Radio Frequency Interference

Federal Aviation Administration

Regional Preparatory Workshop for WRC-19

Mexico City, Mexico

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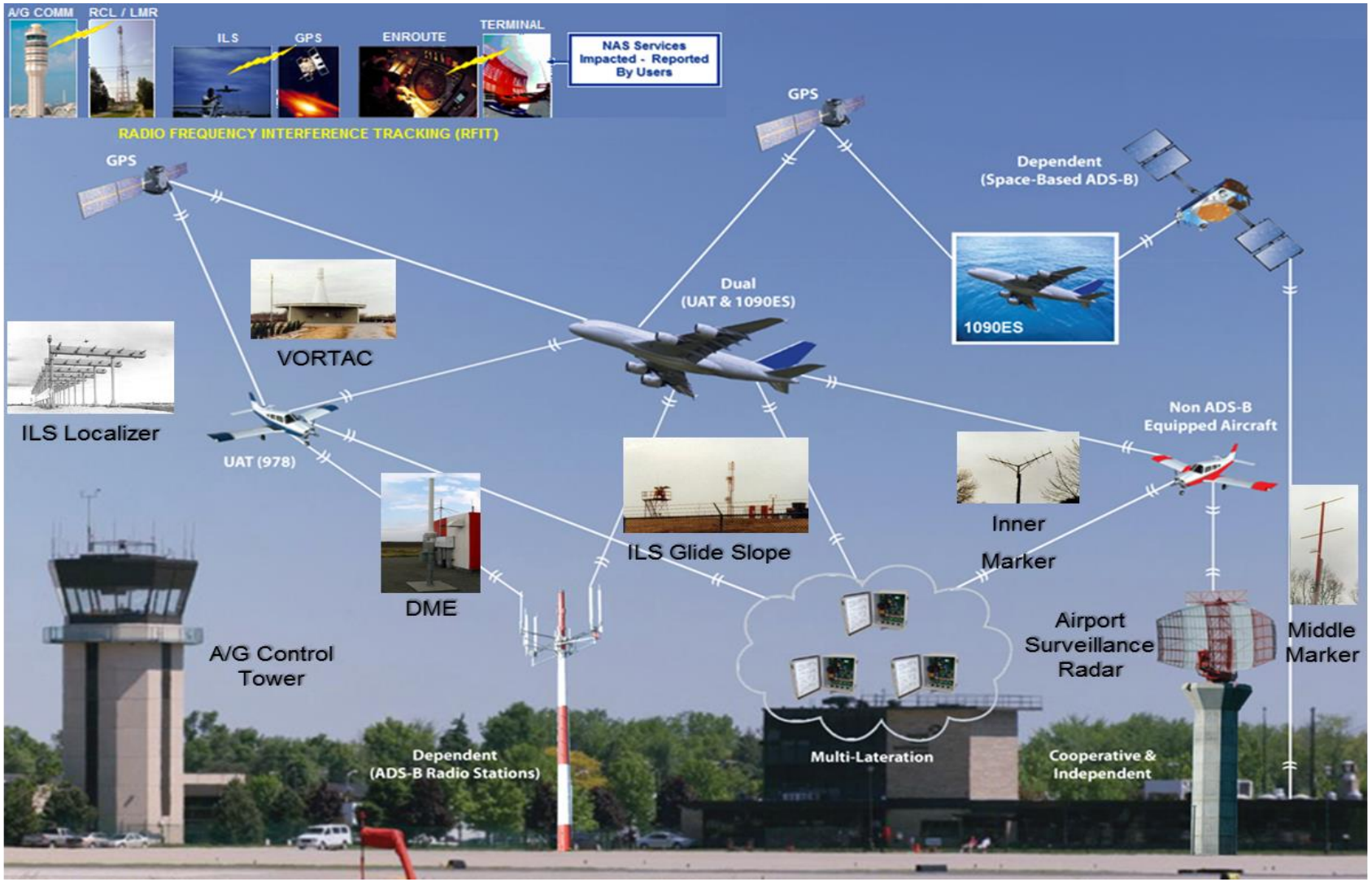
US FAA Spectrum Engineering Services

