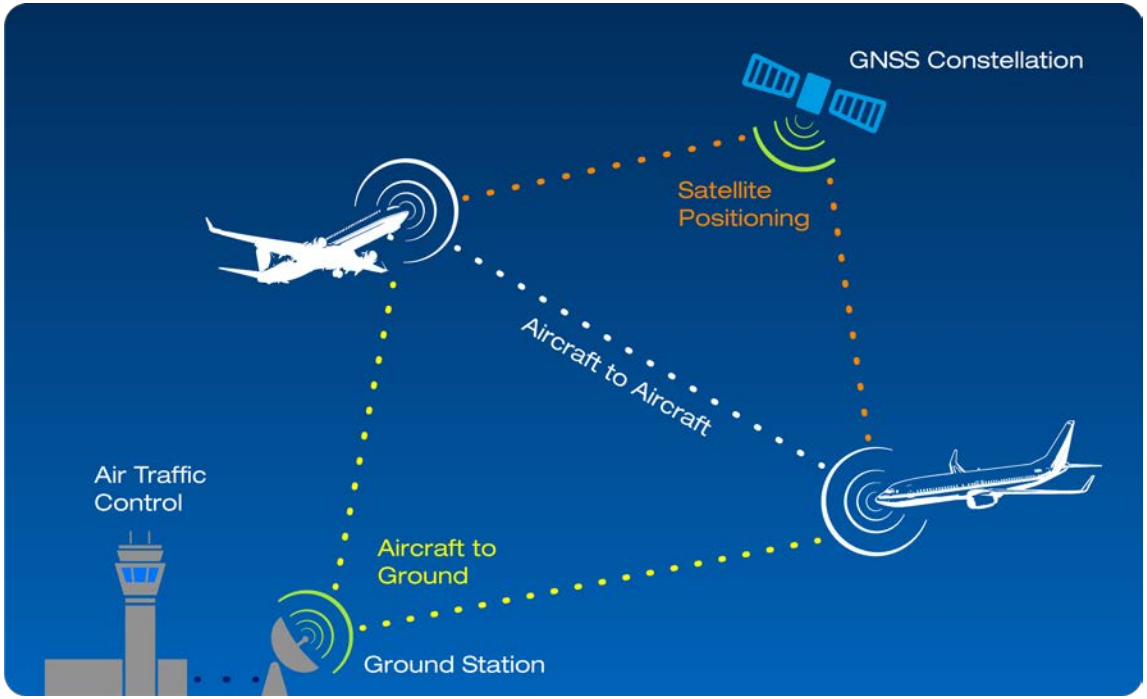
Air Traffic Organization
Program Management Org

