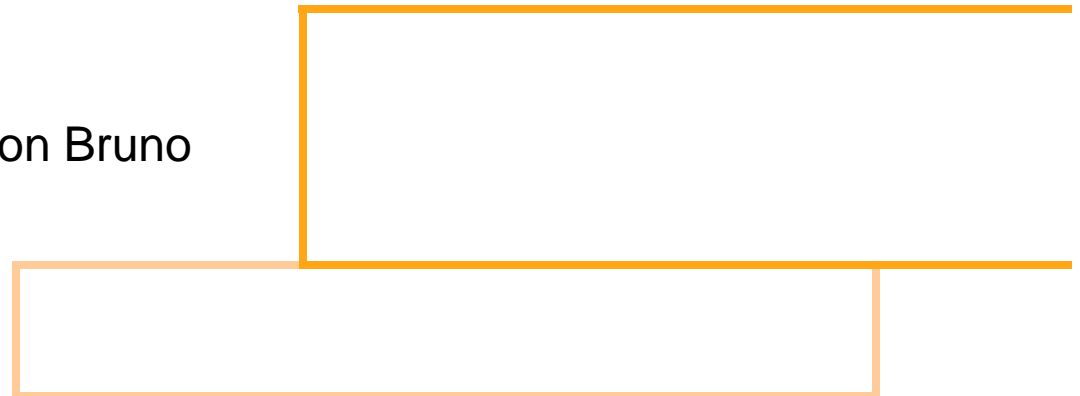




Ensuring Interoperability between the Surveillance Broadcast Services System and ADS-B Avionics

Dr. Michael Garcia and Dr. Ron Bruno
5/15/2009

Engineered for life



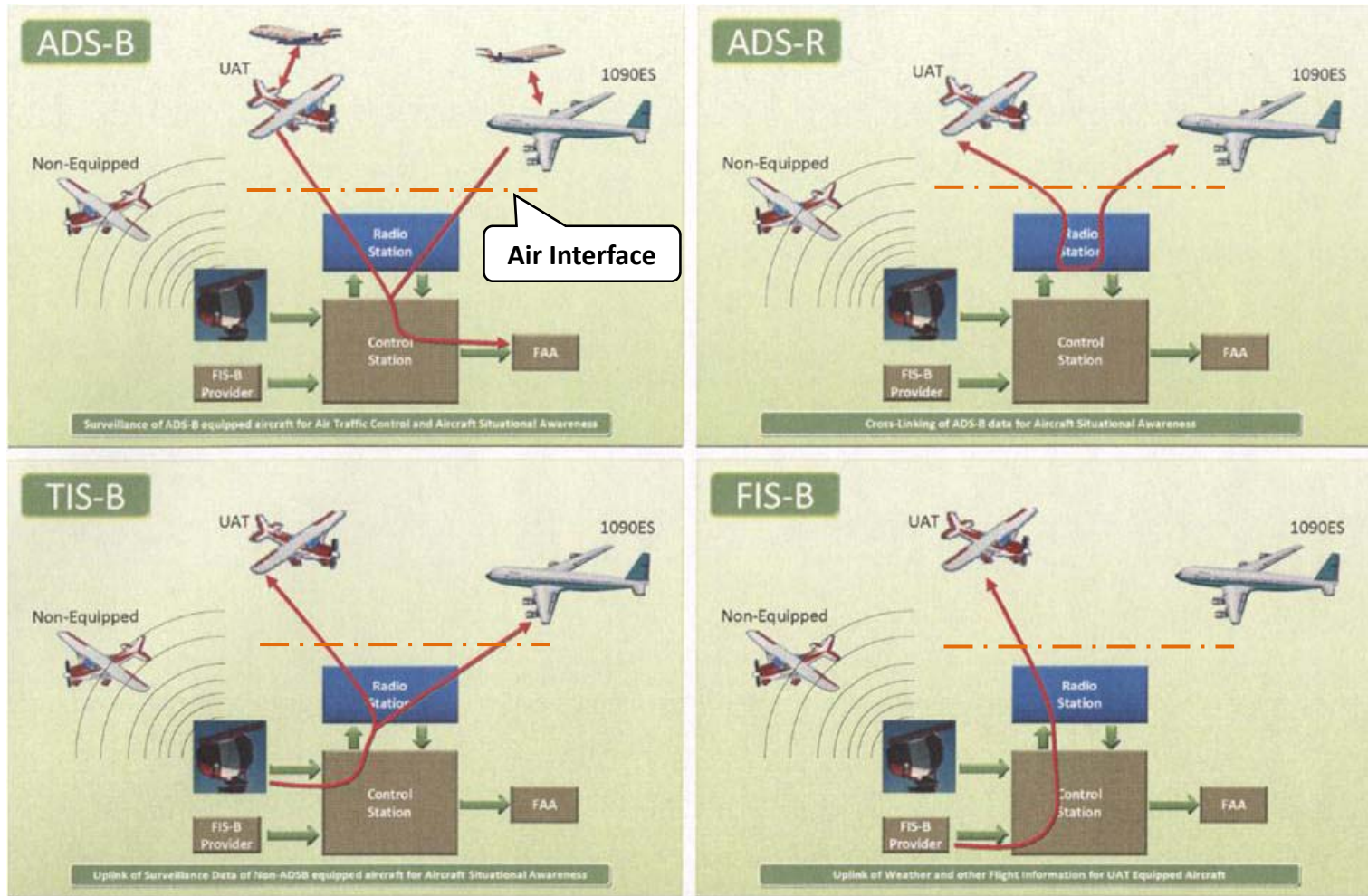
Agenda

- Introduction
- Interoperability Testbed
- Example Scenarios
- Recent Data
- Summary

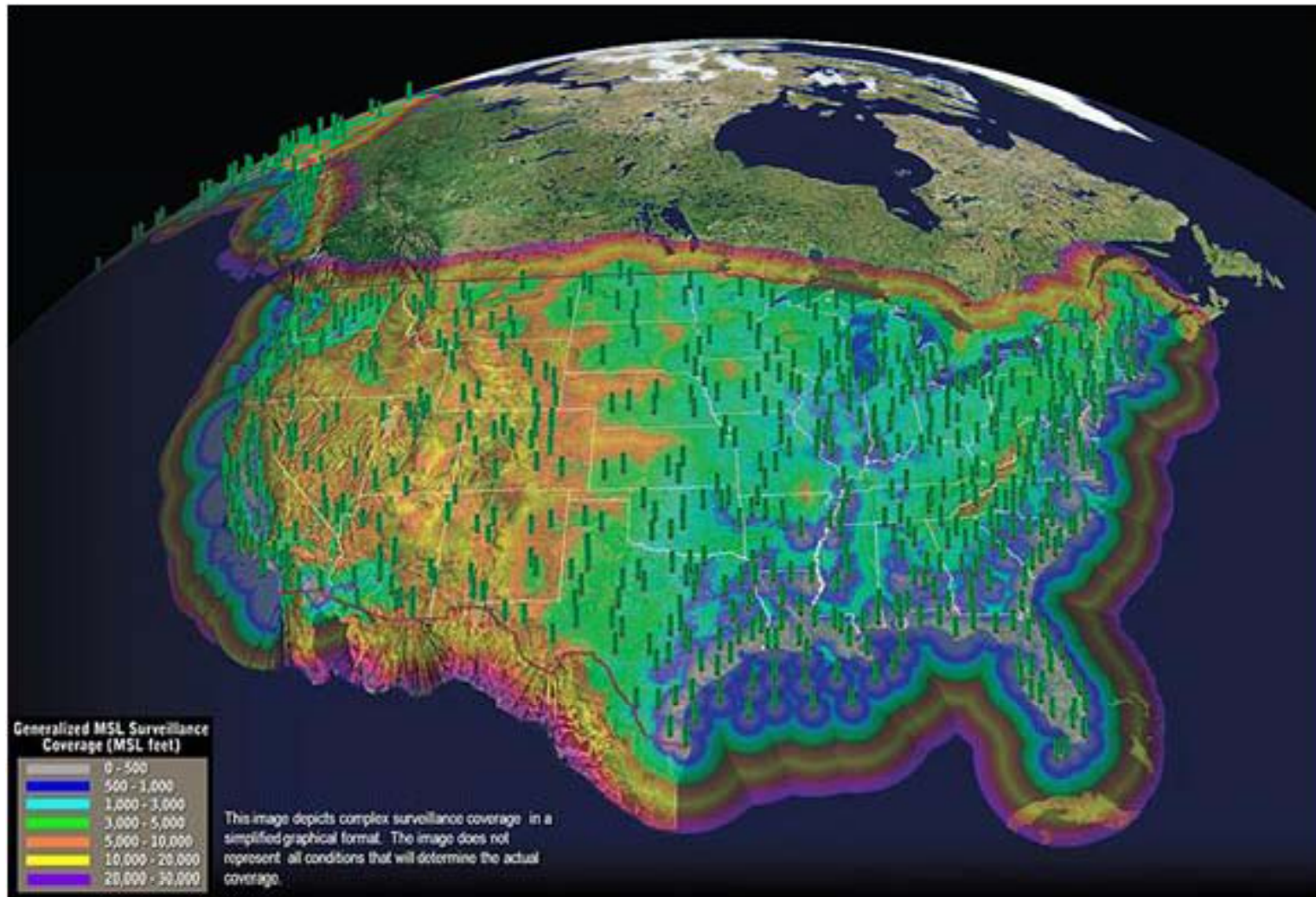
Introduction

- FAA Contract to ITT
 - Surveillance Broadcast Services System (SBSS)
 - Automatic Dependent Surveillance – Broadcast (ADS-B)
 - 1090 Extended Squitter – 1090 MHz
 - Universal Access Tranceiver (UAT) – 978 MHz
 - Traffic Information Services – Broadcast (TIS-B)
 - Automatic Dependent Surveillance – Rebroadcast (ADS-R)
 - Flight Information Services – Broadcast (FIS-B)