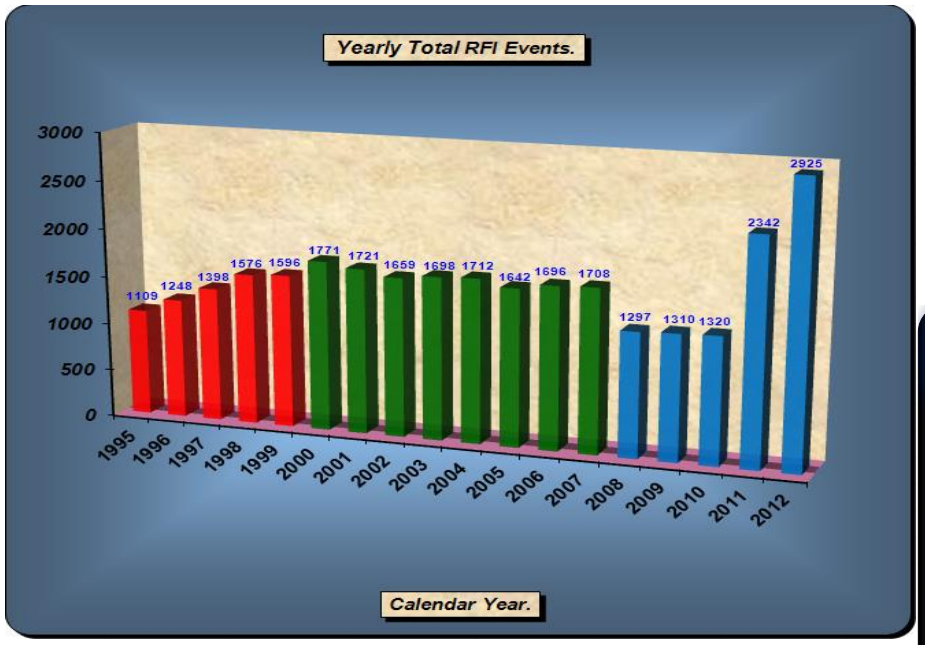
What is Radio Frequency Interference (RFI)?

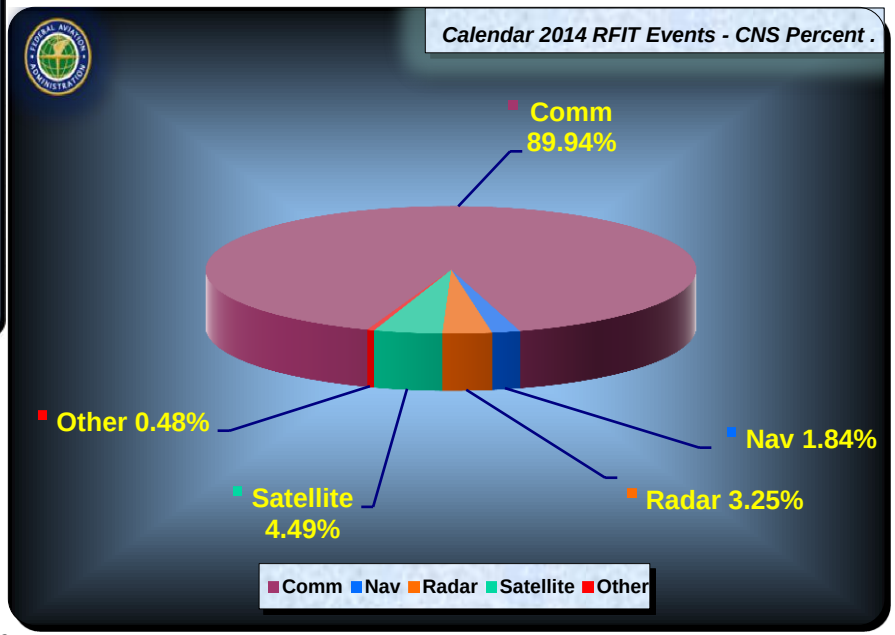
- **ITU Definition: The effect of unwanted energy due to one or a combination of emissions, radiations, or inductions upon reception in a radiocommunication system, manifested by any performance degradation, misinterpretation, or loss of information which could be extracted in the absence of such unwanted energy.**
- **Criteria to mitigate inter-system interference are established as an element of ICAO SARPs.**
  - E.g., 8 dB D/U for co-channel DME assignments