ADS-B Program Status



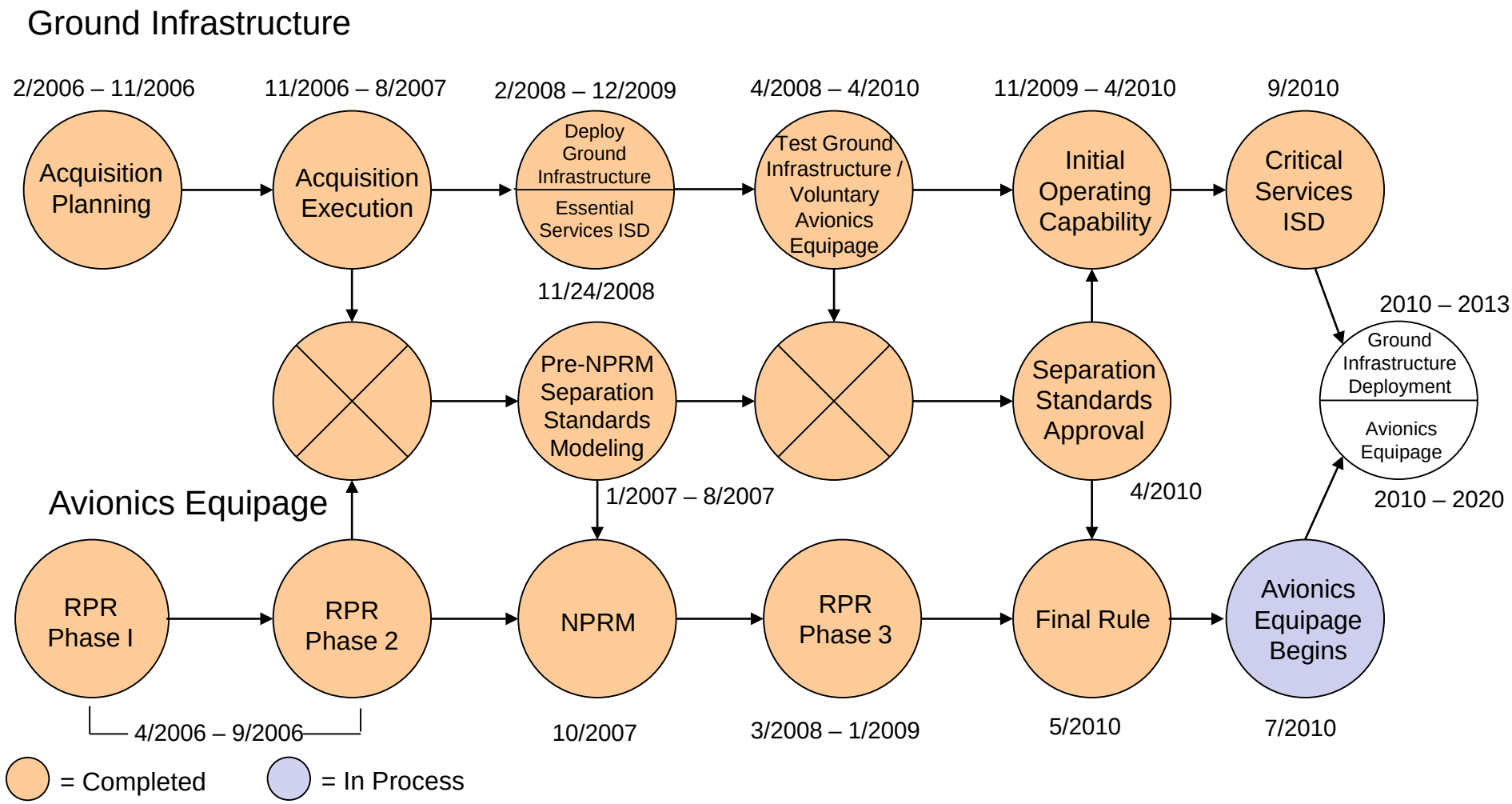
Presented to: ICAO APAC Seminar on Surveillance

