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Analysis of Factors Influencing ADS-B Program Success

NDIA 17th Annual Systems Engineering Conference
October 30, 2014

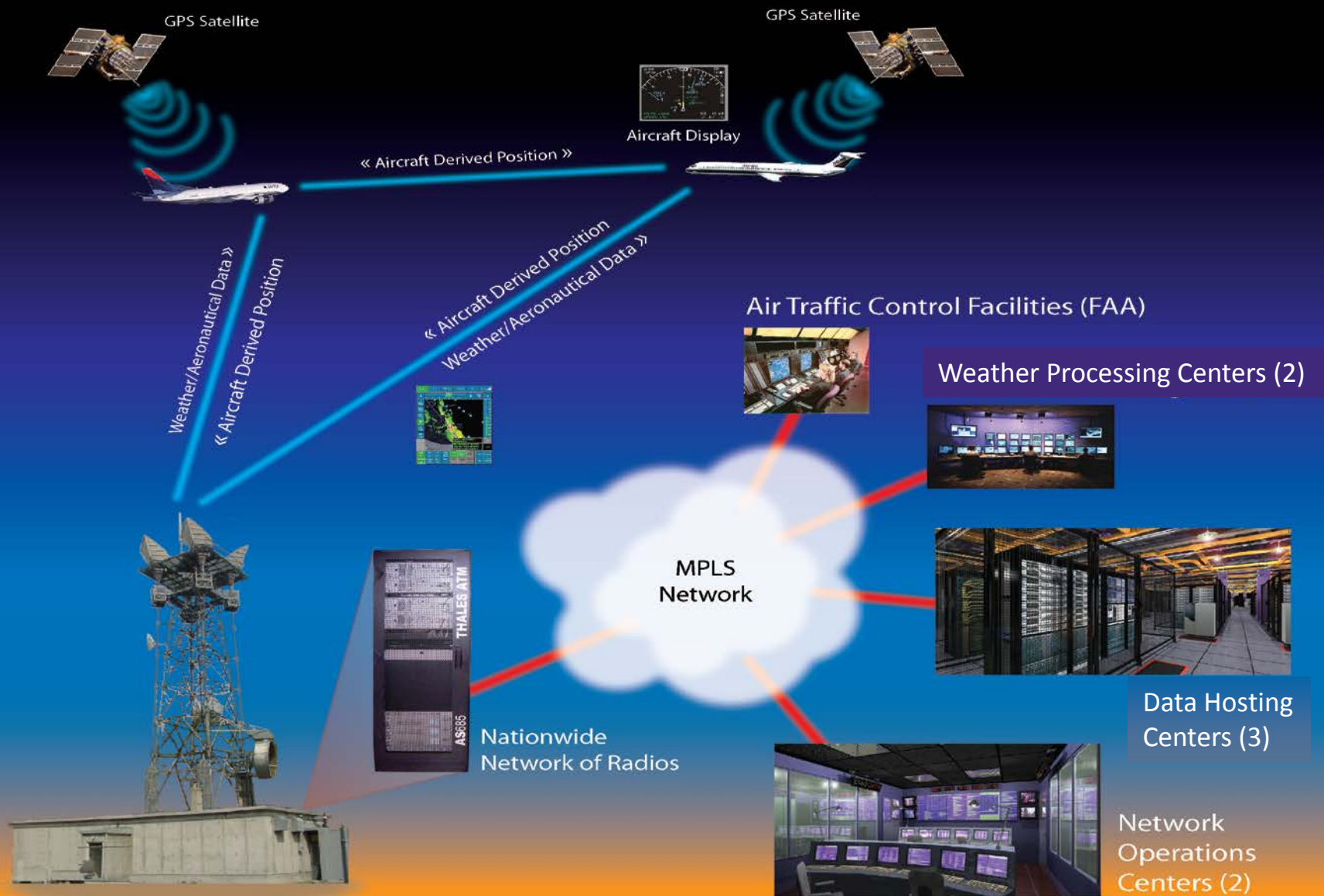
Mark Lorenz, PMP, ADS-B PM
Glen Dyer, Former ADS-B PM