RF Dependent Aviation Systems



US RFI Yearly Activity Statistics





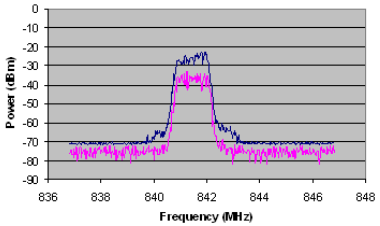
- •Maintenance Management System (MMS) Data
- •Event Manager System (EMS) Data
- •Spectrum RFI Tracking System (RFIT) Data

RFI Categories

- **Authorized Transmissions**
  - Properly Licensed (i.e. FM, AM, TV)
- **Unauthorized Transmissions**
  - Wireless Video Cameras
  - High Power Cordless Telephones
  - Unlicensed Pirate FM Stations Spurious
- **Intentional**
  - Unauthorized Jamming
  - "Phantom" Controllers
- **Unintentional**
  - Spurious Transmissions

RFI Sources

- Citizens Band (CB) Radios (5th harmonic)
- Paging Systems
- Stuck Microphone Transmissions
- Cell phone Spurious Emissions
- Electronic Attack (EA) Missions
- Power line Noise (Broadband Noise)
- Wireless wide area networks
- GPS/Cell phone jammers
- Amateur “HAM” Radio
- Land Mobile/Dispatch



US National Airspace System RFI

✈Most Common Source of RFI:

- ✈The “unknown source”
- ✈Unauthorized Transmissions
- ✈Pirate FM Broadcast Spurious

✈Most Common FAA Victim:

- ✈VHF/UHF Voice Communications

✈Most Difficult RFI to Resolve:

- ✈High Altitude Pilot Only Reported RFI
- ✈Intermittent RFI (Airborne/Ground)
- ✈Broadband RFI on Many Frequencies
- ✈Phase Shift Keying RF Transmissions

US RFI Investigation Resources

- **FAA Personnel and Organizations:**
  - ATO Spectrum Engineering Services
    - Headquarters
    - Technical Center
    - Command Center
  - Frequency Management Officers (FMO)
    - Technical Operations Service Areas
    - Aeronautical Center
  - Technical Support Field Specialists (Technicians)
  - Aviation System Standards (Flight Inspection)
    - One International FIO
    - Six National FIOs

NAS/CNS RFI Reporting Process

617 RFI Trained Air Traffic Systems Specialists – First Level Response

COMM RFI

NAV RFI

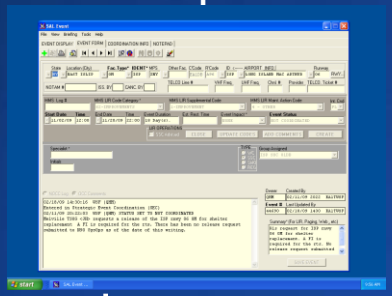
RADAR RFI

NAS Services Impacted - Reported By Users

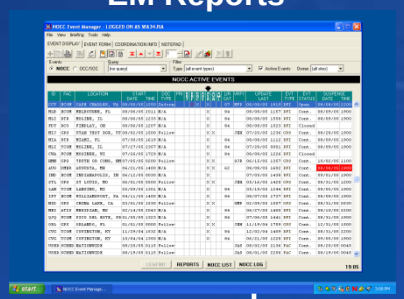
RCL/LMR *ILS* *GPS* *ENROUTE* *TERMINAL*

