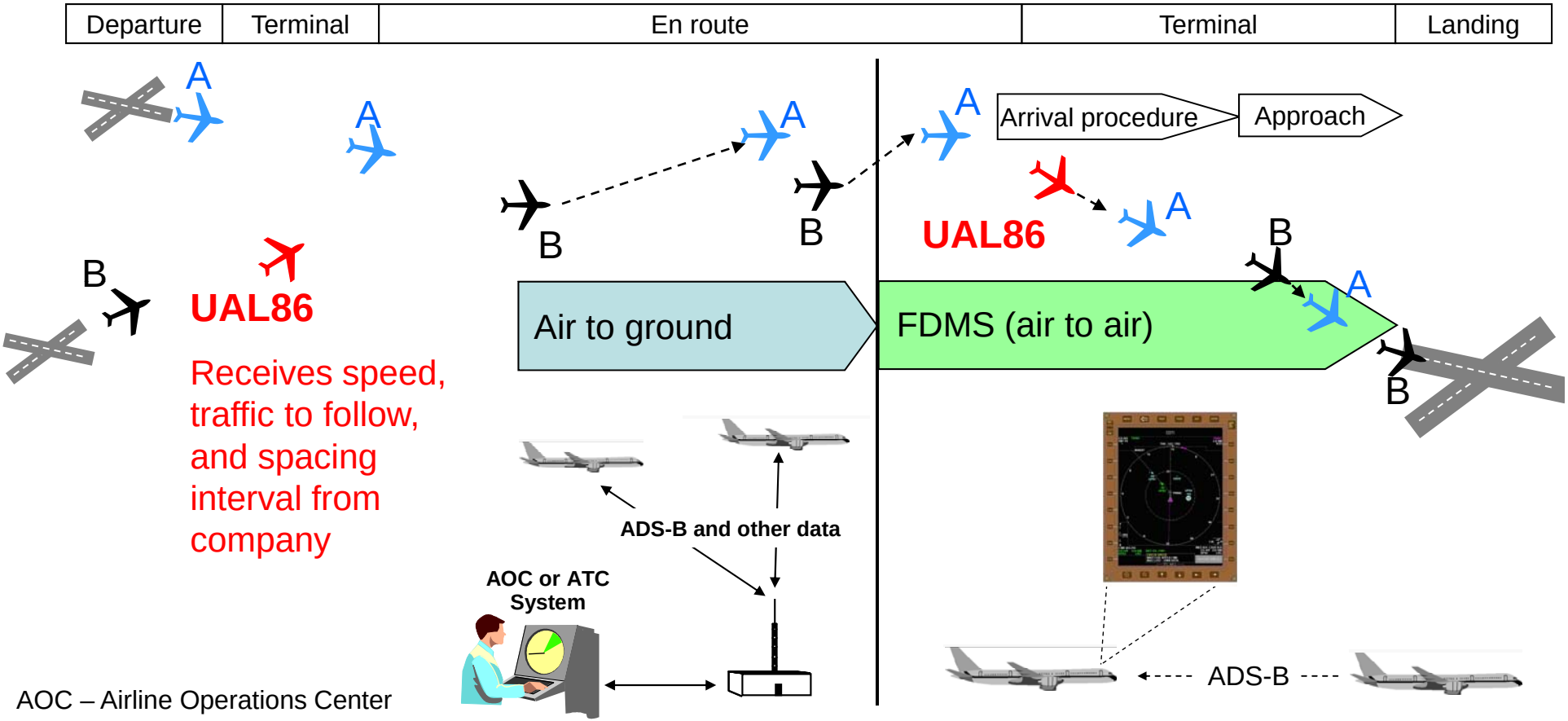
ADS-B In-Trail Procedures are airborne ADS-B enabled climbs and descents through otherwise blocked flight levels



•UAL86 burns off enough fuel and requests FL360

blue = ADS-B transceiver and onboard decision support system
red = ADS-B out minimum required