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Agenda

- Background
- Program Description
- Description of Program Success
- Factors Contributing to Success
- Lesson Learned and Concluding Remarks

Background: ADS-B System Overview



Background: ADS-B Benefits are Already Being Realized

Safety

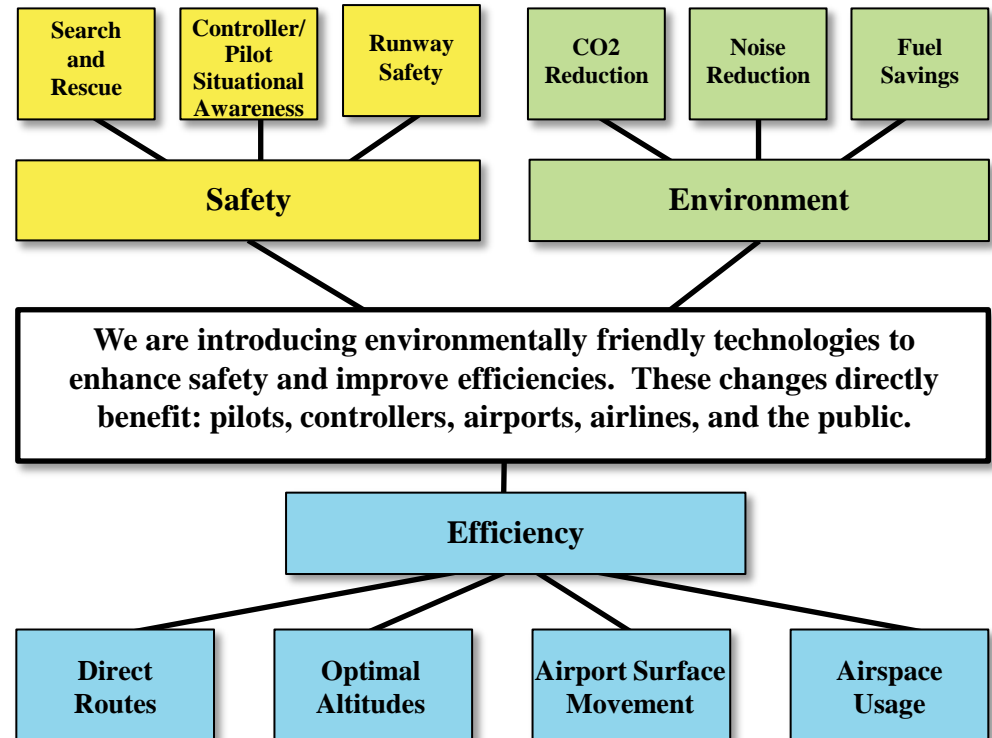
- Decreased search and rescue time due to more accurate coverage at low altitudes thereby reducing the search area
- Greater than 30% reduction of accident rates for equipped aircraft in Alaska