Telephone & eMail Reports

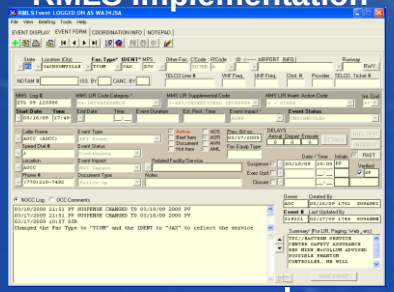
SAL Reports



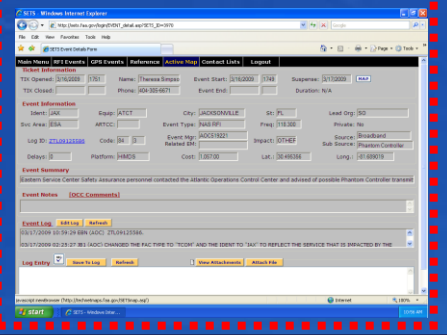
EM Reports



RMLS Implementation



All Reports to RFIT



Linked | **Consolidation in 2005** | **Linked** | **Consolidation in 2009**

CLOSED /WAN

Radio Frequency Interference Tracking (RFIT) → **FAA Intranet web-Records**

Since 2005

FAA RFI RESOURCES - Handheld

- **FAA Assets and Software Tools**
- **Radio Frequency Interference Kit (K95-103) Handheld**

District Field Offices
33 Offices in the FAA NAS

K95-103 Detection Coverage
20 – 3000 MHz
Typically 2 miles

Approx. 300
K95-10x Systems

GPS DF Antenna
L1,L2,L5

VHF Yagi Antenna
Directional

Service Area

Most Cost effective First choice instrument for technicians

RFIT Event Attachments – AOI Analysis

RFIT EVENT REPORT - Windows Internet Explorer

http://rfit.faa.gov/Reports/SetsPrint.aspx?ticketId=18619

Favorites

RFIT -> Ticket Detail/Edit | RFIT EVENT REPORT

RFIT EVENT REPORT (RFI-14-2534)

TIX Opened:	11/06/2014 02:25	**Event Start:**	11/06/2014 02:25	**Suspense:**	02/24/2015
TIX Closed:	02/24/2015 21:30	**Event End:**	02/24/2015 11:49	**Private:**	☐
TIX Created:	11/08/2014 22:54				

Ident:	ZDCZ	**Equip:**	ECOM	**Svc Area:**	ESA
Delays:	0	**Cost:**	7975	**LOO:**	RS
NOCC:		**OCC:**	1060899102		

City:	LEESBURG	**State:**	VA	**Priority:**	5
Event:	NAS RFI	**Freq:**	133.975	**JSIR:**	
User Rcvr:	Aircraft Avionics	**Alt:**		**USNG:**	
Rel Tix1:		**Source:**	Unknown	**Lat:**	39.101188
Rel Tix2:		**Sub Source:**	None Found	**Long:**	-77.542733

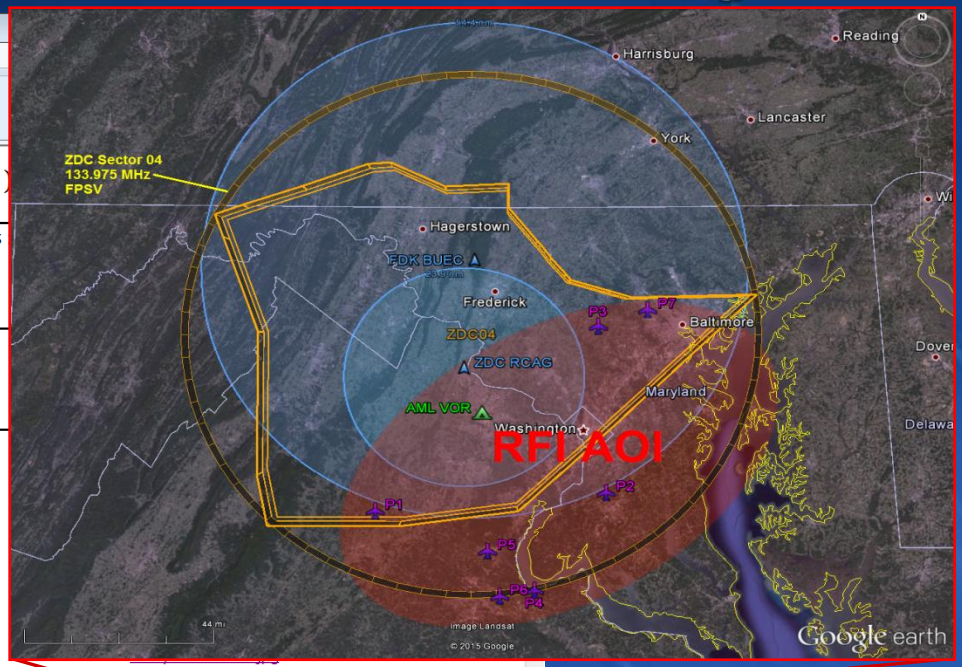
ZDC-RCAG-133.975-RFI-Google-Analysis-Plot-04.jpg
ZDC-RCAG-133.975-RFI-Google-Analysis-Plot-05.jpg
ZDC-RCAG-Aerial-View.jpg
ZDC-RCAG-Close-Up-View.jpg
ZDC-RCAG-FAA882337-133.975-FPSV-Plot-01.jpg
ZDC-RCAG-FAA882337-133.975-FPSV.kml
ZDC-RCAG-FAA882337-133.975.pdf
ZDC-RCAG-Sreet-View-01.jpg
ZDC-RCAG-Sreet-View-02.jpg
ZDC-Sectional-Map.jpg