SBSS Services Provided in the NAS



US Nationwide Planned Coverage



Interoperability Testbed

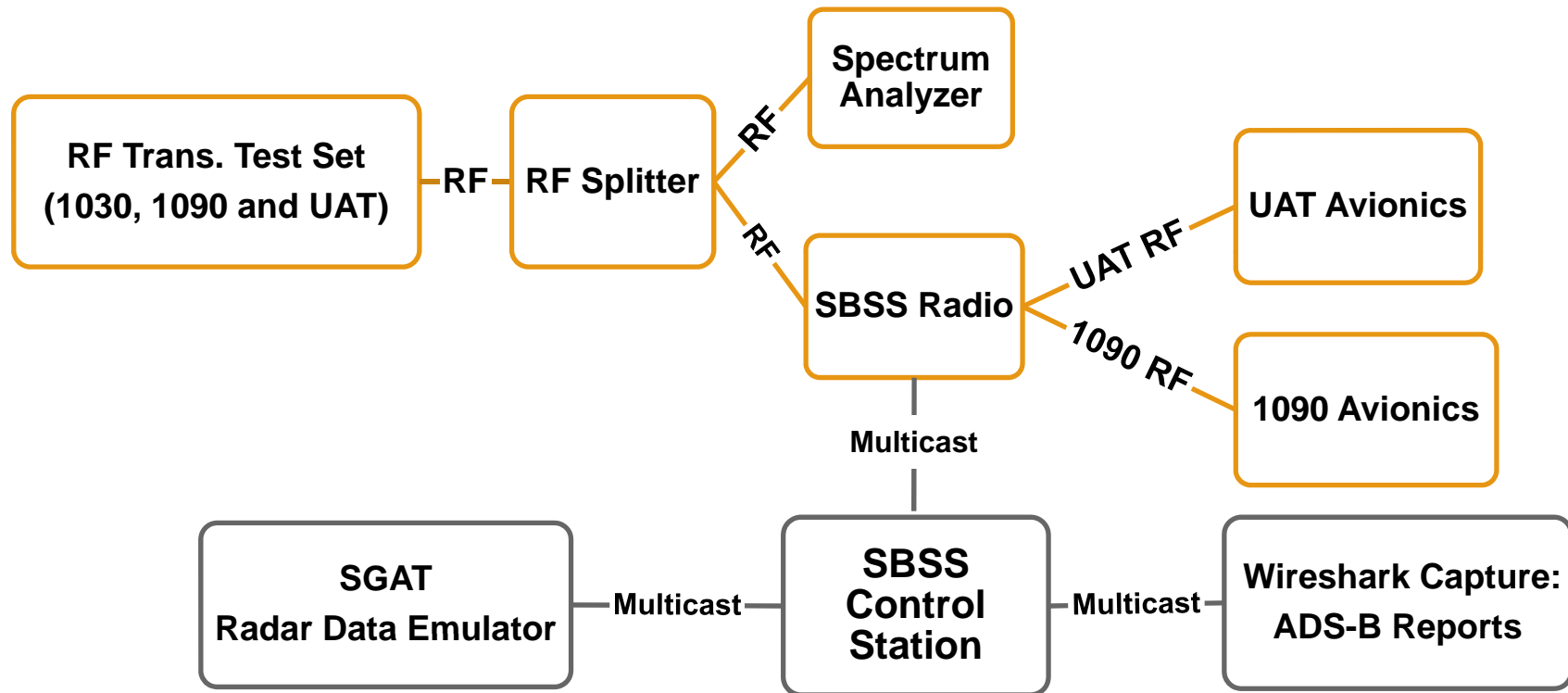
■ SBSS

- SBSS Control Station and System Integration – ITT
- SBSS Radio Station – Thales
- Surveillance Generator and Analysis Tracker (SGAT)
 - Radar Data Emulator – Sunhillo

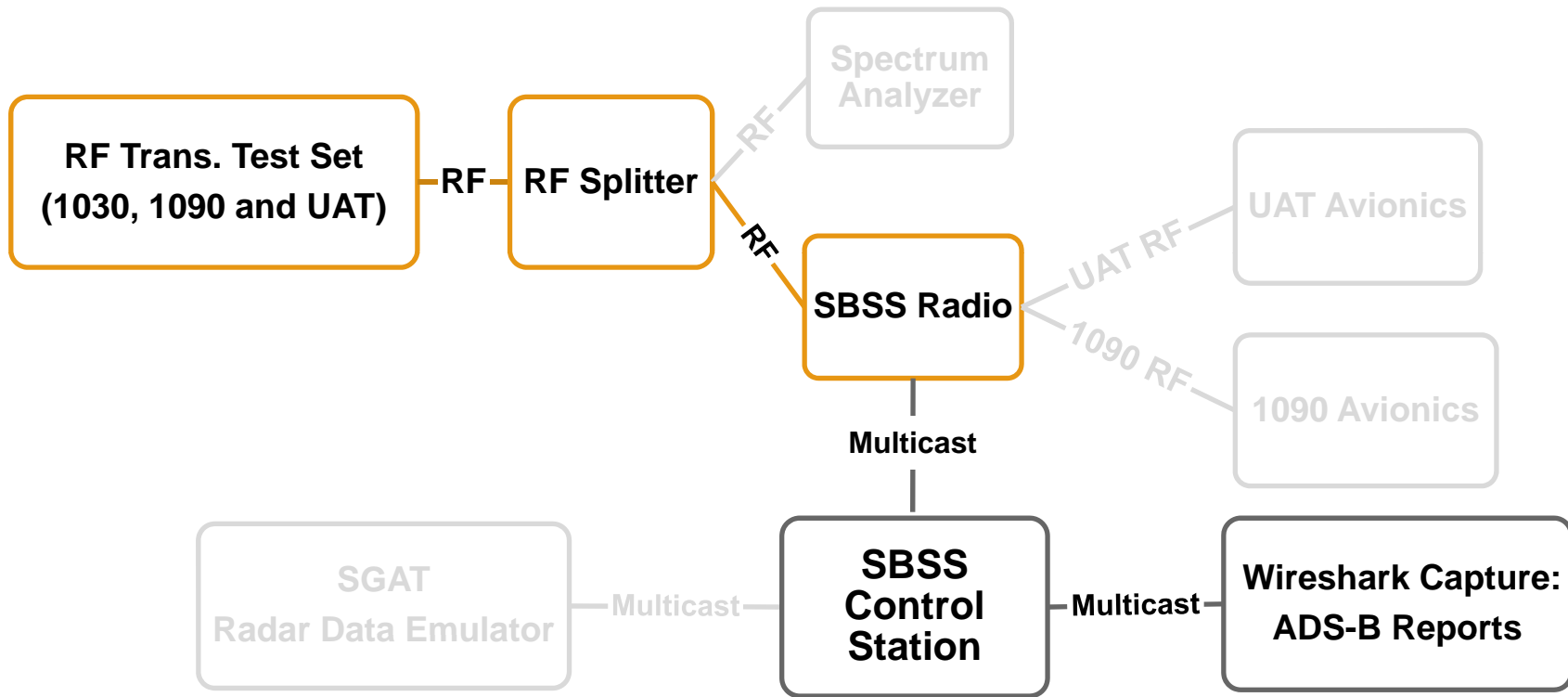
■ Avionics

- RF Transmitter Test Set (RTTS) – KLJ Instruments SQTR-3
 - 1090, UAT, and 1030 Transmitter
- 1090 Receivers
 - ACSS XS-950 and TCAS 3000SP surveillance processor
 - Dimensions International – DISSR
 - Kinetic SBS-2
- UAT Receiver
 - Garmin GDL 90 and GMX 200
 - MITRE Multi-Function Display of Garmin data

SBSS/Avionics Interoperability Testbed



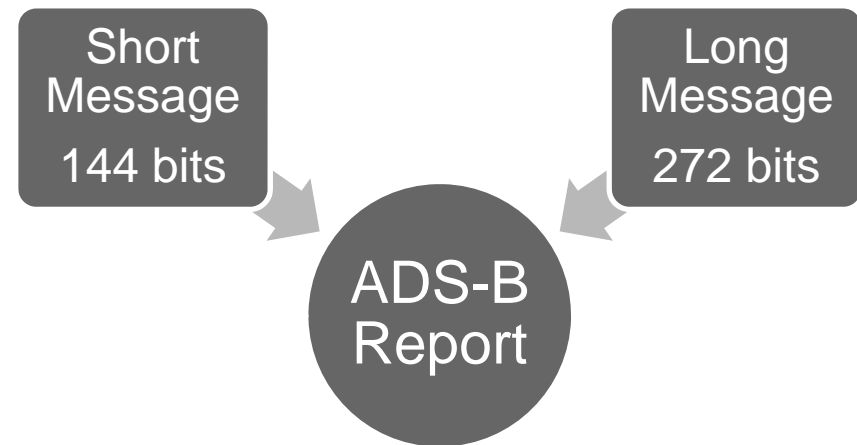
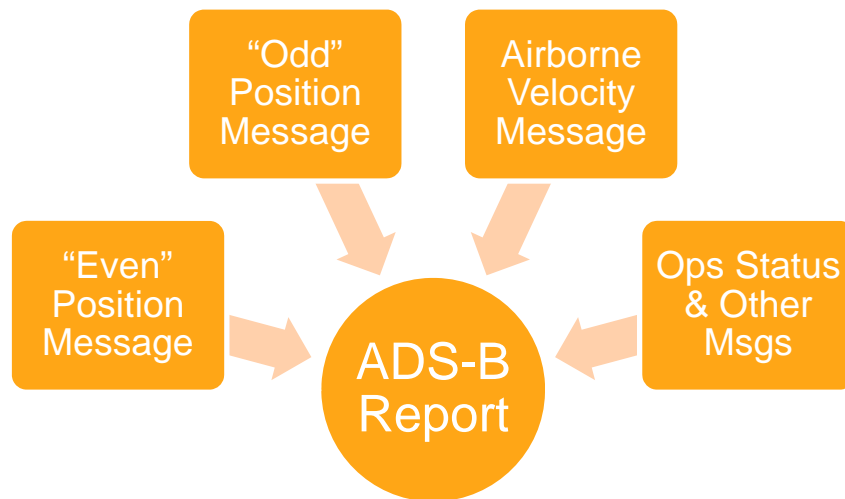
SBSS/Avionics Interoperability Testbed ADS-B Example