Environment

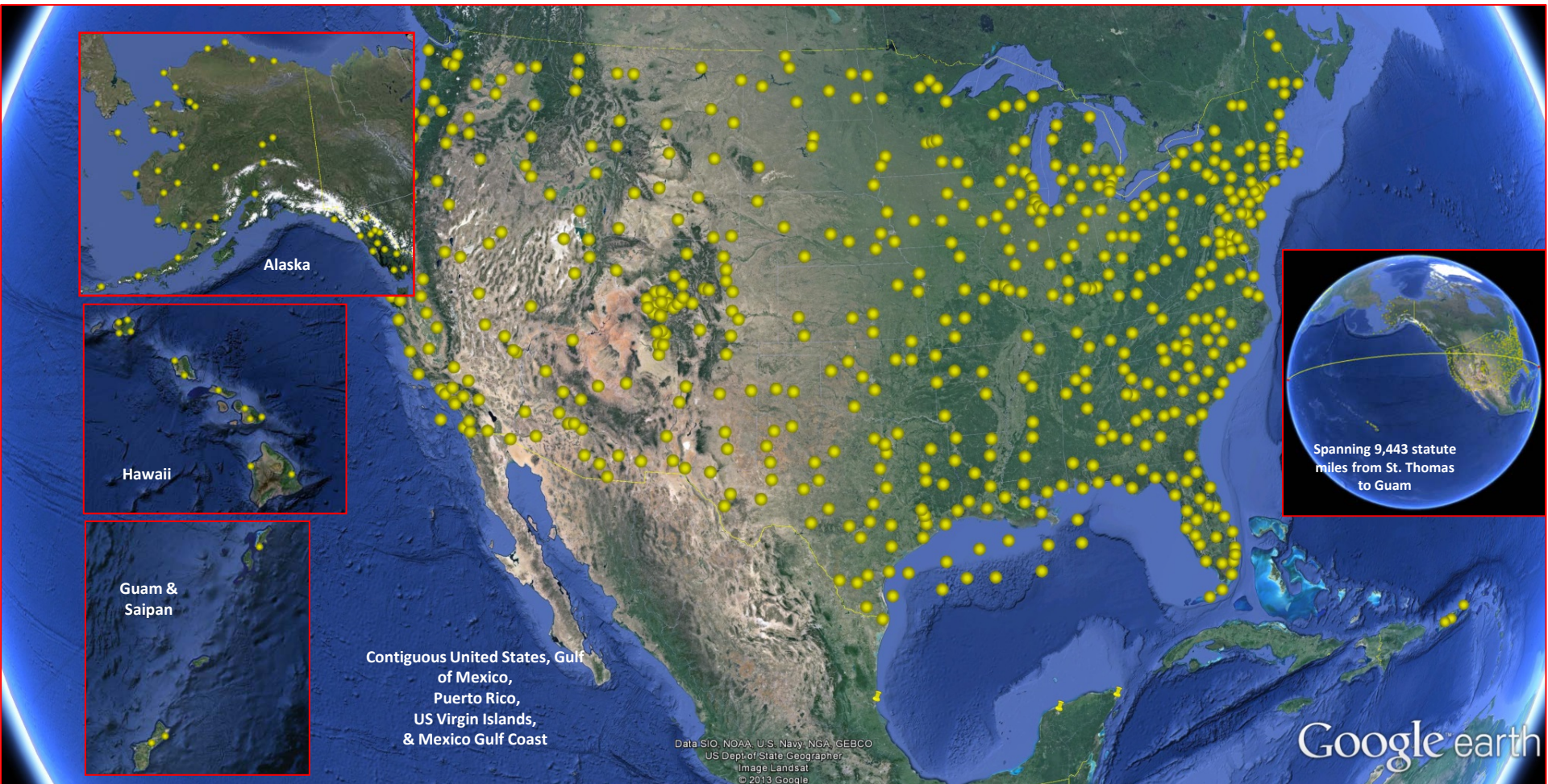
- 98 lbs fuel savings per IFR helicopter flights on direct routes in the Gulf of Mexico, and associated reduction of CO₂ emissions

Efficiency

- Over 300% increased capacity for low altitude flights in the Gulf of Mexico due to ADS-B surveillance and new procedures
- Reduced spacing between arriving and departing aircraft in Colorado ski-area airports
- Reduced delays due to weather for equipped aircraft



Background: ADS-B National Deployment of Ground Infrastructure is Complete



Over 650 Radio Stations, 200 Service Delivery Points, 3 Central Processing Stations and a fully capable Operations Center are complete and interconnected through a robust and redundant network

Background: Typical Radio Station

Radio Station design leverages COTS with custom-developed electronics

- Design factors included RF engineering to meet coverage requirements and security engineering to ensure compliance with NIST requirements
- Design constraints include significant environmental requirements, providing coverage despite RF interference, and numerous site-specific requirements
- Radios were custom designed and built to meet 1000's of FAA requirements



