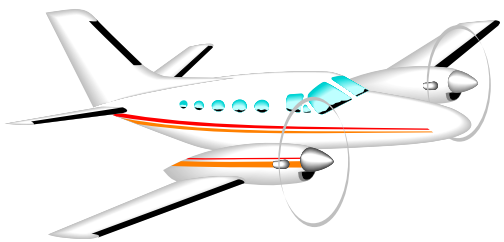
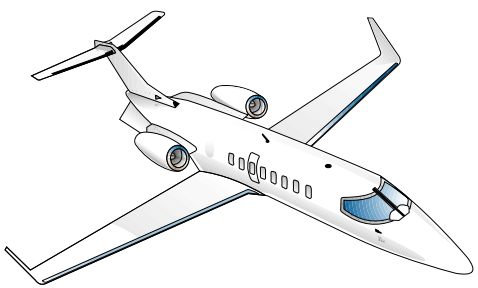
# Aeronautical Radio Spectrum Policy and Management



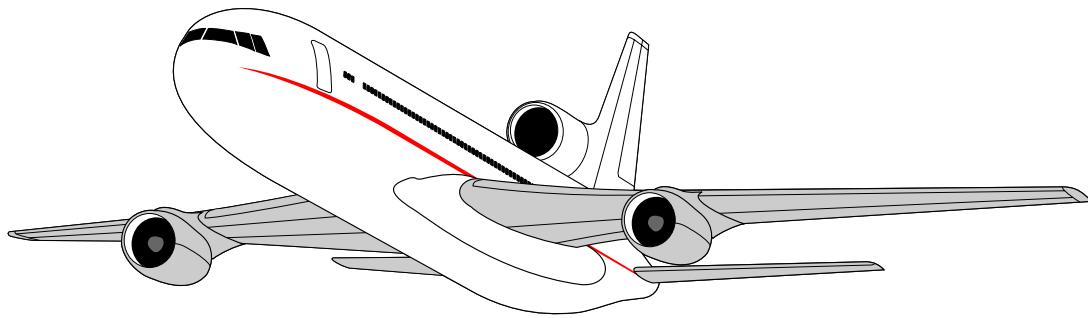


**International Civil Aviation Organization**
**Regional Coordination Meeting**
**Lima, Peru**
**March 27 – 28, 2001**

**Federal Aviation Administration**
**Washington, D.C.**

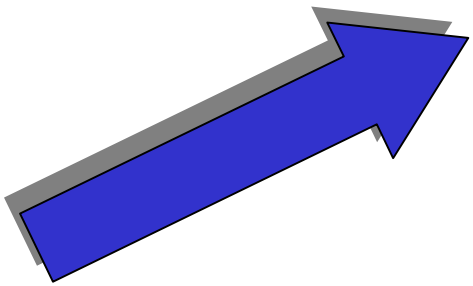
# FAA Responsibilities
# Federal Aviation Act of 1958


***Air Safety***

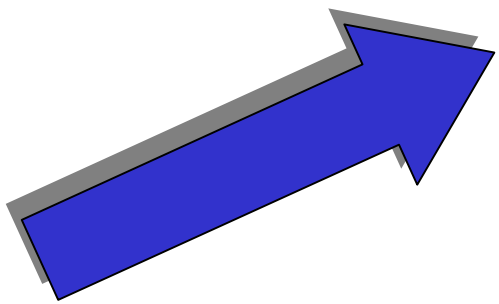


***Efficient Air Commerce***

# FAA Mission

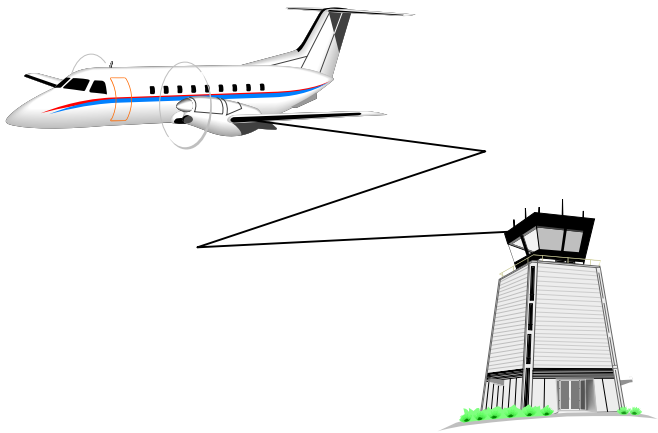


**To regulate airspace control only as needed to promote safe and efficient movement of aircraft**

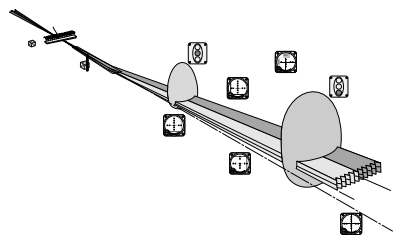


**To develop and operate a common system of air navigation and air traffic control for both civil and military aviation**