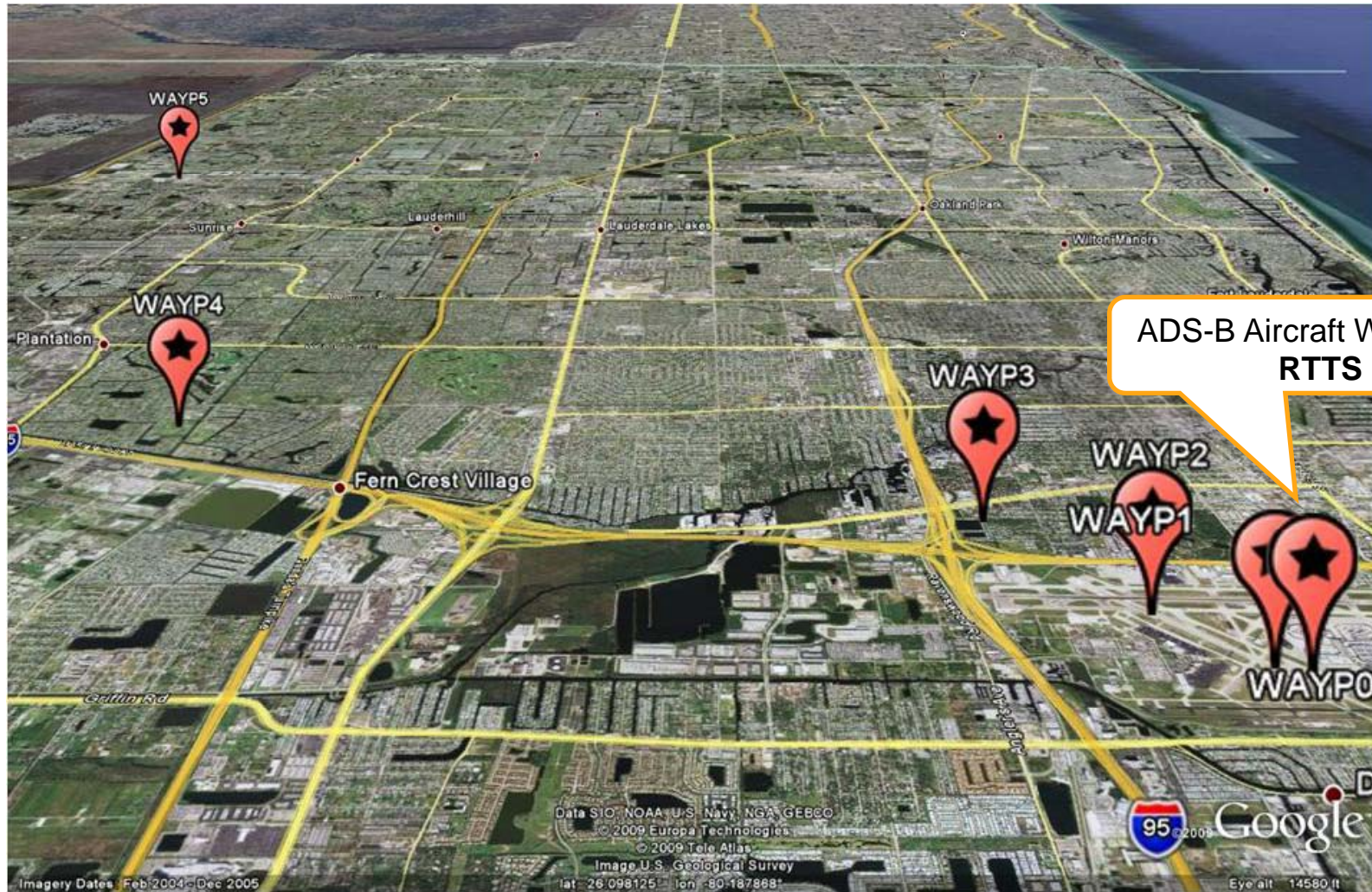
ADS-B Message Mapping

1090 ADS-B Messages to Reports –
88 payload bits

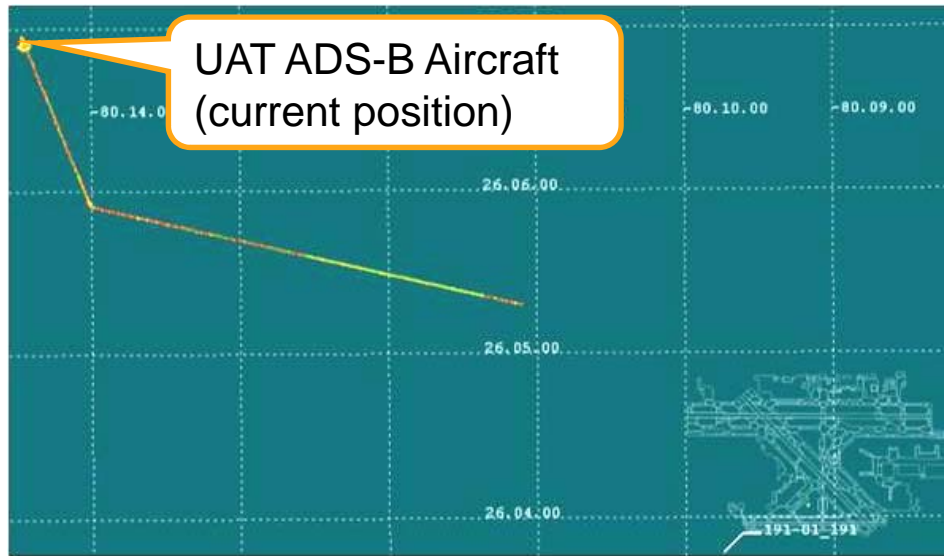
UAT Messages to Reports



ADS-B Example Setup



ADS-B Example Results

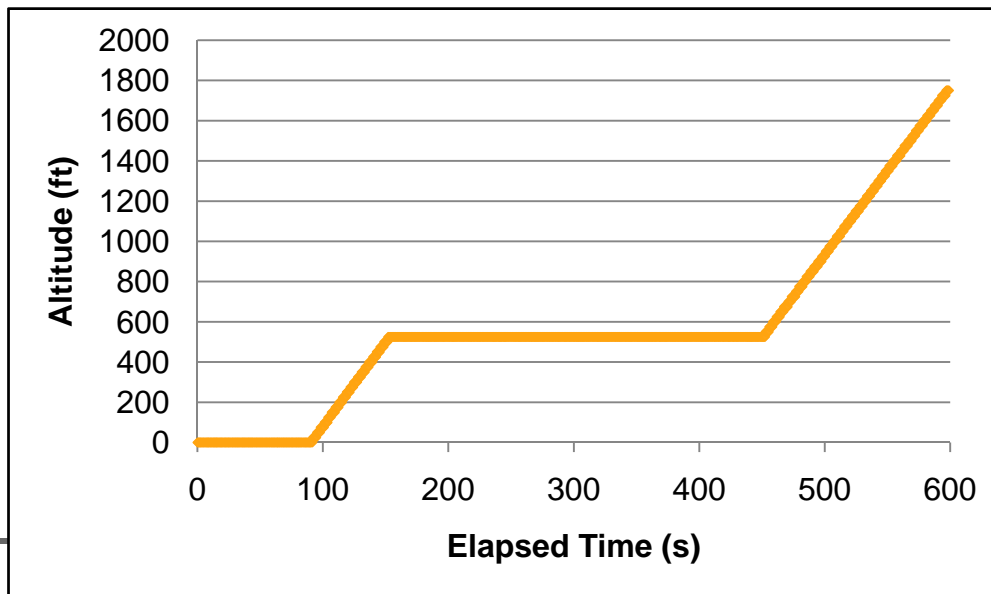
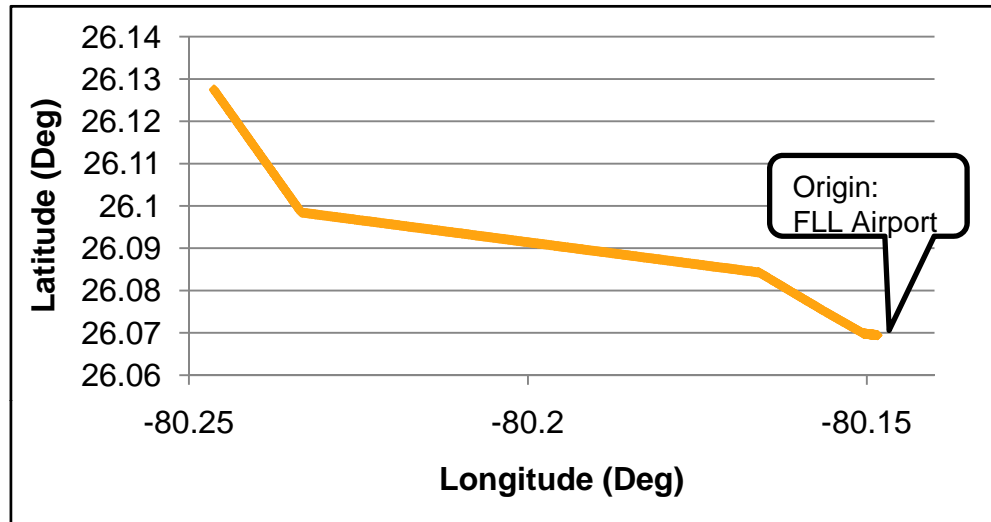


SBSS Airscape View



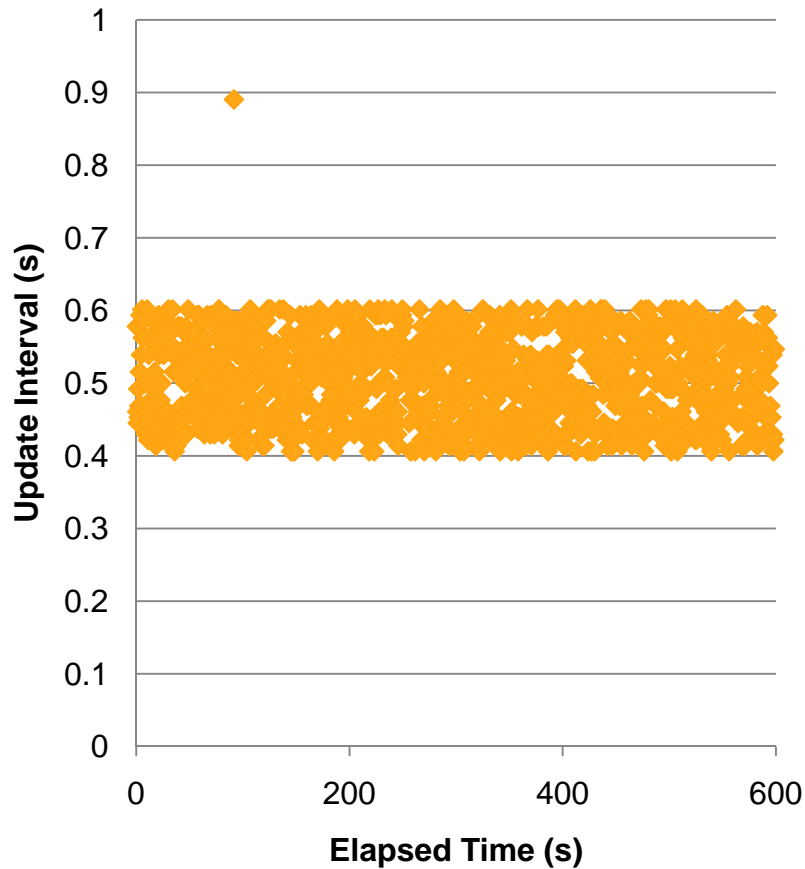
Google Earth Data Plot
(UAT)