By: Doug Arbuckle

Date: April 9, 2019

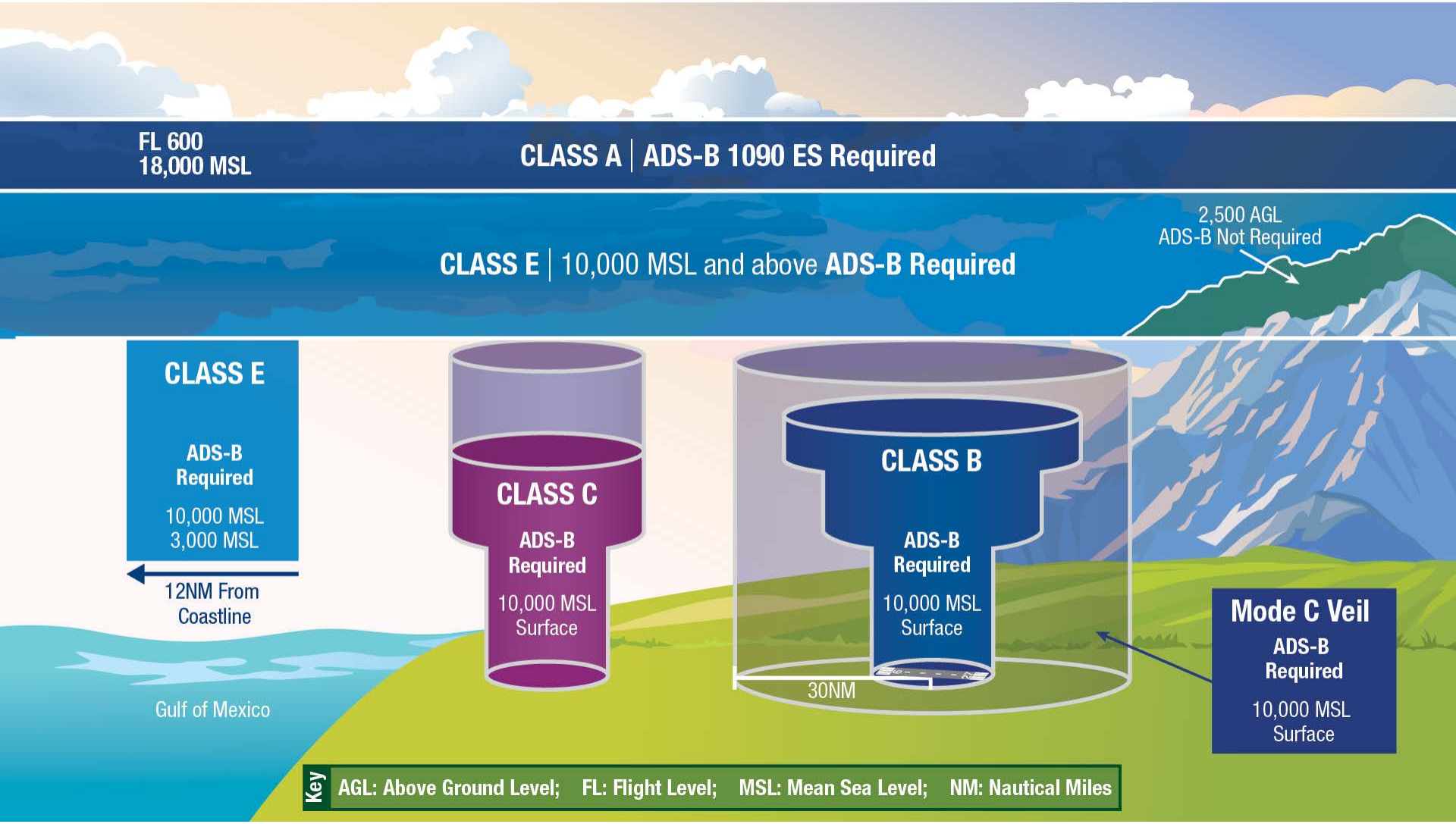
Federal Aviation Administration

“Dual Track” Strategy (Sept 2010)



RPR = Rulemaking Project Record; **NPRM** = Notice of Proposed Rulemaking; **ISD** = In-Service Decision

Required ADS-B Airspace



Visit https://www.faa.gov/nextgen/equipadsb/research/airspace/

Exemption 12555 Summary

- **not an extension of the rule compliance date**
- **five year limited exemption only from 91.227(c)(1)(i) & (iii) – NIC and NACp requirements – under following conditions and limitations:**
  - Operator must have sent their application to FAA by 1-Aug-2018
  - Operators of SA-Aware equipped aircraft with the Exemption are not required to conduct preflight verification; such operators are exempted from performance requirements in 14 CFR §91.225 when their ADS-B Out equipment is not predicted to meet requirements of §91.227(c)(1)(i) and (iii)
  - Operators of SA-On equipped aircraft must conduct preflight verification; operators with the Exemption may operate in airspace specified in §91.225 when their ADS-B Out equipment does not meet requirements of §91.227(c)(1)(i) or (iii) **and** FAA determines there is a backup means of surveillance
    - FAA will make this determination available through the Service Availability Prediction Tool (SAPT)

Service Delivery Points for ATC Separation Services										
	FY10 – FY12	FY13	FY14	FY15	FY16	FY17	FY18	FY19	FY20	Operational
En Route	6	4	12	2	N/A	N/A	N/A	N/A	N/A	24 of 24
Terminal	19	27	17	5	13	24	26	5 of 24	N/A	136 of 155
Surface (Advisory)	16	10	9	0	1	1	1	3	2	38 of 43
Oceanic	0	0	0	1	1	1	N/A	N/A	N/A	3 of 3

U.S. Rule-Compliant ADS-B Out Avionics Equipage 69,038

ATC Spacing Services

Ground-Based Interval Mgmt - Spacing (GIM-S) (En Route only)

2011 - 2014: GIM-S Develop

2013 - 2014: GIM-S Deploy

2014: GIM-S Test

2014: GIM-S IOC

2020 Avionics Equipage

Flight Deck Based Interval Mgmt– Spacing (FIM-S)

In Trail Procedures (ITP)

Traffic Situation Awareness with Alerts (TSAA)

Pilot Applications

U.S. ADS-B In Avionics Equipage 55,363

TIS-B
FIS-B
ADS-R

Pilot Advisory Services			
	FY14-FY18	FY19	Total
Baseline Deployment (2008 – 2014)			Complete
Alaska Expansion Deployment			Complete
Service Expansion Deployment (ASSC and Gulf of Mexico* Service Volumes)	5	3 of 4	8 of 9