Flight Deck Merging & Spacing

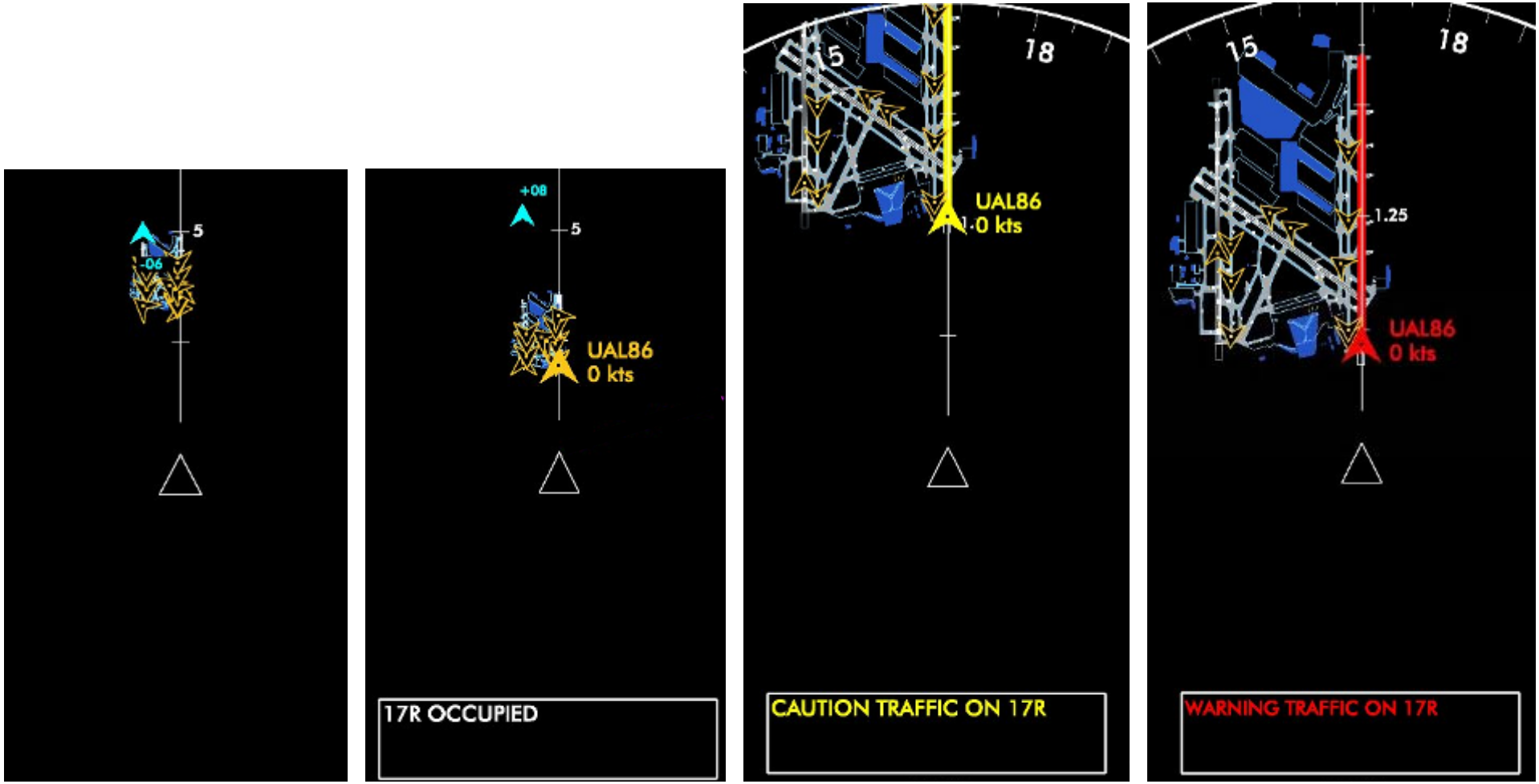


AOC – Airline Operations Center

ATC – Air Traffic Control

FDMS – Flight Deck-Based Merging and Spacing

UAL86 Landing at DFW on 17R

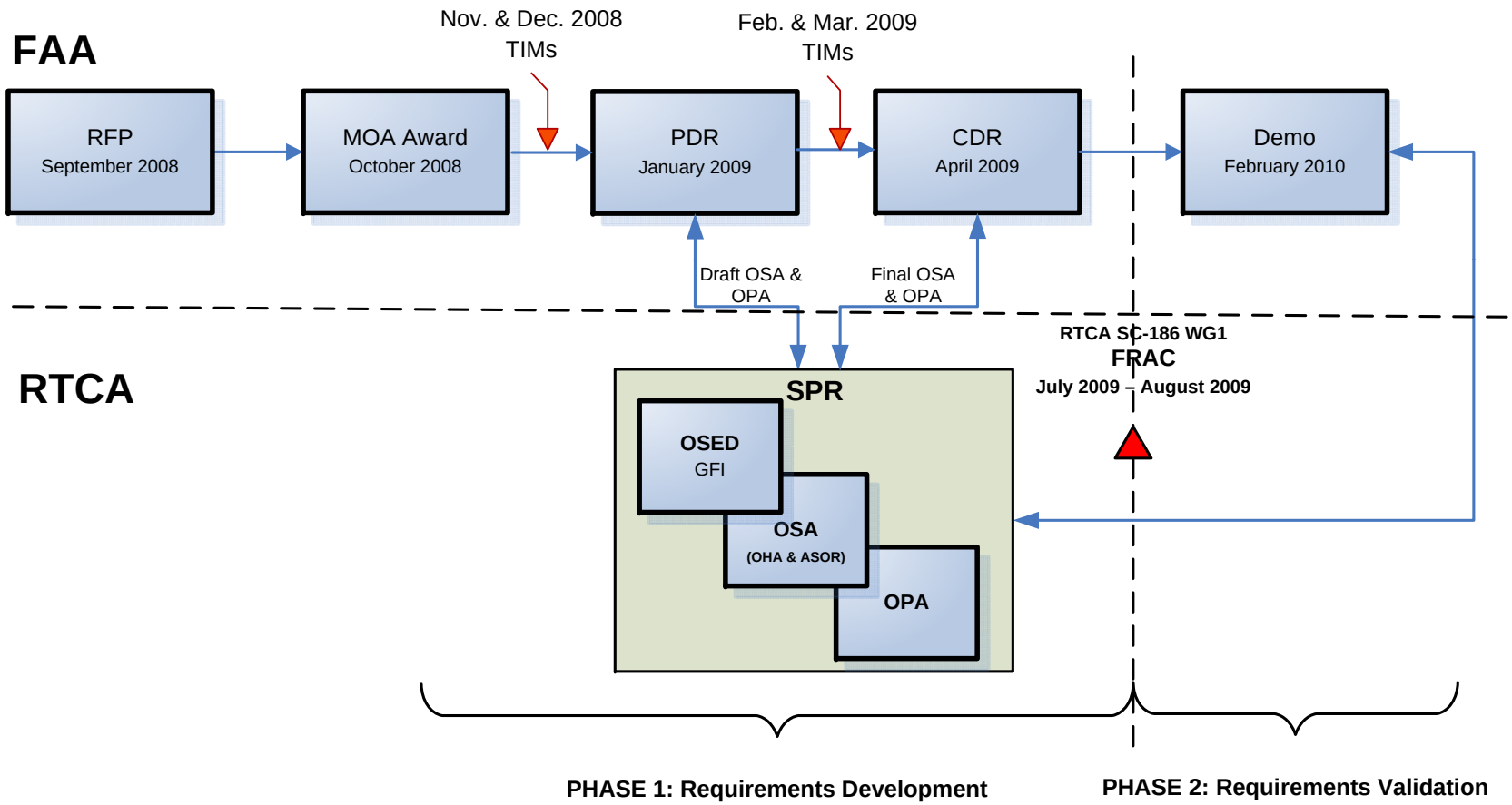


4.5 Future Application Development

CAM: Peter Moertl

- **ATSA SURF IA - Enhanced Traffic Situation Awareness on the Surface with Indication and Alerting**
  - **Application that uses traffic surveillance information to provide flight deck indication and alerting in reference to a potential or actual traffic conflict on or near the airport surface.**
  - **RTCA SC-186 Subgroup WG-1**
  - **SBS MOA's with Honeywell and ACSS.**
    - The performance requirements and safety/hazard assessments developed will be made available to SC-186 WG-1 to develop standards.
    - RTCA ADS-B MOPS for surface alerting will eventually be the basis for TSO's for manufacture of avionics.
  - **Research, development and prototyping aimed at accelerating stable performance requirements, avionics manufacturing and more widespread application.**

Surface Conflict Detection and Cockpit Alerting MOA Schedule – Honeywell & ACSS



Mid-Point Comic Relief

Vinny's Marathon Run

Vinny is racing in a marathon…

If he overtakes the second person, what position will he be in?

If he overtakes the last person, what position will he be in?

4.5 Future Application Development

- **Application Integrated Work Plan (AIWP)**
  CAM: Roberta Massiah
  - **Timeline of applications that serves to prioritize research and requirements development activities.**