ADS-B SBSS Position Plots of 1090 Track

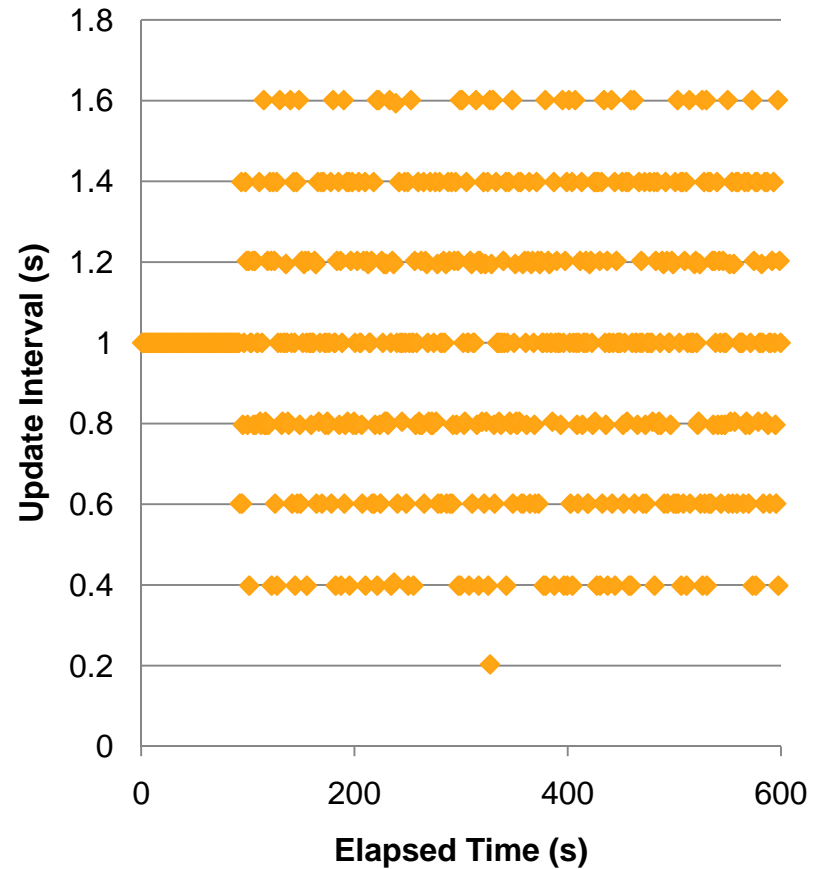


SBSS Radio Receive Update Intervals

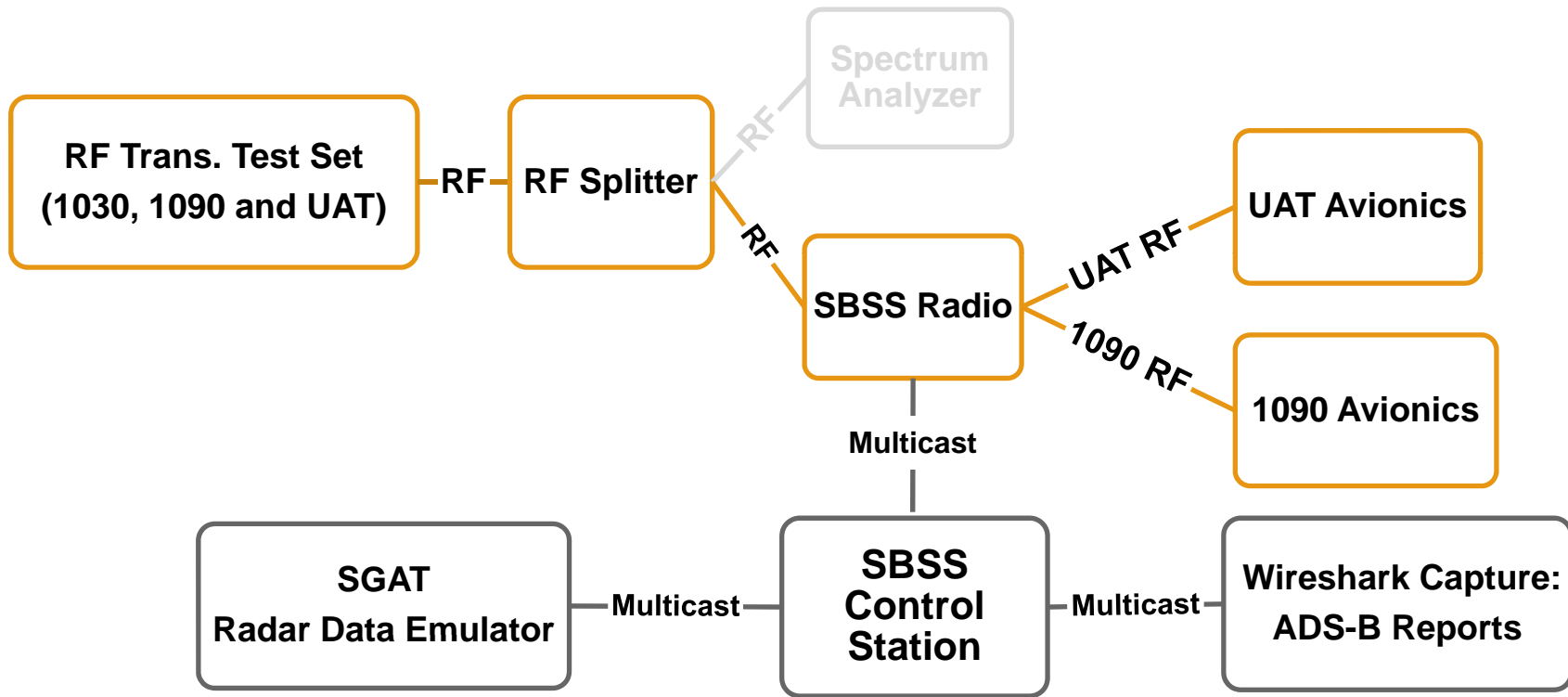
ADS-B 1090 Update Interval



ADS-B UAT Update Interval

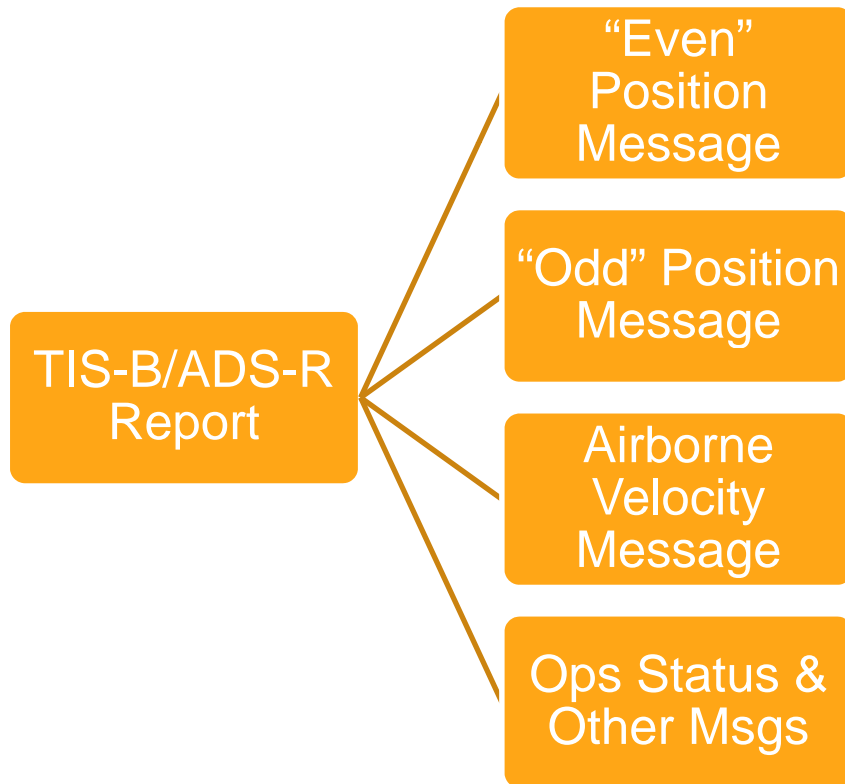


SBSS/Avionics Interoperability Testbed TIS-B Example