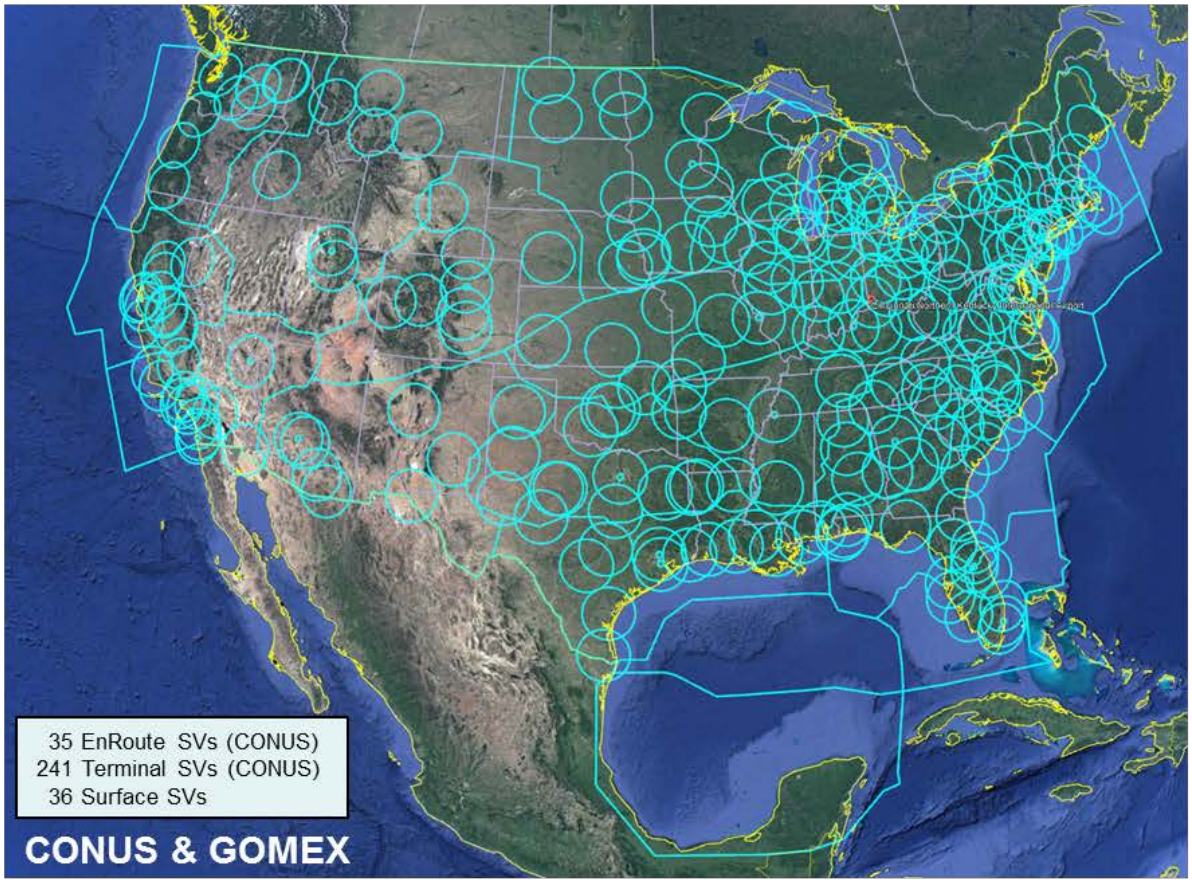
In Process

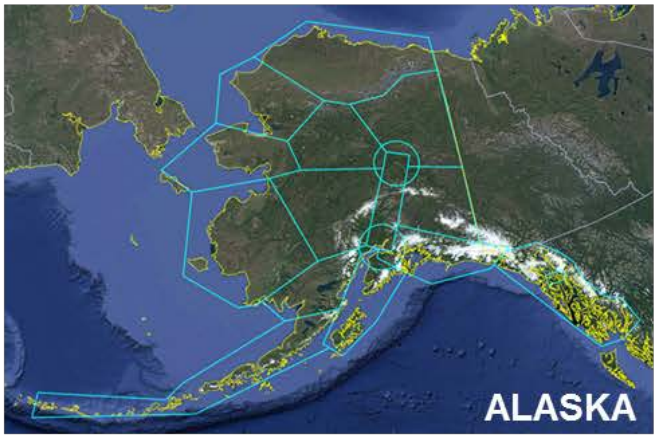
Complete

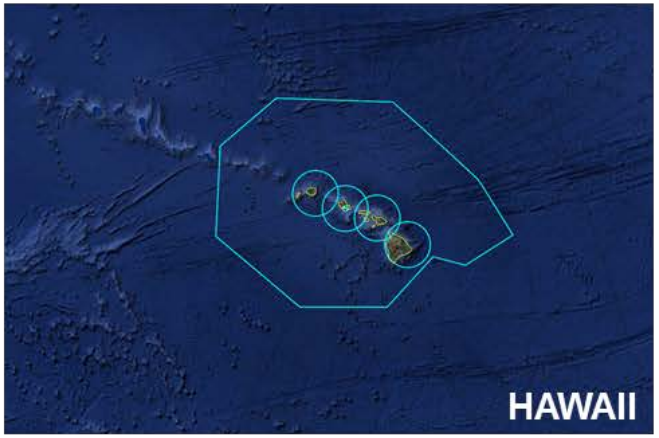
**Pilot services not provided in Mexican Service Volumes*

As 3-01-2019

