Federal Aviation Administration



ATC Spectrum Engineering Services

Presented at the United States NTIA Radio Frequency Spectrum Management

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FAA Spectrum Engineering Services





Federal Aviation Administration

Briefing Outline

- FAA Spectrum Organization Structure
- FAA Spectrum Organizational Responsibilities
- Frequency Bands Supporting Aviation
- > National Airspace System (NAS) Facilities
- AAG/RADAR Frequency Coordination Process
 - →Government Applicants
 - →Non-government Applicants
- FAA Radio Frequency Interference (RFI) Program
 - → Statistics
 - →RFI Sources
 - →Resources







NTIA Telecommunications Training Institute (USTTI) Radio Frequency Spectrum Management Course April 8, 2009

Administration





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Spectrum Engineering Mission

→FAA ATC Spectrum Engineering Services Organizational Responsibilities

- Develops and Executes Spectrum Policy for the FAA (HQ)
- Represents the United States Civil Aviation community on Spectrum Issues in the ITU-WRC International Arena (HQ)
- →Represents FAA at the IRAC and it's Subcommittees (HQ)
- Chairs the Aeronautical Assignment Group and Serves as Coordinator of Radar Bands (HQ)
- Coordinates Department of Defense EA Requests (HQ)
- Satisfies All NAS Radio Spectrum Requirements (HQ & SA)
- Protects the Existing Aeronautical Radio Spectrum (HQ & SA)
- Resolves RFI Events Disrupting NAS CNS Services (HQ & SA)





Bands Supporting Aviation

190 - 285 & 285 - 435* & 510 - 535* kHz 2100 - 28.000 kHz 74.8 – 75.2 MHz 108 - 112 MHz 112 - 118 MHz 118 - 137 MHz 138 - 150.8 & 162 - 174 MHz 225 - 328.6 & 335.4 - 400 MHz 328.6 - 335.4 MHz 406.1 - 420 MHz 932 - 935 & 941 - 944 MHz 960 - 1215 MHz 1030 & 1090 MHz 1215 - 1390 MHz 1545 - 1559 MHz 1559 - 1610 MHz 1646.5 - 1660.5 MHz 1710 - 1850 MHz 2700 - 3000 MHz 5000 - 5150 MHz 5600 - 5650 MHz 7125 - 8500 MHz 9000 - 9200 MHz 14.4 - 15.35 GHz 15.7 - 16.2 GHz

Non-directional Beacons **HF** Communications **NAVAID (Marker Beacons)** VOR: ILS Localizer VOR; LAAS (GPS augmentation) VHF Air/Ground Communications Fixed, Mobil **UHF Air/Ground Communications (Military) ILS Glide Slope** Fixed, Mobil RMM, LLWAS, LDRCL, etc. NAVAID (TACAN/DME, etc.); GPS L5; UAT Air Traffic Control Radar Beacon; Mode S; TCAS Air Route Surveillance Radar; GPS and GLONASS L2 Satellite-Based Comm (To Aircraft) Satellite Navigation; GPS and GLONASS L1 Satellite-Based Comm (From Aircraft) LDRCL; fixed links **Airport Surveillance and Weather Radar Microwave Landing System Terminal Doppler Weather Radar RCL: LDRCL** Military PAR; ASDE-X Microwave Link Radar (ASDE-3)





(As of June 01, 2008)

Aeronautical Facilities

+Communication 14,406 facilities including 2,410 radio sites

Navigation 11,130 facilities including 1,029 Very High frequency(VHF) Omni directional Range (VOR)

→Landing

- 1,379 Localizers
- →Surveillance
- 1,882 facilities including 369 radar sites









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FAA NAS Facilities

(As of June 01, 2008)

Air Traffic Control Facilities

→Air Route Traffic Control Centers (ARTCC)	21
Terminal Radar Approach Control (TRACON)	30
→Air Traffic Control Towers (ATCT)	518
Automated Flight Service Stations (AFSS)	76
Certificated Airports	575 *

* Certificated airports serve Air Carrier Operations with aircraft seating more than 9 passengers seats. (FAR Part 139)

38,103 frequency assignments to support these facilities! FAA FY2008 NTIA Reimbursable Fee \$3,904,104.00





NAS Airspace Sector Strata-Layers





AAG/Radar Frequency Coord. Process

Federal Government Applicant (other than FAA):