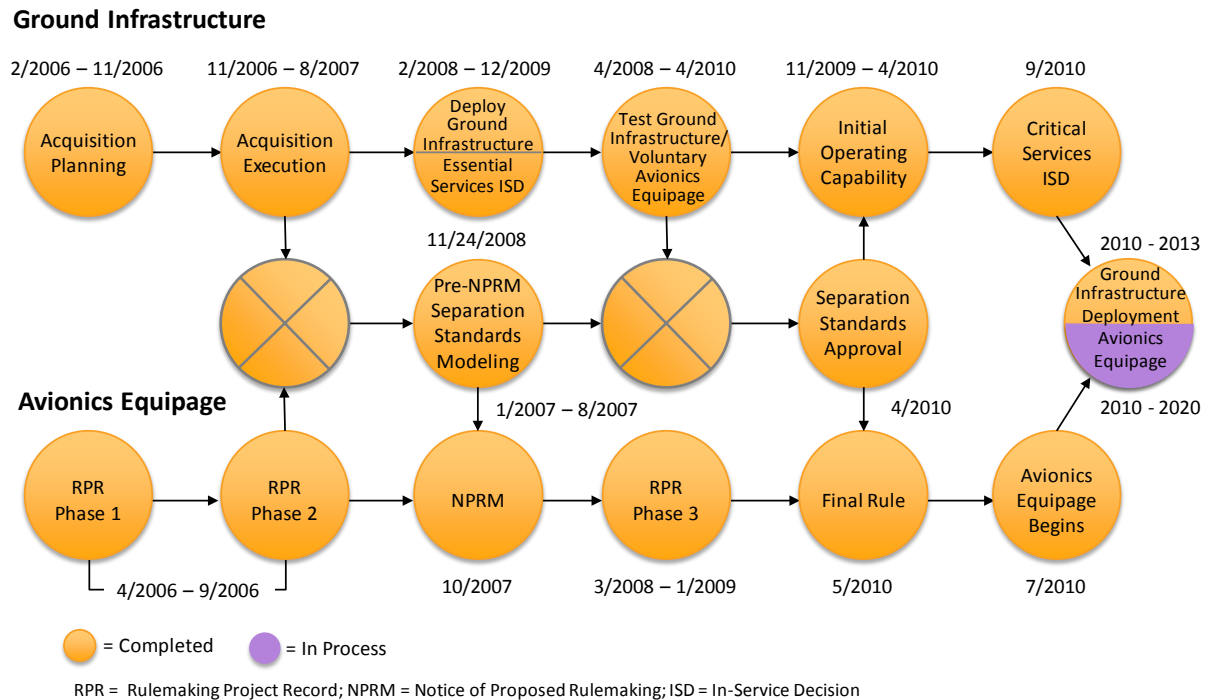
Program Description: Contract Summary

- Base Development CLIN (Awarded August 2007)
 - CPIF, 3 year period of performance
 - Design, Development, Key Site Testing, Significant Essential Services Deployment
- Base Implementation and O&M CLINs (Awarded September 2010)
 - FFP, performance through GFY 2016
 - Nationwide Essential and Critical Services deployment, maintenance, and operations
 - Deployment capital expense funded by Exelis
- Optional FFP CLINs for operations and maintenance of the system through 2025

Program Description: Milestone Schedule

ADS-B Program strategy comprised a three-prong approach

- Ground Infrastructure acquisition, development, deployment, and testing
- Avionics Equipage mandated by publishing of the Final Rule for aircraft to equip by 2020
- Development and approval of separation standards enabled both workstreams