Summary: Air Traffic personnel in Area 1 at the Washington ARTCC report that aircraft pilots indicate hearing again ticking noise interference on sector ZDC04 frequency 133.975 MHz regardless of the controllers equipment in use. ATSS COMM specialists have been notified and will contact Spectrum for investigation support.

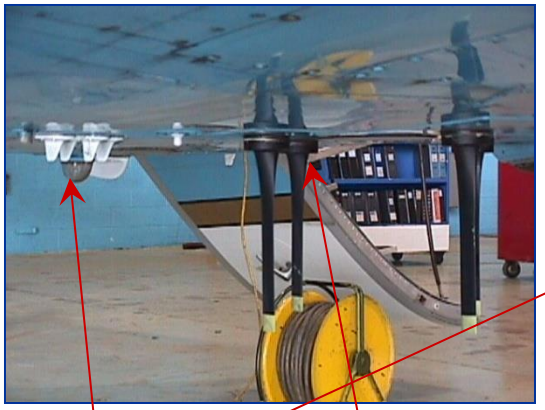
Notes: UPDATE: 11/06/2014 11:47 AM- Mike Gooden, not sure if you been following this issue. It seems to only happen at night just after Zulu. The data is a little confusing. If you won't mind checking this out some night the search area is split. The most obvious area is Baltimore NW to EMI. Looks like I795 to Northwest

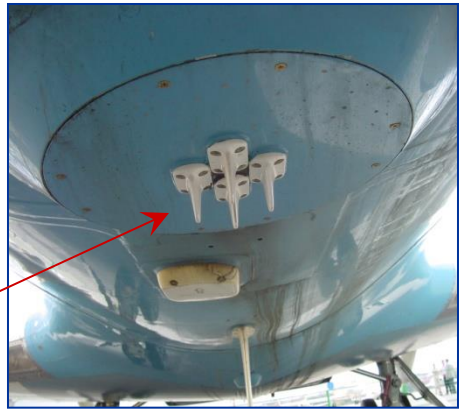
Trusted sites | Protected Mode: Off 100%