- Government Agency (POC) Coordinates with FAA Service Area Frequency Management Office (FMO)
- Service Area FMO Engineers Frequency and Coordinates with FAA HQ ATC Spectrum Engineering Services
- Government Agency (POC) Submits Frequency Application to NTIA/FAS
- FAA HQ's Reviews FAS Agenda
- NTIA/FAS Approves Application





AAG/Radar Frequency Coord. Process

Non-Federal Government Applicant:

- Proponent/Sponsor Notifies the Appropriate FAA Regional Frequency Management Office (FMO)
- → Once Notification to the FAA is Accomplished, Sponsor Submits FCC Form 601 and Schedules D&G to the FCC
- FCC Coordinates with FAA HQ's
- FAA Submits Frequency Application to NTIA/FAS
- > NTIA/FAS Approves Assignment Application
- FCC Issues License





RFI Yearly Activity Statistics

→ 1995 Events = 1109

- → 1996 Events = 1248
- → 1997 Events = 1398
- → 1998 Events = 1576
- → 1999 Events = 1596
- → 2000 Events = 1771
- → 2001 Events = 1721
- → 2002 Events = 1659
- → 2003 Events = 1698
- → 2004 Events = 1712
- → 2005 Events = 1642
- → 2006 Events = 1696



Note: Data as extracted from the FAA Maintenance Management System (MMS) at the end of every calendar year. Data may be subject to change.





RFI/GPS Reporting Flow

COMM RFI



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SETS Event Logging

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Ident	<u>Equip</u>	<u>City, State</u>	<u>Start</u> <u>S</u>	<u>uspense</u>	Last Updated	<u>Summary</u>	CENTERS
LAX	GPS	LOS ANGELES, CA	6/28/2006 1200	6/30/2008	6/2/2008	SPC GPS 06-401 10/1/07 - 10/24/08	REPORTING BIT
ORL	GPS	ORLANDO, FL	1/1/2008 0001	6/30/2008	6/2/2008	SPC GPS 2007-150 1/1/08 - 6/30/09	BUCKETS
YUM	GPS	YUMA PROVING, AZ	6/4/2008 1600	6/30/2008	6/2/2008	YPG GPS 08-01 6/4/08 - 6/5/08	DOORETO
HMN	GPS	HOLLOMAN AFB, NM	4/1/2008 2100	6/30/2008		WSMR GPS 08-01 4/1/08 - 3/31/09	
<u>FHU</u>	GPS	FT HUACHUCA, AZ	6/30/2008 0600	6/30/2008		EPG GPS 08-02 6/30/08 - 8/1/08	ACTIVE EVENTS
LAS	GPS	LAS VEGAS, NV	6/3/2008 1500	6/30/2008		ACC GPS 08-3902 6/3/08 - 6/11/08	LIST
<u>ORL</u>	GPS	ORLANDO, FL	10/24/2008 0001	6/30/2008	6/2/2008	AFSPC GPS 08-404 10/24/08 - 4/24/10	
<u>FLX</u>	GPS	FALLON, NV	6/7/2008 0130	6/30/2008		NSAWC GPS 08-02 6/7/08 - 6/26/08	
<u>PXT</u>	GPS	NORFOLK, VA	4/1/2008 1500	6/30/2008	6/2/2008	PAXRV GPS 08-02 4/1/08 - 10/31/08	HTPERLINKS TO
NID	GPS	CHINA LAKE, CA	4/1/2008 1400	6/30/2008		CL GPSJ 08-03 4/1/08 - 9/30/08	TICKET INFORMATION
AWA	GPS	HERNDON, VA	1/16/2008 1439	12/31/2008	10/6/2008	USAF requested FAA to develop this GPS TEST Tracking Tool.	DETAILS
Record	Count: 11		Back to E	vent List Pag	e [Dow	nload This Listing]	
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SETS Active Events Map