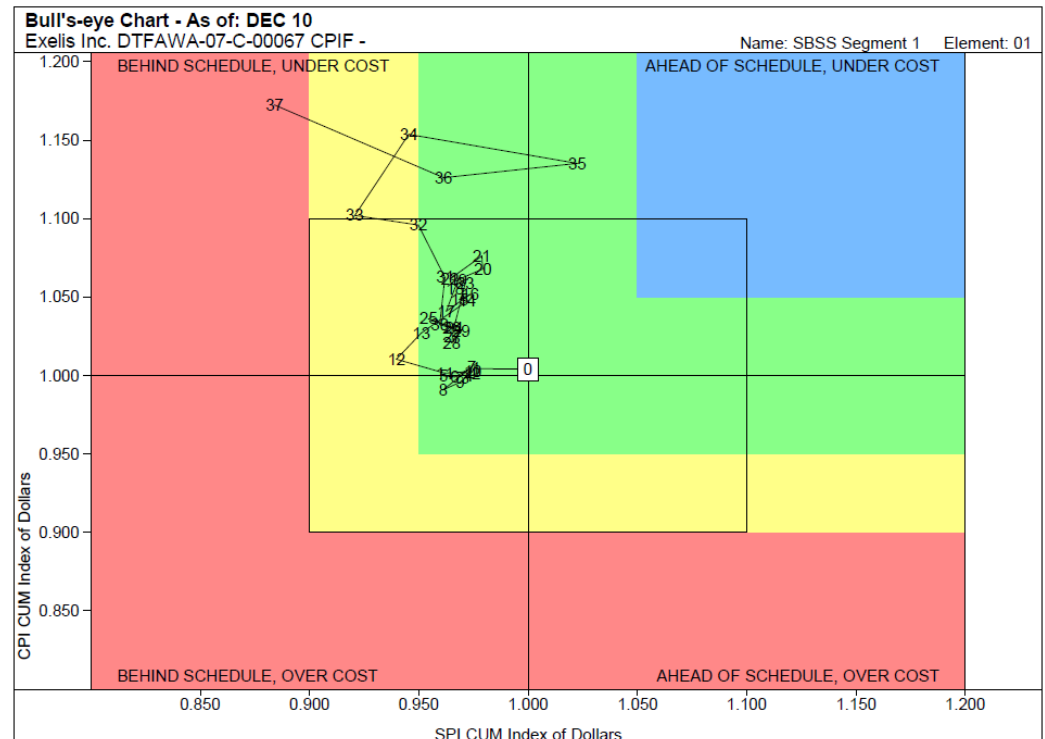
Program Success: Achieving All FAA Milestones

FAA ADS-B Program Milestone	Schedule	Actual	Result
System Requirements Review	25 – 26 Sept 2007	25 – 26 Sept 2007	Successful
Integrated Baseline Review	15 – 16 Oct 2007	15 – 16 Oct 2007	Successful
Preliminary Design Review	13 – 16 Nov 2007	13 – 16 Nov 2007	Successful
Critical Design Review	25 – 29 Feb 2008	25 – 29 Feb 2008	Successful
Essential Services Factory Acceptance Test	30 April 2008	28 April 2008	Successful
Essential Services Initial Operating Capability	31 August 2008	29 August 2008	Successful
Essential Services In-Service Decision	25 November 2008	24 November 2008	Successful
Critical Services Factory Acceptance Test	31 March 2009	19 March 2009`	Successful
Critical Services Initial Operating Capability Louisville GoMex Philadelphia Juneau	31 October 2009 31 December 2009 28 February 2010 30 April 2010	30 October 2009 18 December 2009 28 February 2010 28 April 2010	Successful
Critical Services In-Service Decision	30 September 2010	22 September 2010	Successful
Baseline Implementation Complete	30 June 2014	28 March 2014	Successful

Program Success: Achieving Cost and Schedule Performance

Earned Value Management measured cost and schedule performance for system development and a significant portion of infrastructure deployment