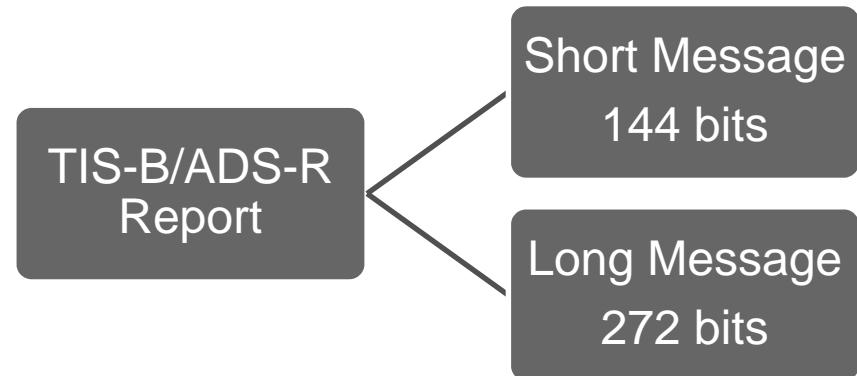


TIS-B/ADS-R Message Mapping

1090 TIS-B/ADS-R Reports to Messages – 88 payload bits

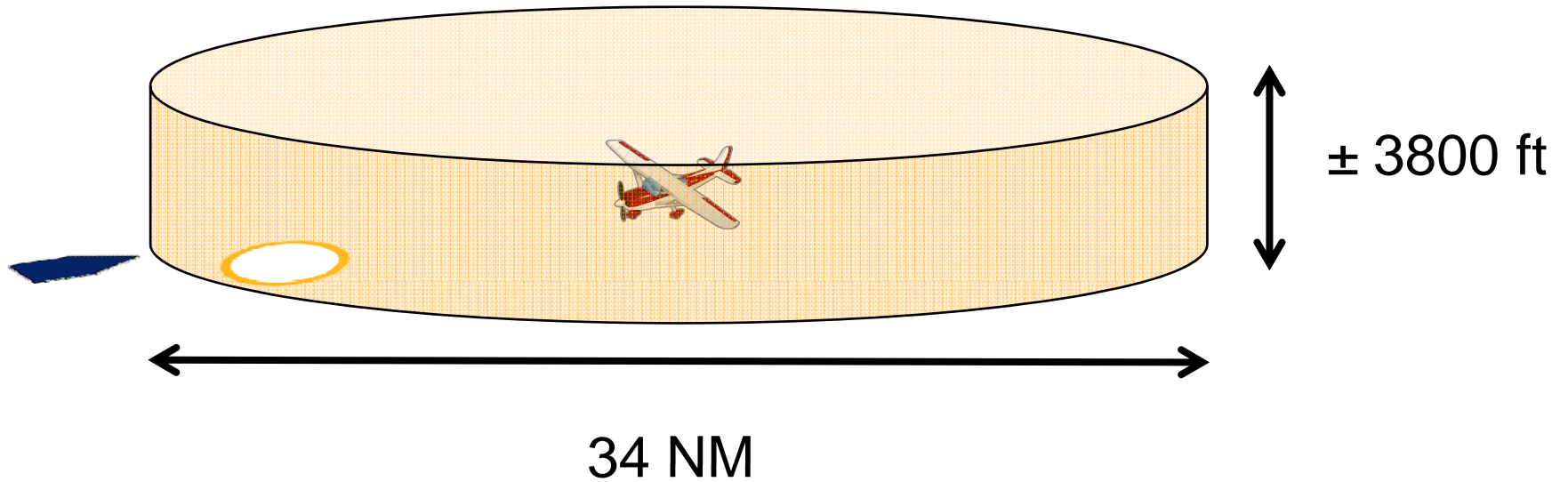


UAT Reports to Messages

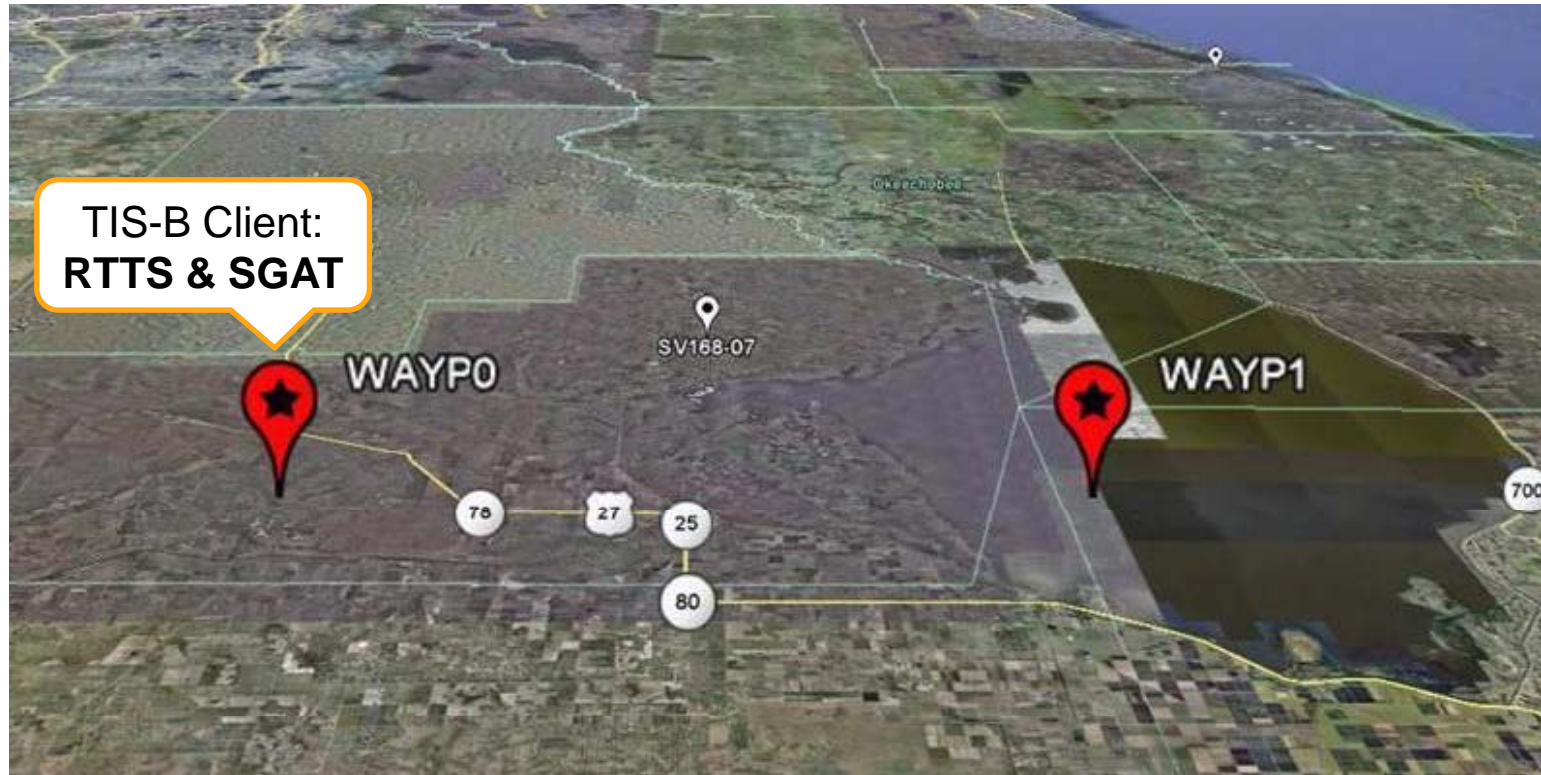


Spectrum Management – TIS-B & ADS-R

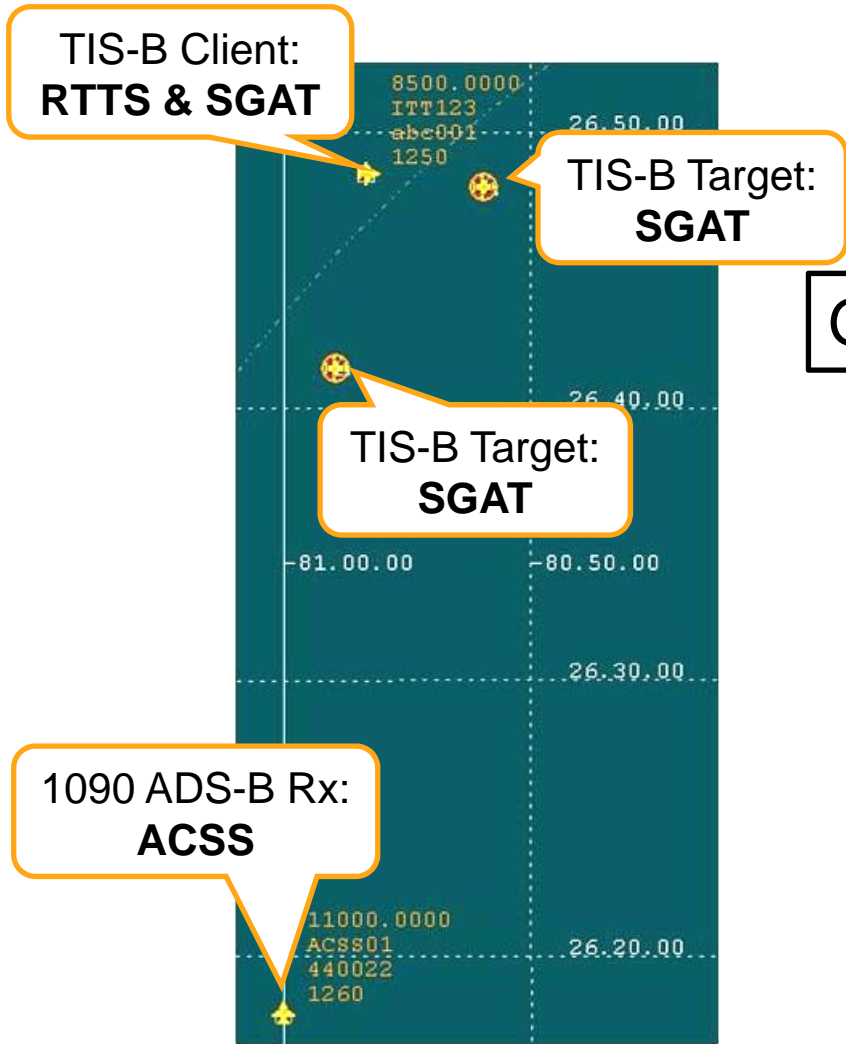
The “Hockey Puck”