  - **Prioritization based on risk-adjusted B/C ratio and bundled according to implementation dependencies.**
    - Avionics requirements
    - Required changes to airspace, procedures, and/or separation standards
  - **Living document that will be periodically updated based on new information gained from ongoing research and development.**

4.5 Future Application Development

- **Action Plan 23 (AP-23)**
  CAM: Roberta Massiah
  - FAA/Eurocontrol Memorandum of Agreement focusing on Long Term ADS-B/ASAS (Airborne Separation Assistance Systems) Applications
  - Coordinate with Eurocontrol operational and technical representatives on prioritization of research activities.

4.5 Future Application Development

- **Airborne Separation Assistance System (ASAS) Forum**
  CAM: Ethan Walters
  - **Establishment of a series of conferences to share information and research data on ADS-B and other related ASAS technologies.**
  - **Includes participants from government, industry, academia, and R&D firms.**
  - **Expected to be held twice a year with location alternating between US and European locations.**
  - **Next meeting tentatively planned for May 2009 in Chicago.**

4.5 Future Application Development

- **Third Party Flight Identification**
  CAM: Randy Bone
  - **Examine and develop options for the use of third party identification during pilot / controller voice communications.**
  - **Necessary for fielding future ADS-IN applications.**
  - **Has been tested to varying levels in simulations and field but no clear results.**
  - **Conduct high fidelity simulations to feed further field testing.**