ADS-B Service Volumes: EnRoute, Terminal, and Surface







As of 1-Dec-18

Target Caribbean Airspace

Figure 2: Grand Turk Surveillance Gap*

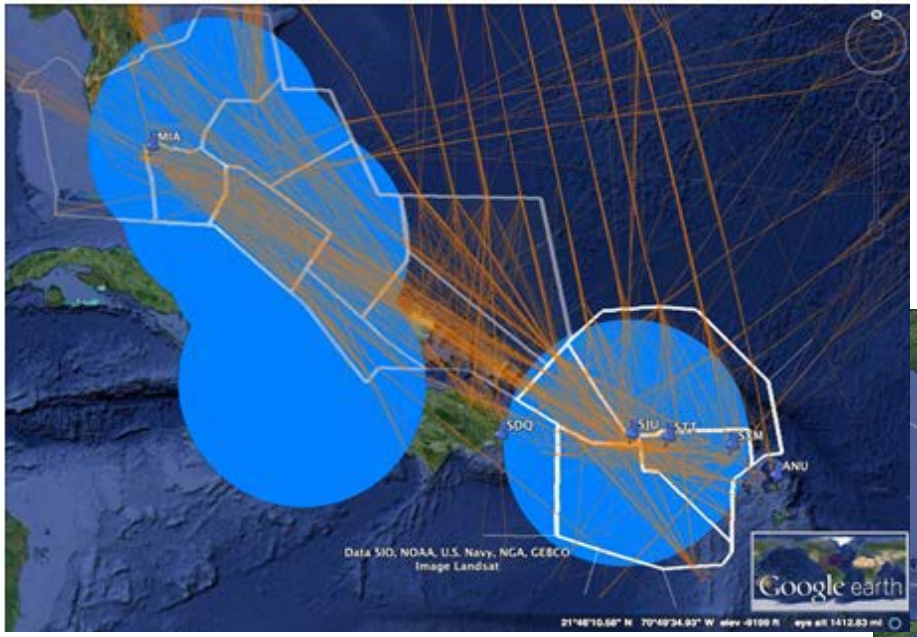
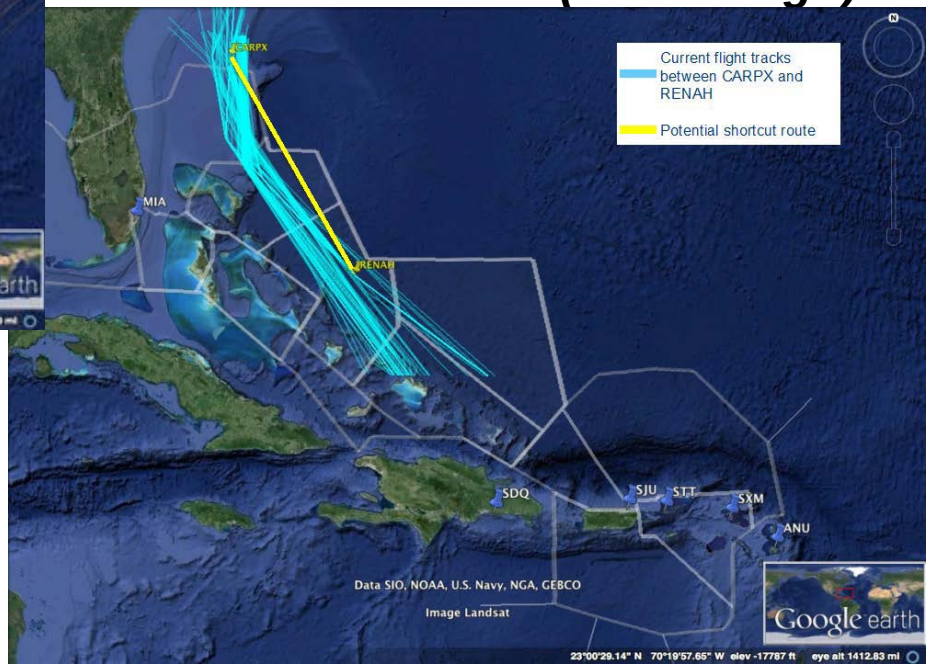