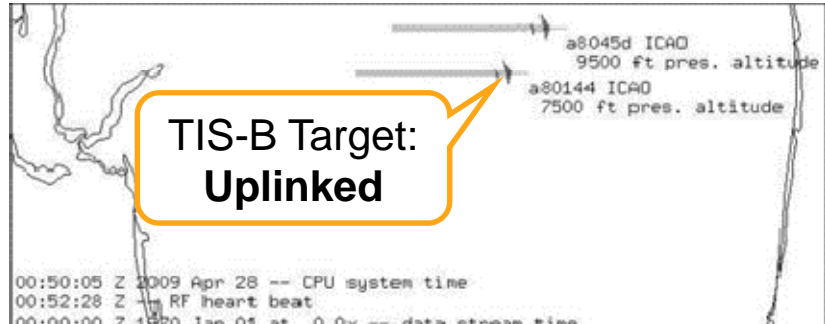
TIS-B Example Setup



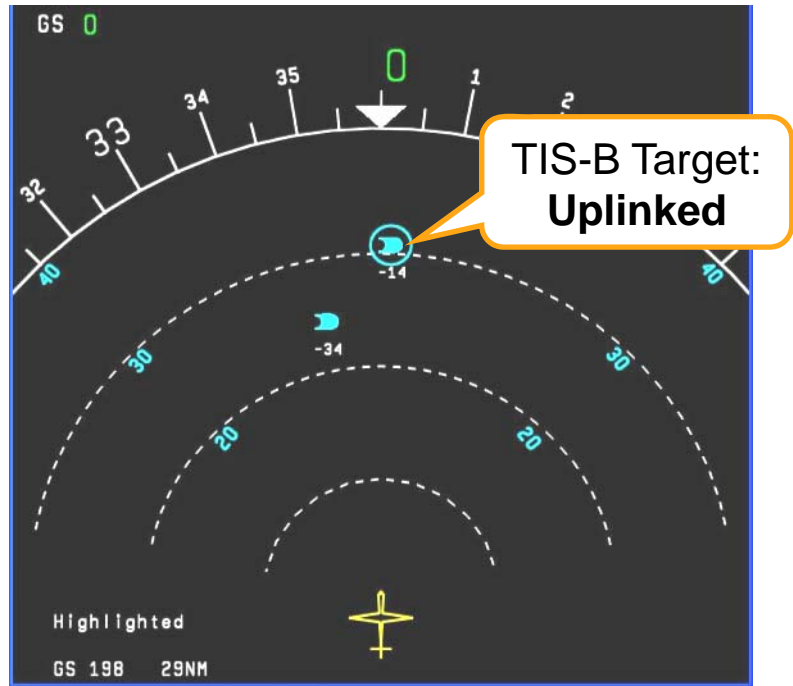
TIS-B Example Results



SBSS Airscape View



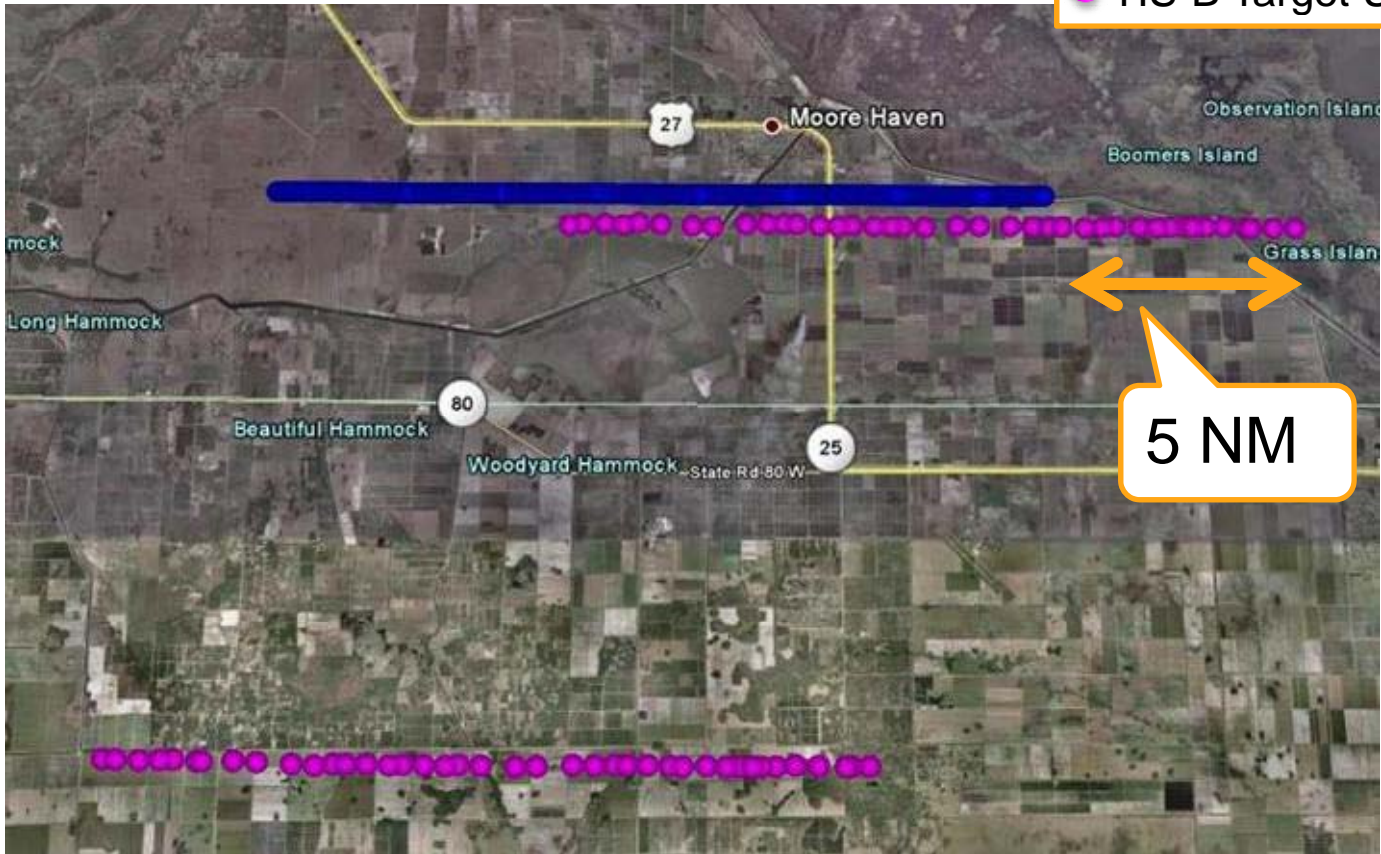
Garmin/MITRE Tool View (UAT)



ACSS View (1090)

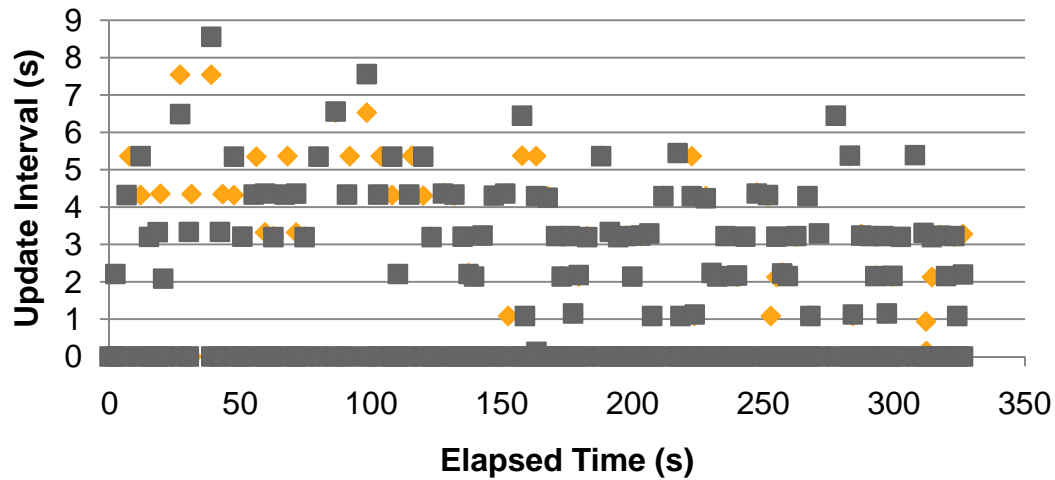
TIS-B 1090 Data Playback: SBSS Radio & DI DISSR Receiver