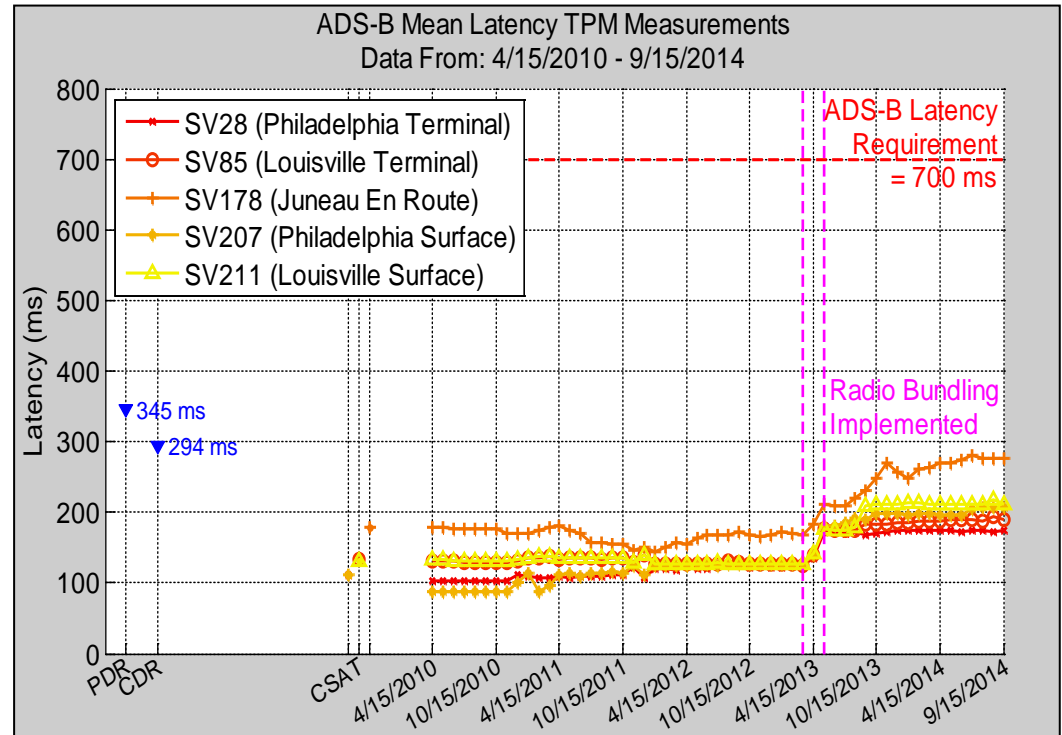
- After the initial 6 months of the program, the overall program schedule performance was within 5% of the baseline (except for one outlier)
- Cost performance throughout development was generally better than planned and completed with a Cost-Performance-Index (CPI) above 1.0



Program Success: Technical Performance Measures

System performance was assessed via Technical Performance Measures of Availability, Latency, and Update Interval

- Latency measures transitioned from predicted values during design and development to actual measures during test and deployment
- As deployment and equipage increased, latency values remained within requirements
- Corrective actions were taken to respond to the increasing message traffic, which slightly increased latency while remaining within required values