Figure 3: Potential shortcut between CARPX and RENAH (cut through)*



**Source: Report of the Eastern Regional Task Group (ERTG) of the RTCA Tactical Operations Committee (TOC), July 2015*

Space-Based ADS-B Operational Evaluation (Near-term)

1
- SBA in Caribbean in an operational context
- Short term, 1 year

2
- Operations and ATC acceptance
- Route structure (e.g., ops for optimization)
- SBA tech performance
- Benefits

3
- Continued use in Caribbean
- Expansion to other geographic areas

Equipage as of 1-Mar-2019 (good installs)

Rule Driven ADS-B Out Aircraft Detected by FAA network

Category	As of 1-February 2019	As of 1-March 2019	Monthly Increase	
All Link Version 2	66,538	69,038	2,500	3.76%
1090ES	57,996	60,155	2,159	3.72%
UAT	7,550	7,889	339	4.49%
Dual	992	994	2	0.20%
US General Aviation (includes EXP & LSA)	53,330	55,077	1,747	3.28%
US Air Carrier	3,948	4,253	305	7.73%
Intl General Aviation*	3,982	4,112	130	3.26%
Intl Air Carrier	1,338	1,398	60	4.48%
U.S. Military & U.S. Special Use	764	807	43	5.63%

*Aircraft incorrectly reporting outside US ICAO block are included in Intl GA count.

FAA currently tracked ADS-B avionics problems

- **Baro/Geo Altitude Spikes**
- **Missing Baro Altitude**
- **Missing Flight ID**
- **Missing Mode 3/A**

Unique to UAT

- **Kinematic Issues (aka, “position jumping”)**
- **Duplicate & Wrong ICAOs**
- **Air/Ground determination issues**
- **Incorrect Emitter Category**
- **Flight ID Error (includes Partial Flight ID)**

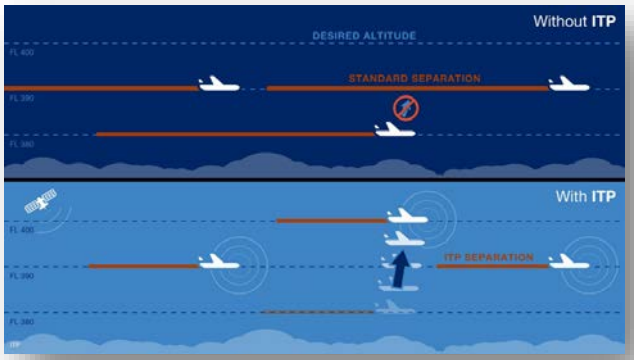
Both links

- **B787 and TSS-4100 (Rockwell ProLine TCAS/transponder unit) erroneous position *(Airworthiness Directives issued)***
- **E170 position jumping**
- **A380 Flight ID change on Surface**
- **A380 Geo Altitude (SB available)**
- **B777-300ERs delivered with wiring error, resulting in non-compliant NACv/SDA/EmitCat/Length-Width Code (SB available)**
- **Airbus single aisle missing Length-Width Code due to production wiring error (SB available)**