- TIS-B Client - 1090
- TIS-B Target Uplinks



Avionics Receive Update Intervals

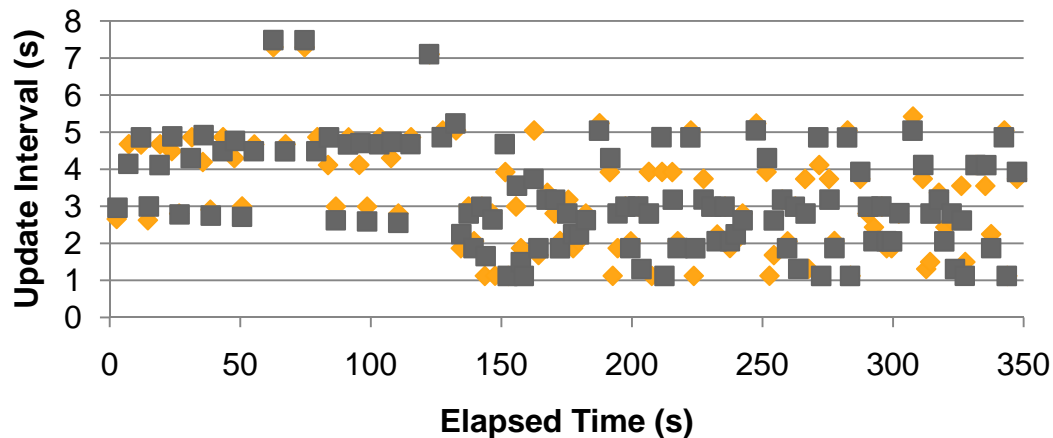
TIS-B 1090 Update Intervals



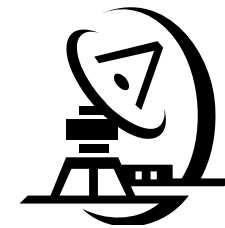
◆ A801D1
■ A80621

En-Route Sweep
Period ~ 12 s

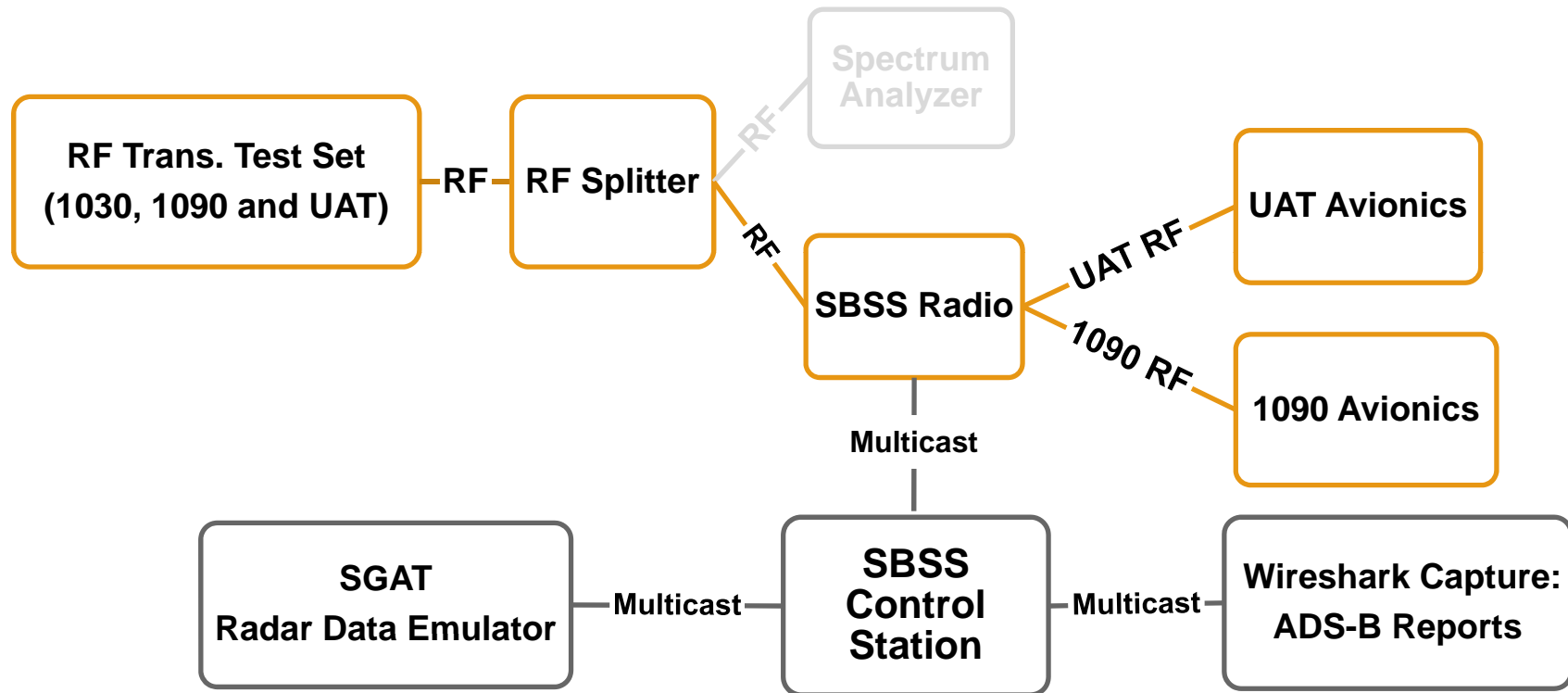
TIS-B UAT Update Intervals



◆ A8045D
■ A80144



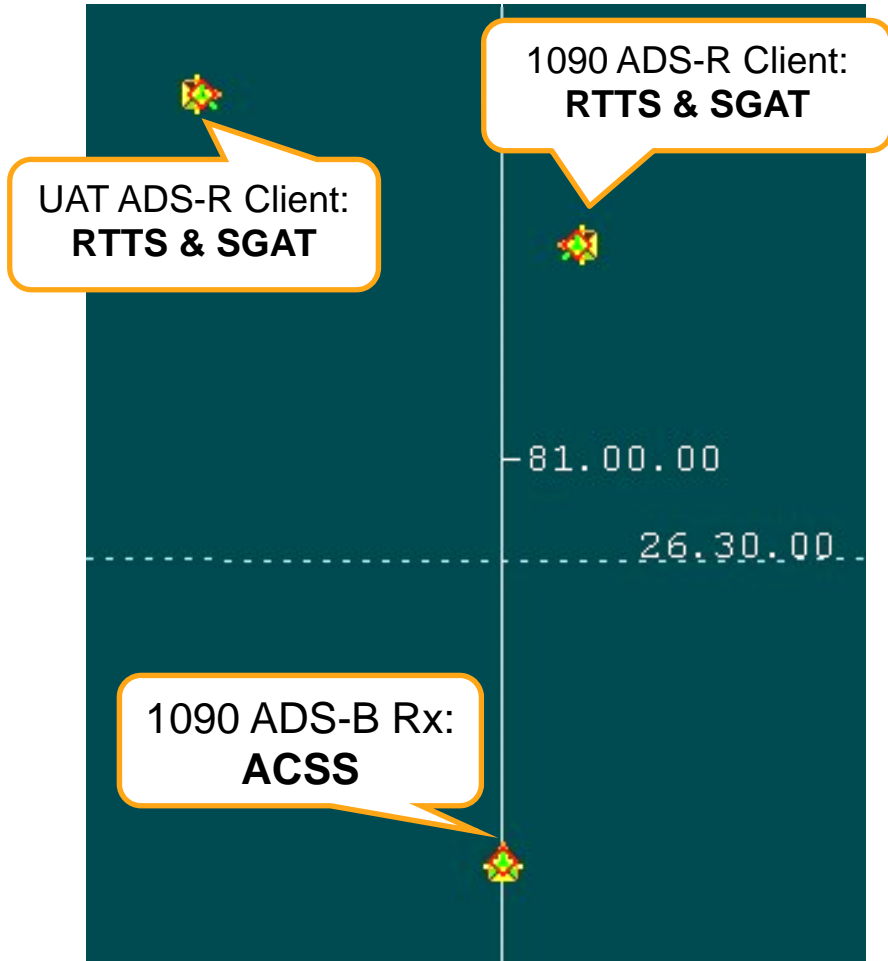
SBSS/Avionics Interoperability Testbed ADS-R Example



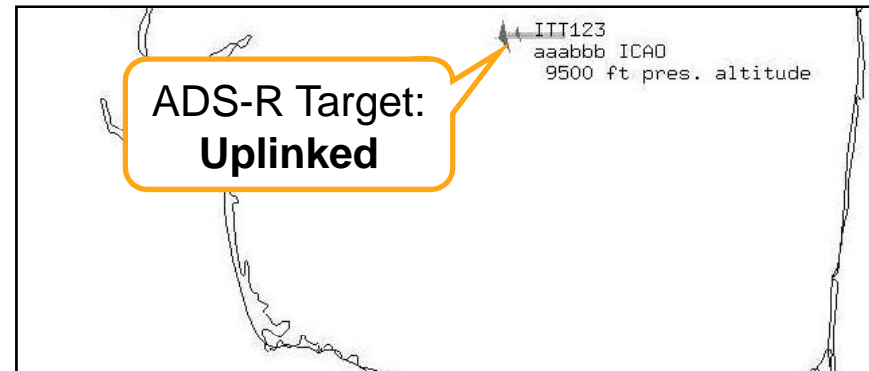
ADS-R Example Setup



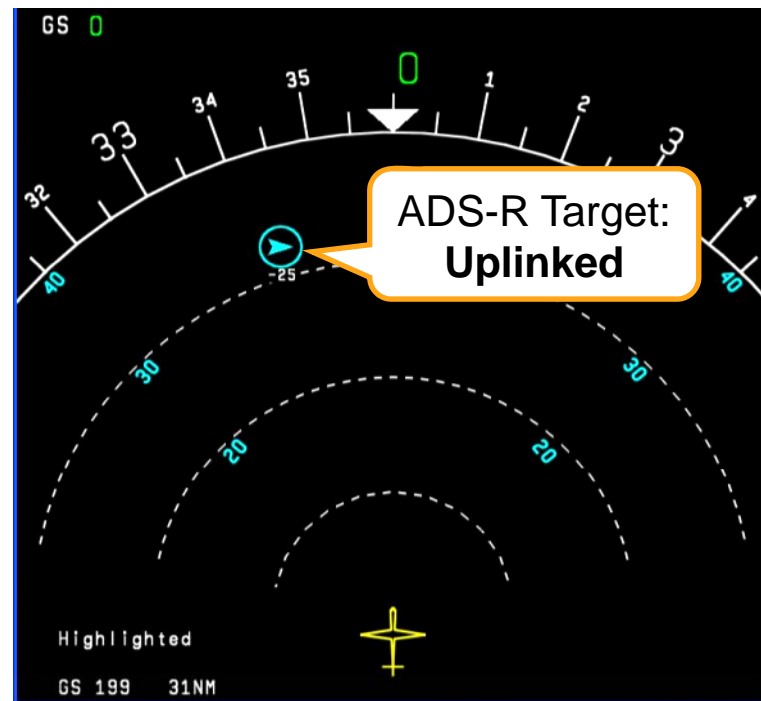
ADS-R Example Results



SBSS Airscape View



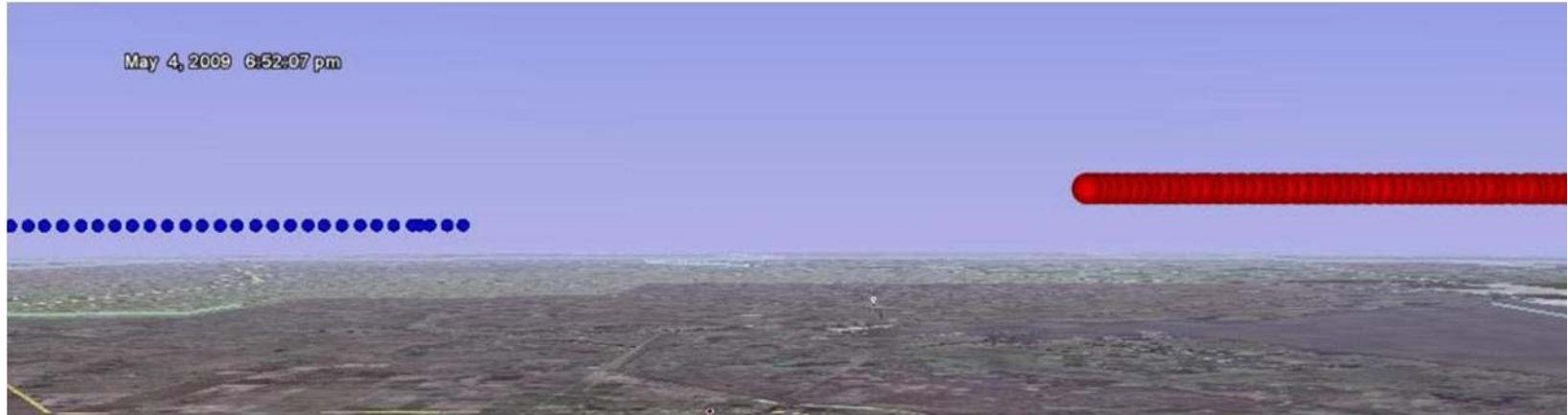
Garmin/MITRE Tool View (UAT)