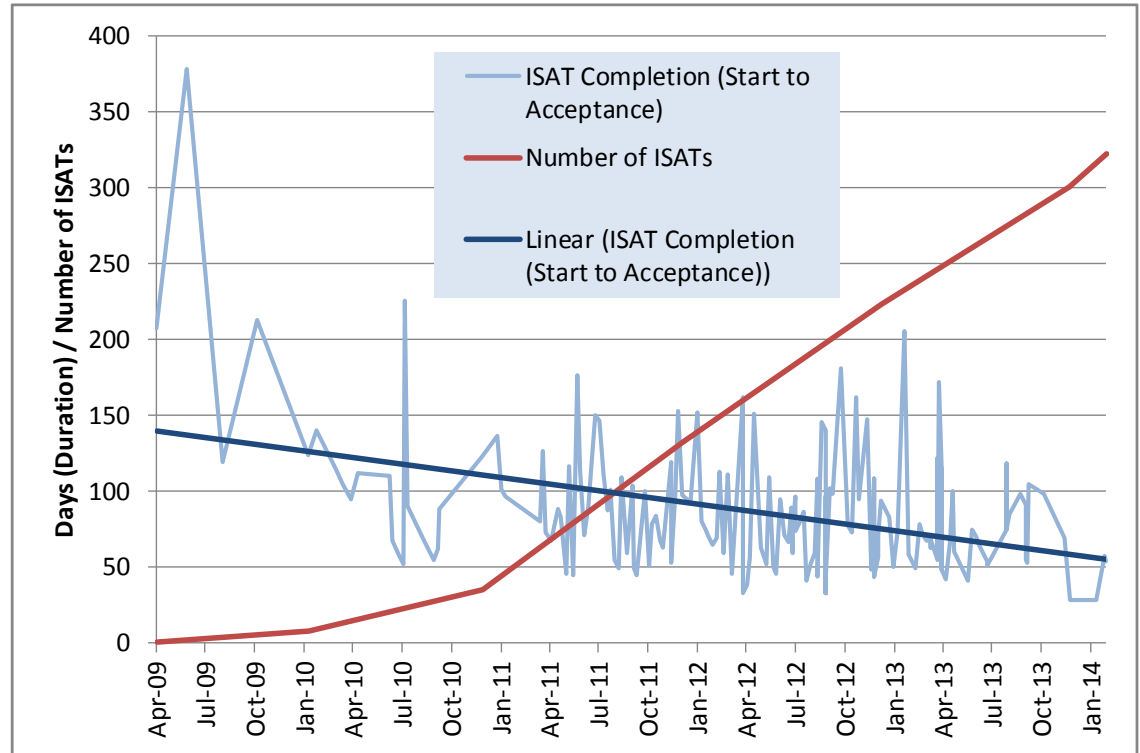
Success Factors: Overview

- Strong Government customer
 - Structured pre-RFP communications and interactions with Industry
 - Execution of a structured government program plan and governance process
 - Clear focus on meaningful program milestones
 - Removal of obstacles impacting success
 - Proactive risk management
 - Collaboration with Exelis and within the FAA to keep the program on course
- Contract structure and incentives tailored for contract scope
 - Emphasized schedule performance with definition of 'contract-default' milestones
 - Emphasized cost performance with CPFF development CLIN that shared cost-savings between FAA and Exelis and cost-share cost overruns
 - Enabled technical success with performance-based approach that facilitated ingenuity in meeting requirements and rewarded achievement of technical performance
- Baseline of EVM at appropriate levels, periodic management review and application of timely corrective actions
- Continuous improvement of key program processes to drive cost efficiencies
- Incremental progression and test to achieve key milestones

Success Factors: Continuous Improvement of Key Program Processes Drove Program Cost Efficiencies

Implementation Service Acceptance Testing (ISAT) of 310 separate Service Volumes (SV) involved planning, execution, analysis, reporting of results, and FAA acceptance for each SV

- Initial test required over 200 days from test start to acceptance
- Efficiencies in all aspects of the test process reduced the duration to less than 60 days even though the number of ISATs increased
- Efficiencies were manifested by an improved CPI and also enabled meeting schedule