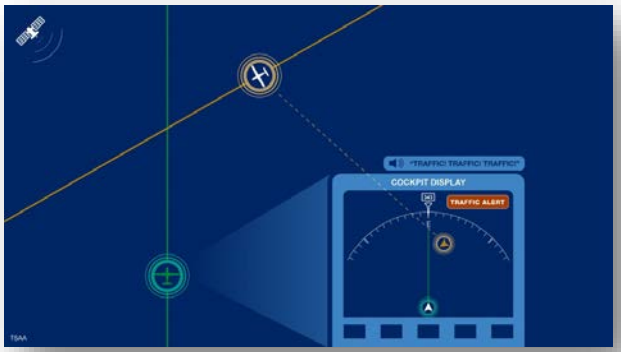
Unique to 1090

[E]TSO-C195b ADS-B-In Applications

In Trail Procedures (ITP)

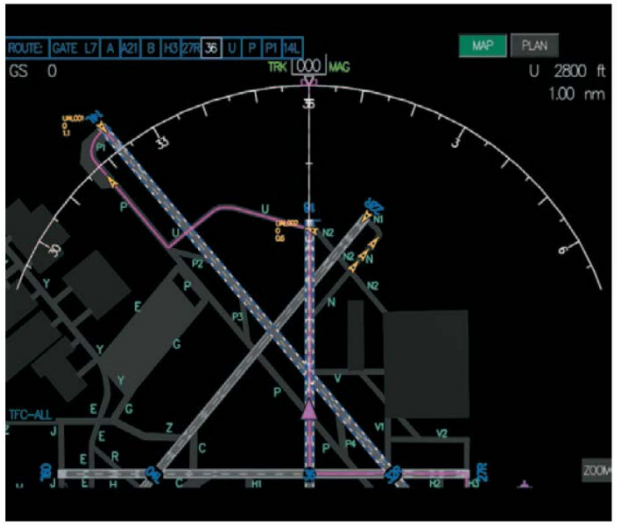


Traffic Situation Awareness with Alerts (TSAA)



Cockpit Display of Traffic Information- Assisted Visual Separation (CAVS)

SURF



AIRB

Advanced Interval Management (A-IM)

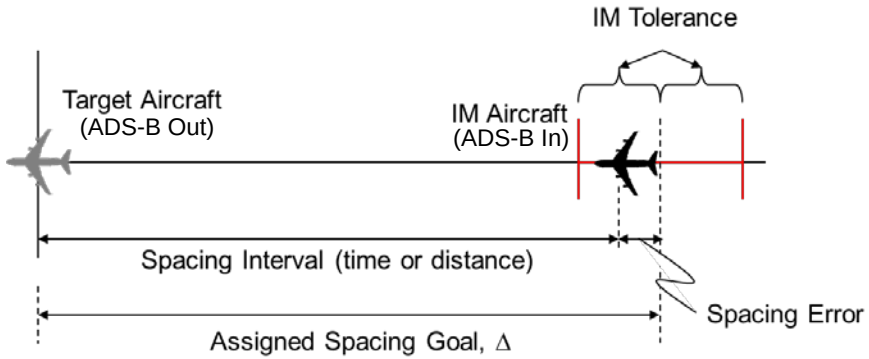
Arrivals & Approach | Flight-deck Integration | DataComm

Description: Develop advanced applications to enable relative spacing ground and airborne capabilities for implementation into the NAS in the mid-term environment

Goals: Maximize airspace throughput and reduce delays in the NAS

Objective: Publish A-IM SPR, MOPS (avionics standards)
Integrate A-IM ConOps

Partners: RTCA/EUROCAE SC-186/WG-51, RTCA/EUROCAE SC-214/WG-78, RTCA SC-227, NATCA



Key Project Milestones

Complete | In Progress | Not Yet Started

- Draft Revised Functional Requirements Oct 2017
- A-IM ConOps Oct 2017
- A-IM Initial Rqmts (iPR) Apr 2018
- Initial FIM MOPS v2 Oct 2018
- A-IM Paired Approach HITL Report Q2 FY19
- MOPS Integrated Test Procedures Q1 FY20
- Final SPR/MOPS publication FY20

FAA AAL ACSS ADS-B In Retrofit Spacing Evaluation

Description: Operational evaluation of partial IM spacing capabilities and CAVS for arrivals into PHX using certified ACSS equipment on AAL A321 aircraft (entire fleet)