ACSS View (1090)

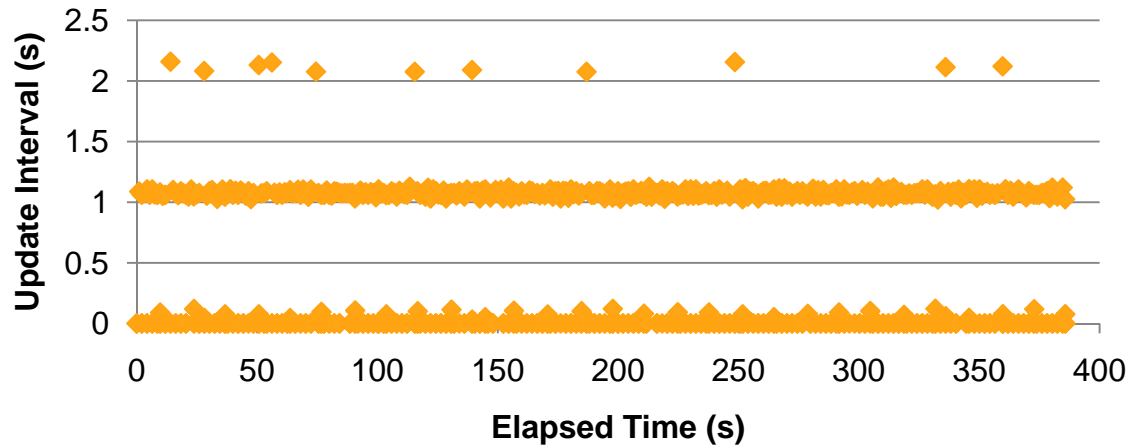
ADS-R Data Playback

- UAT A/C uplinked to 1090
- 1090 A/C uplinked to UAT

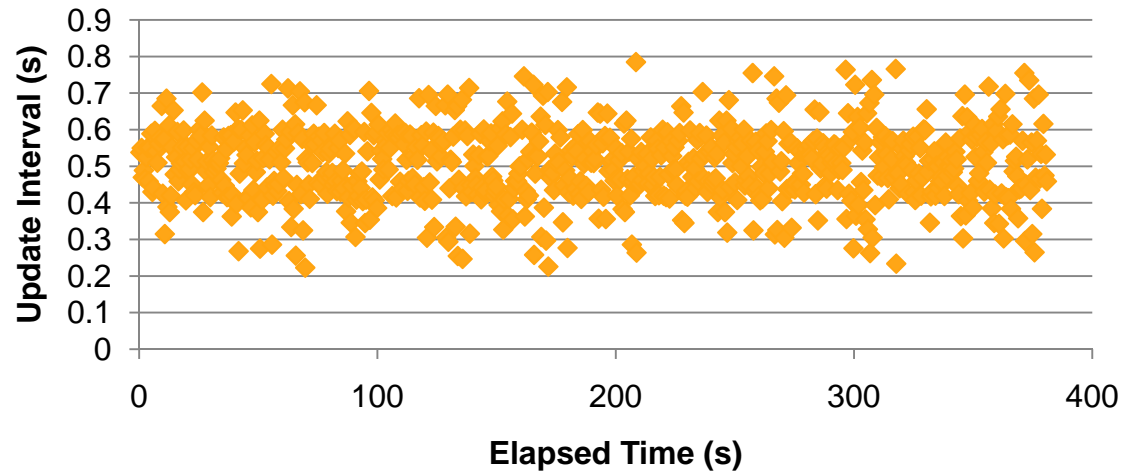


Avionics Receive Update Intervals

ADS-R UAT to 1090 Update Intervals

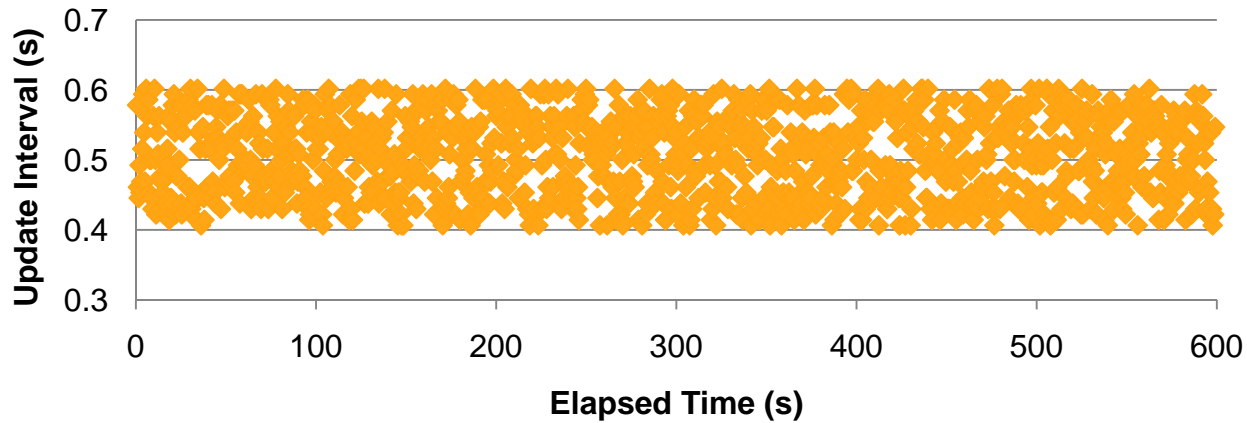


ADS-R 1090 to UAT Update Intervals

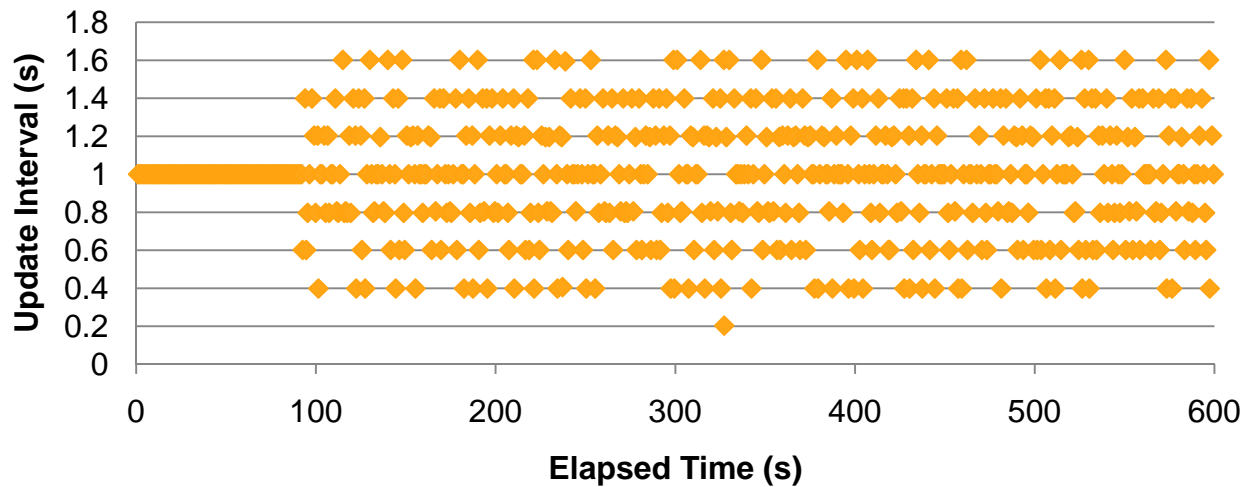


SBSS Radio Receive Update Intervals

ADS-B 1090 Update Interval

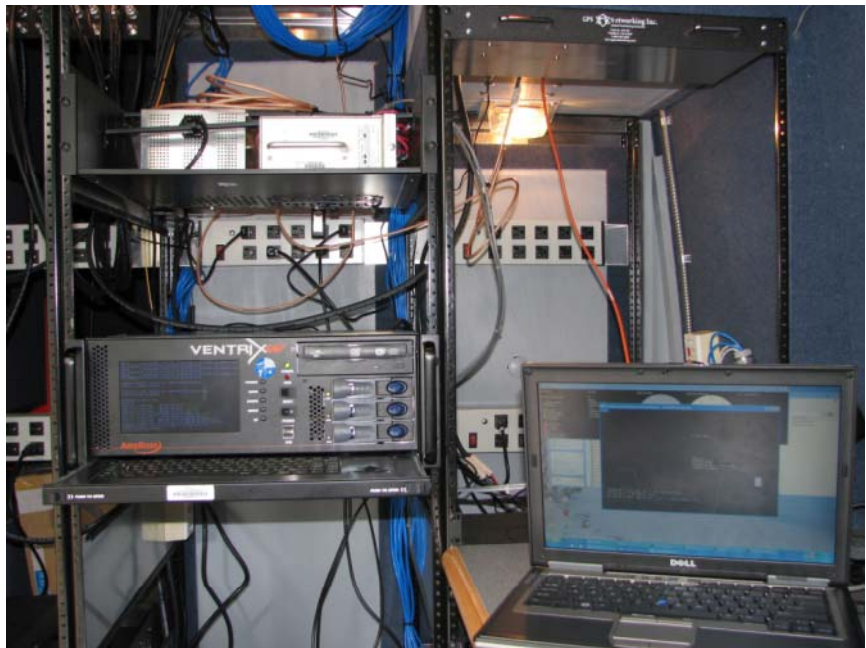


ADS-B UAT Update Interval



Recent Data – Louisville, KY

System Acceptance Testing (SAT)



FIS-B Field Data Example



Summary

- SBSS Program
 - ADS-B, ADS-R, TIS-B, FIS-B
- Interoperability Testbed between SBSS and Avionics
- Basic Scenario Demonstration
- Recent Data, Ongoing System Testing
- Testbed can be used for new and existing challenges
 - Avionics Application Interfaces
 - MOPS Changes
 - International Standards Support
- Contact Information
 - Michael Garcia
 - Michael.A.Garcia@itt.com
 - 703-668-6107
 - <http://www.itt.com/adsb>



BACKUP SLIDES

UAT Field Data Example