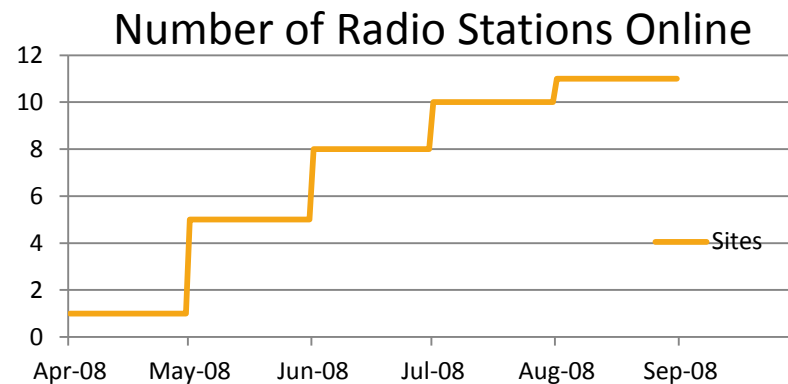
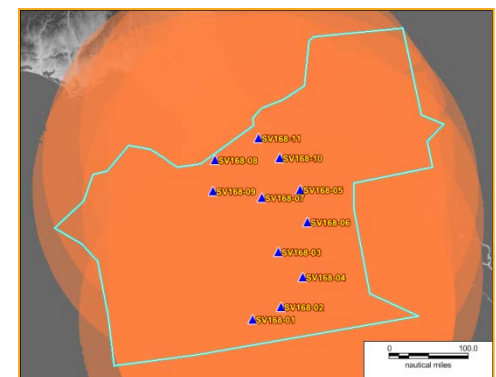
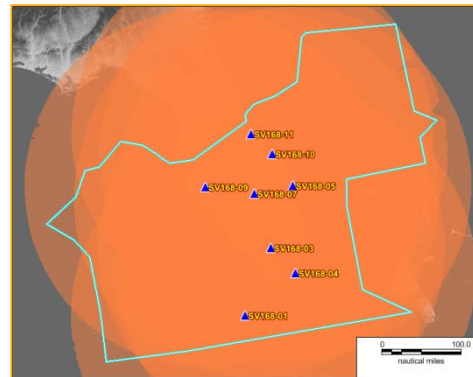
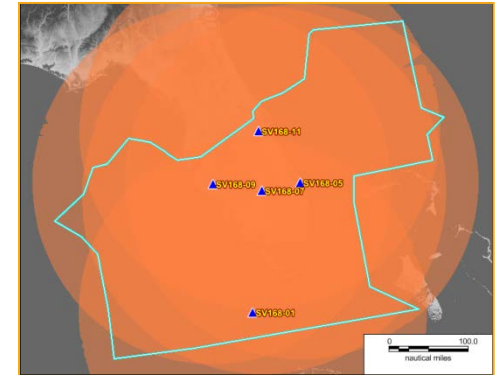
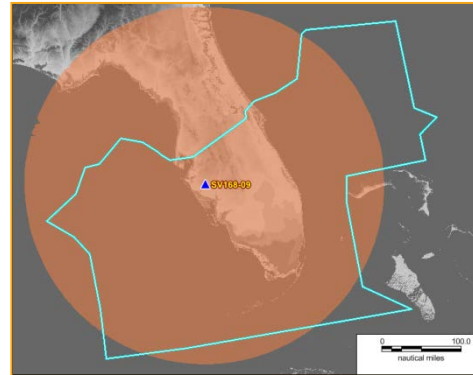


Success Factors: Incremental Progression to Achieve Major Milestones

Service Volume Coverage at 30,000 ft

Essential Services Key Site Service Acceptance Testing was scheduled for 15 June 2008

- 5 of 11 radio stations were complete for the test start which were sufficient to verify the functional requirements
- As additional radio stations were implemented, regression testing verified the incremental additions to coverage
- Parallel scheduling of implementation and test activities enabled achievement of IOC in August 2008



Lessons Learned

- Leadership within the Government and Contractor teams was essential
 - Define the right organizational structure given the nature of the work and strengths of the staff
 - Issue hard challenges to individuals and teams to build program unity and pride
 - Maintain clear focus despite frequent distractions
 - Implement and maintain fundamental program management processes tailored for the specific needs
- Continuity of funding and purpose sustained the forward momentum through completion
 - Minimize changes in program direction and program requirements
 - Build stakeholder commitment through inclusion and communications
- Genuine Government-Contractor partnership established trust and honesty in interactions to meet needs of both organizations
 - Promote clear and transparent communications for proactive and joint issue resolution

Concluding Remarks

- The ADS-B program accomplishments and successes have driven a change of culture in all of the contributing organizations
 - Instilled a sense of pride in the staff which bred further commitments to maintain high-achieving performance
 - Established framework for continued success as the program moves from implementation to operations, maintenance, and sustainment