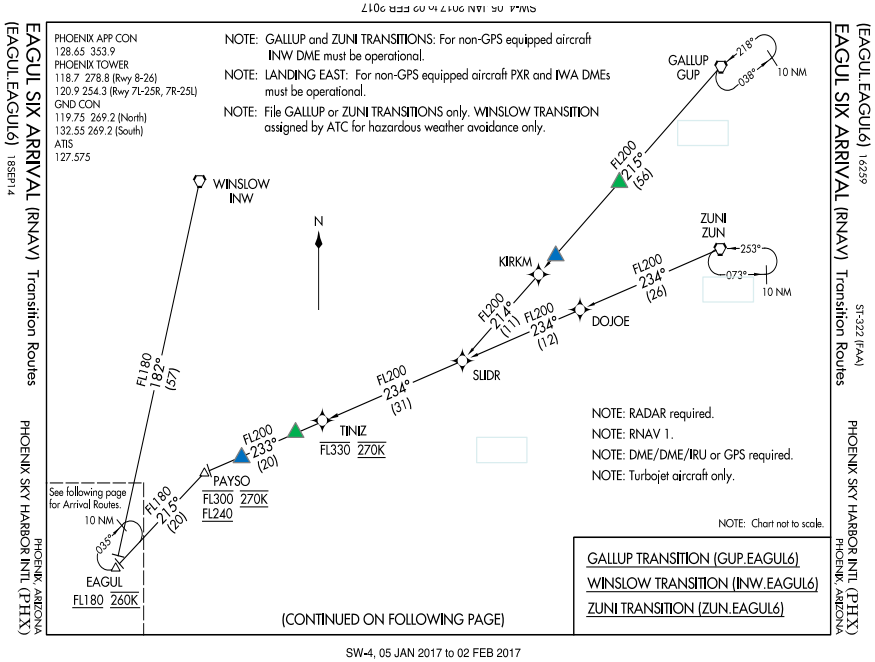
Goal: Demonstrate operational feasibility and value of an ADS-B In retrofit solution that could enable early adoption of IM, CAVS and other ADS-B In applications

Objectives: Promote adoption of ADS-B In applications

Support ADS-B In industry initiatives by gathering data in an operational environment

Gather insight for building FAA business case for IM

Partners: FAA, NATCA, ACSS, AAL



Operational evaluation proposed for AAL westbound arrivals through Albuquerque Center to PHX

Key Project Milestones

Complete | In Progress | Not Yet Started

Signed Planning MOA	Signed Funding MOA	AAL Funding Approval	Avionics TSOA & STC	Initiate PHX CAVS Operations	Aircraft Equipage Sufficient	Initiate ZAB/PHX Spacing Ops	Complete Benefits Analysis
Jul 2016	Sep 2017	Nov 2017	Q3 FY19	Q4 FY19	Projected Q4 FY21	Projected Q4 FY21	Q4 FY22

Operator Next Steps

- **Considerations for the U.S. ADS-B mandate**
  - **Version 2 ADS-B transmitter**
  - **Compliant position source approved to “pair” with V2 ADS-B transmitter**
  - **Aircraft wiring as needed**

- **Less than 9 months to go!**

Acronyms

ADS-B: Automatic Dependent Surveillance – Broadcast
ADS-R: Automatic Dependent Surveillance – Rebroadcast
AML: Approved Model List
APB: Acquisition Program Baseline
ASSC: Airport Surface Surveillance Capability
ATC: Air Traffic Control
ATOP: Advanced Technologies and Oceanic Procedures
ConOps: Concept of Operations
ES: Extended Squitter
FIM-S: Flight Deck Based Interval Management – Spacing
FIS-B: Flight Information Services - Broadcast
GIM-S: Ground-Based Interval Management – Spacing
GOM: Gulf of Mexico
IOC: Initial Operating Capability
ISAT: Implementation Service Acceptance Test
ITP: In Trail Procedures
MFD: Multi-Function Display
MHz: Megahertz
MOPS: Minimum Operational Performance Standards
NCT: Northern Cal TRACON
NM: Nautical Mile
O&M: Operations and Maintenance
PED: Portable Electronic Device
RIO: Risks, Issues, and Opportunities
SBS: Surveillance and Broadcast Services
SFO: San Francisco International Airport
STC: Supplemental Type Certificate
SVR: Service Volume Rollout
TAMR: Terminal Automation Modernization and Replacement
TIS-B: Traffic Information Services - Broadcast
TRACON: Terminal Radar Approach Control
TSAA: Traffic Situation Awareness with Alerts
UAT: Universal Access Transceiver