RFIT EVENT REPORT ... 10:34 AM



FAA RFI RESOURCES - Aircraft





AVN

Flight Check NASE/RFI Program to assist in locating RFI/GPS sources

First Choice when High Altitude PIREPS ONLY

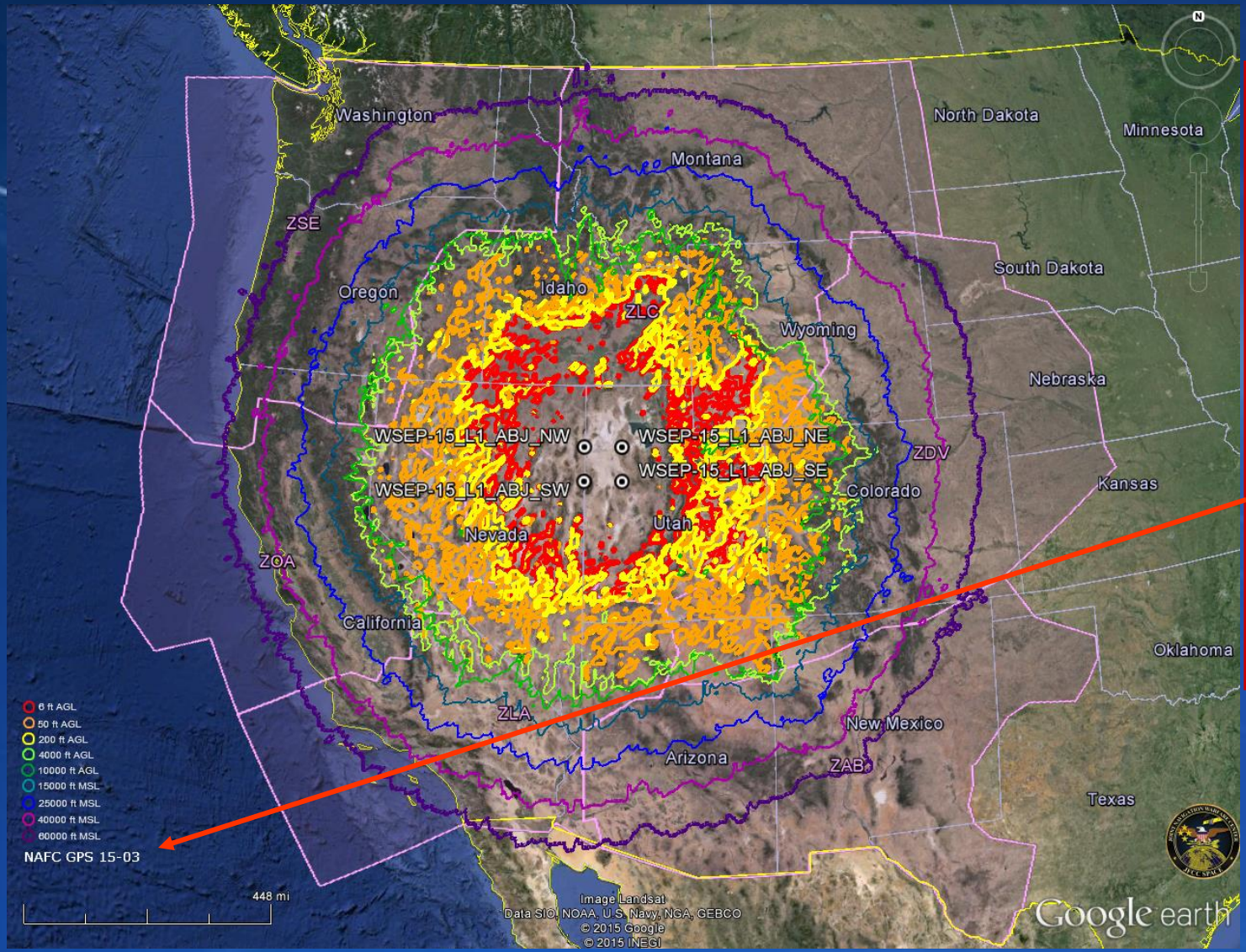
DF Control/Mapping Operated Automation

GPS DF Array & VHF DF Array L1,L2,L5 & 108 - 174 MHz

Software Engineering Analysis Tools

- **FAA ATCSCC/NOCC Spectrum Engineering Services:**
  - **Radio Frequency Interference GIS Tracking (RFIT)**
  - **Automated Frequency Manager (AFM)**
  - **Enhance Traffic Management System (ETMS)**
  - **GPS Interference Navigation Tool (GiANT)**
  - **Hepburn Ionosphere Skip Forecasts (HPBRN)**
  - **Google Earth 3-Dimensional Analysis (GE)**
  - **RFI Field Investigation Software Tools (FMT)**