SETS Event Log History

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* *	88 🔹 🏉 SETS	5 X 🏉	SETS Map			🏠 👻 🕞 👻 🖶 Yage 👻 🌘 Tools 🔹	»	GPS HISTORY
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		. 💌				>= v (mm/dd/yyyy) Search		
Ident	Equip	City, State	<u>Start</u>	uspense	Last Updated	Summary		
<u>JNU</u>	GPS	JUNEAU, AK	2/25/2005 2122	2/26/2005	10/18/2008	Wide Area Augmentation System (WAAS) personnel at the Operations Center reported loss of service due to high solar activity causing ostellite signal degradation. WAAS Operators have been notified. NOCC Spectrum Management has been notified.		- START EVENT
<u>JNU</u>	GPS	JUNEAU, AK	10/15/2005 2100	10/16/2005	10/18/2008	Air Traffic personnel at the Juneau Automated Flight Service Station (AFSS) received a GPS Anomaly pilot report from a <u>Cessna C310 (N5806X)</u> about 15 nautical miles west of the airport. WAAS Operators checked their receivers and no problems noted. Notified the FAA National Operations		
MIJ	GPS	UTAH TEST RGE, UT	12/7/2005 1730	12/9/2005	10/19/2008	Control Center (NOCC). Global Positioning System (GPS) will be unreliable and may be unavailable within a 290 NM radius of the Michael (MIJ) Tactical Air Navigation (TACAN) at FL400; decreasing in area with altitude to a circle of 260 NM radius at FL250, and 170 NM radius at FL100 and 4,000ft AGL.		TICKET INFORMATION DETAILS
NID	GPS	CHINA LAKE, CA	9/13/2005 1430	2/28/2006	10/19/2008	Global Positioning System (GPS) will be unreliable and may be unavailable within a 310 NM radius of the NAWS China Lake/Armitage airport (NID) at FL400 ending at 113w longitude and not extending into Oakland oceanic airspace; decreasing in area with altitude to a circle of 260 NM radius at FL250, and 190 NM radius at FL100 and 170 NM radius at 4,000ft AGL. The impact area also extends approximately 50 NM into Mexican Airspace to the south of the California border.		ORACLE DATA BASE
<u>FHU</u>	GPS	FT.HUACHUCA, AZ	4/3/2006 0500	4/13/2006	8/25/2006	TA#: WSMR GPS 06-03 Affected ARTCC's: ZAB/ZLA. dates: 04-07 April This test impact area extends into the Mexican airspace Flight Information Region (FIR)		
TRF	GPS	TOBE CO	4/20/2006 2000	4/22/2006	8/25/2006	closed///TA#: SPC 06-02 Affected ARTCC's	~	
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SETS Event Report

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😪 💠 😑 👻 🎉 SETS Event Details Form	🍘 http://sets.faa.gov/login 🗙 🍘 SETS Map	🏠 🔹 🗟 🔹 🖶 🖓 Page	e 🕶 🎯 Tools 👻 🎽	GPS EVENT REPORT
TIX Opened: 10/15/2005 21107	Name: James S. Aziles	10/16/200 5	_	POC INFO
TIX Closed: 10/16/2005 2346Z	Phone: 703-326-3922	uspense. 10/10/2003		
Event Start: 10/15/2005 2100Z	Event End: 10/15/2005 2130Z	Duration: 0 hrs 30 mins		
				STARTEVENT
Ident: JNU	Equipment: GPS State: AV			DAT/TIME
Lead Org: GPS	State: AK Svc Area: WSA			
ARTCC: ZAN	Event Type: GPS ANO	MALY		
Freq: 1575.42	Private: No			CLOSED EVENT
Log Id:	Code: 87 0			DAT/TIME
Event manager TIX #: ZAN57304	Source: Unknown			
Delays: 0	Platform: MIMDS			
Cost: 2837.00	Impact: OTHER			- HYPERLINKS TO
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	JNU-Aerial-Photo.jpg			
	JNU-AirNav.pdf			
	JNU-Airport-Diagram.pd INUL Sectional Map http://www.initeductional.com	<u> </u>		DETAILS
	N5806X-Registration.pdf	l P		
Summary: Air Traffic personnel at the June	eau Automated Flight Service Station (AFSS) received a GP	'S Anomaly pilot report from a Cessna C310	_	
(N5806X) about 15 nautical miles west of t	the airport. WAAS Operators checked their receivers and no	o problems noted. Notified the FAA National		ORACLE DATA BASE
Operations Control Center (NOCC).				
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SETS Event Attachments







RFI Source Categories

→Authorized Transmissions

 \rightarrow 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



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RFI Culprit 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)
- →Anomalous Propagation
- Atmospheric Conditions
- →Amateur "HAM" Radio
- →Land Mobile/Dispatch







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-30 -40 -50 Frequency (MH)







US National Airspace System RFI

Most Common Source of RFI:

→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