GPS Interference Navigation Tool

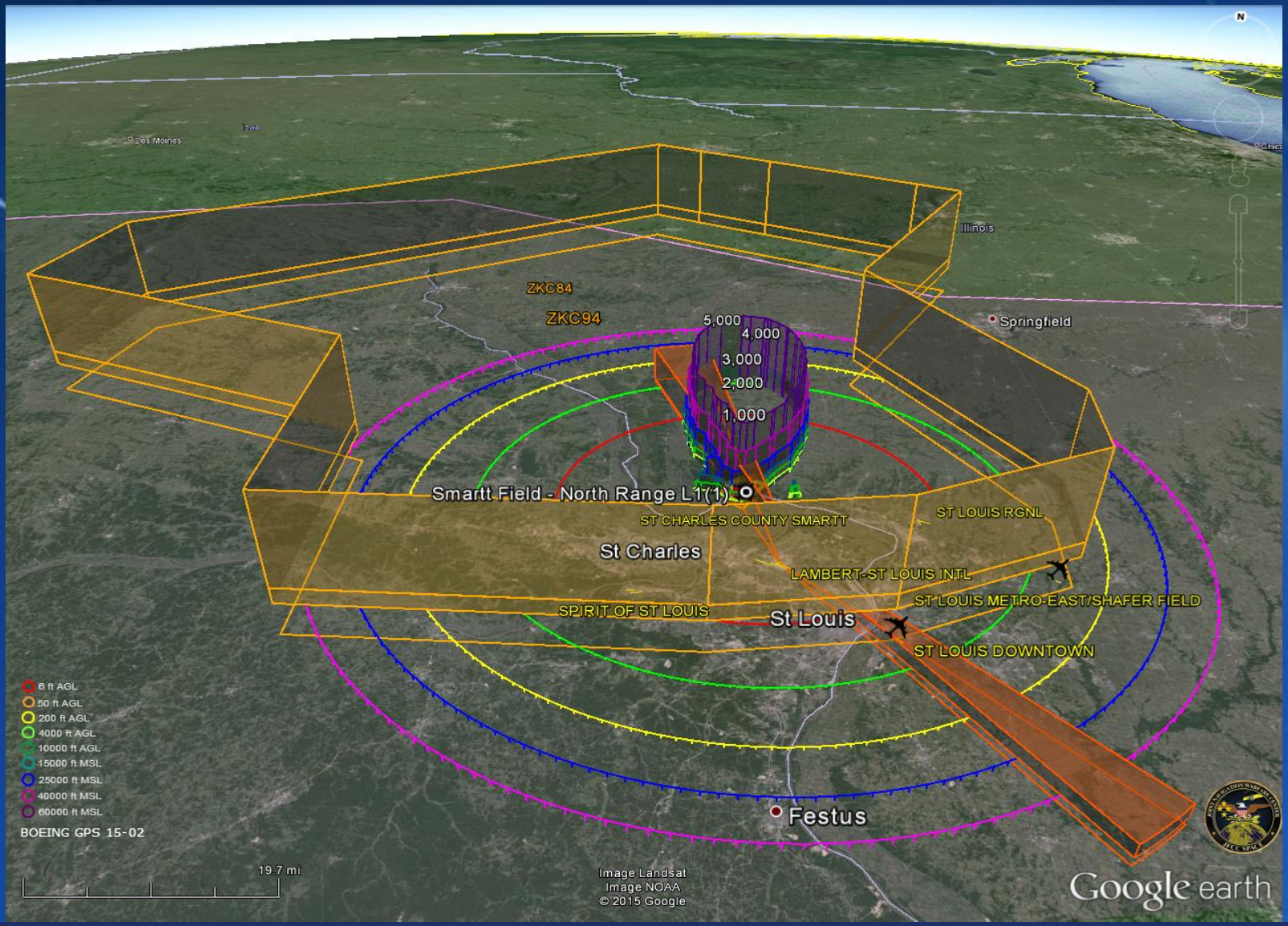


GPS Unreliability Prediction Contours

Altitude Color Coded Legend

ARTCC Airspace Boundary Overlay

Google Earth 3-Dimensional Analysis-P2



FAA *FoxHunt* Operation Support

FAA *FoxHunt* Mobile Suite