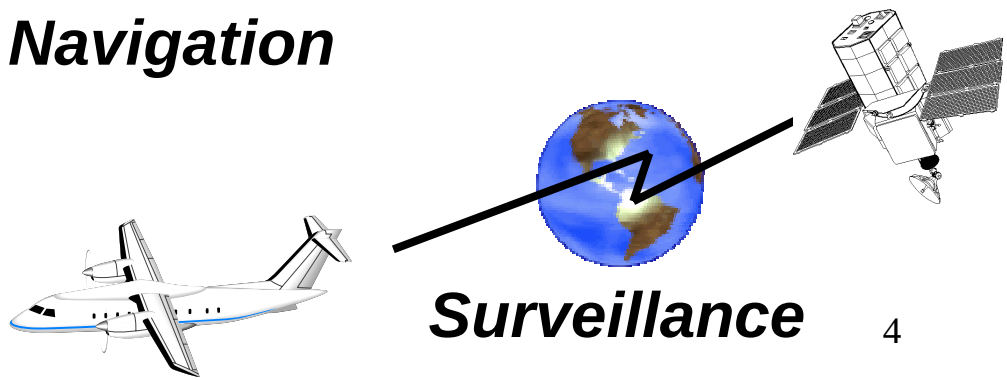
# Three Functions for Safe Flight



***Communication***



***Navigation***



***Surveillance***

# Two Tasks of Air Traffic Control

**Separation**


**Collision Avoidance**

# FAA Employment

- **TOTAL WORKFORCE**: **48,463**
- ***Major Occupations***

| | |
|---|---|
| -Air Traffic Services | 35,425 |
| -Regulation and Certification | 5,864 |
| -Civil Aviation Security | 1,153 |
| -Airports | 446 |
| -Research and Acquisition | 1,898 |
| -Commercial Space Transportation | 25 |
| -Staff | 3,652 |

# Number of FAA Facilities

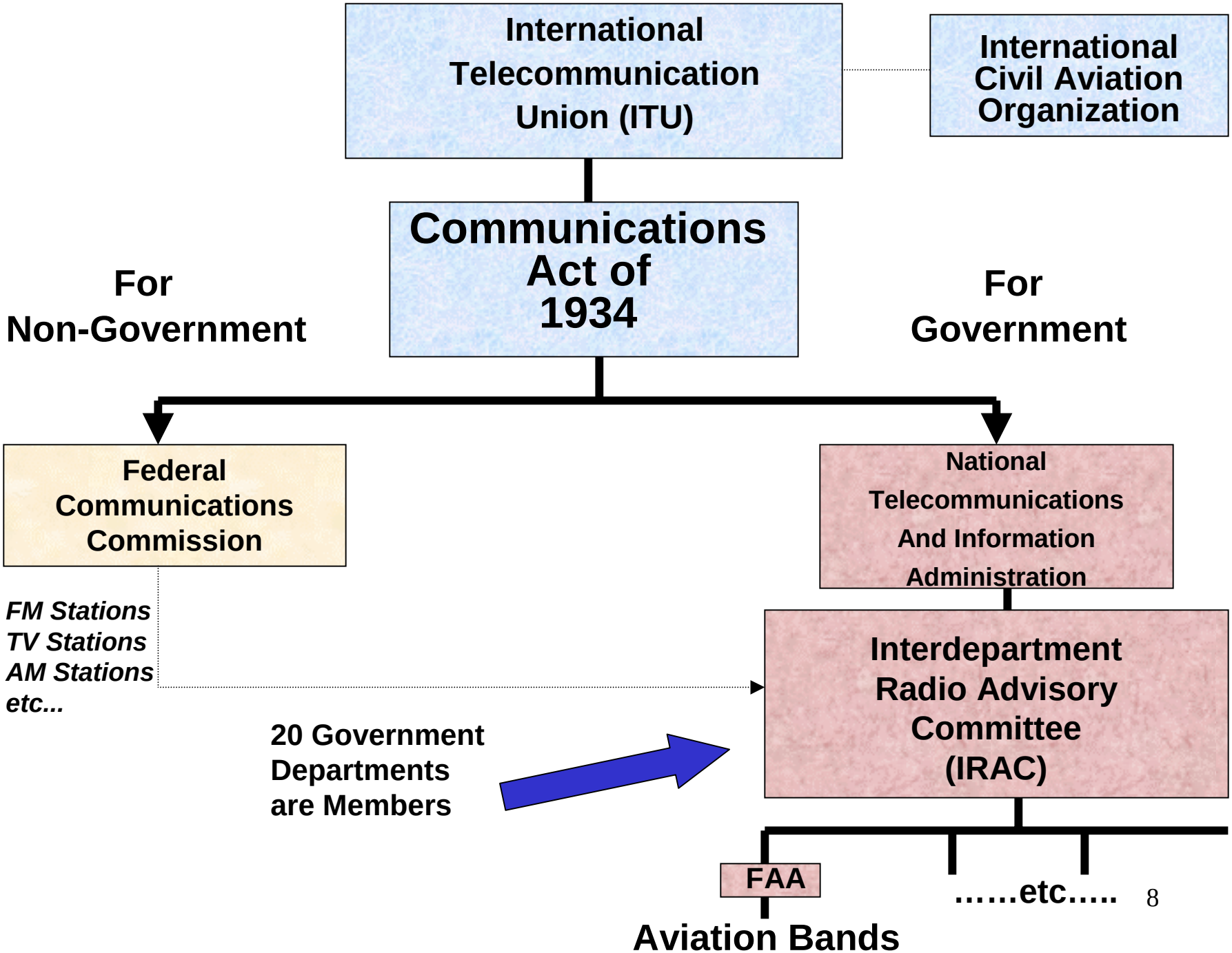
## Aeronautical Facilities

| | |
|---|---|
| - Communications | 14,103 |
| - Navigation | |
| VOR | 1,054 |
| DME | 813 |
| ILS | 1,131 |
| - Surveillance | 1,794 |

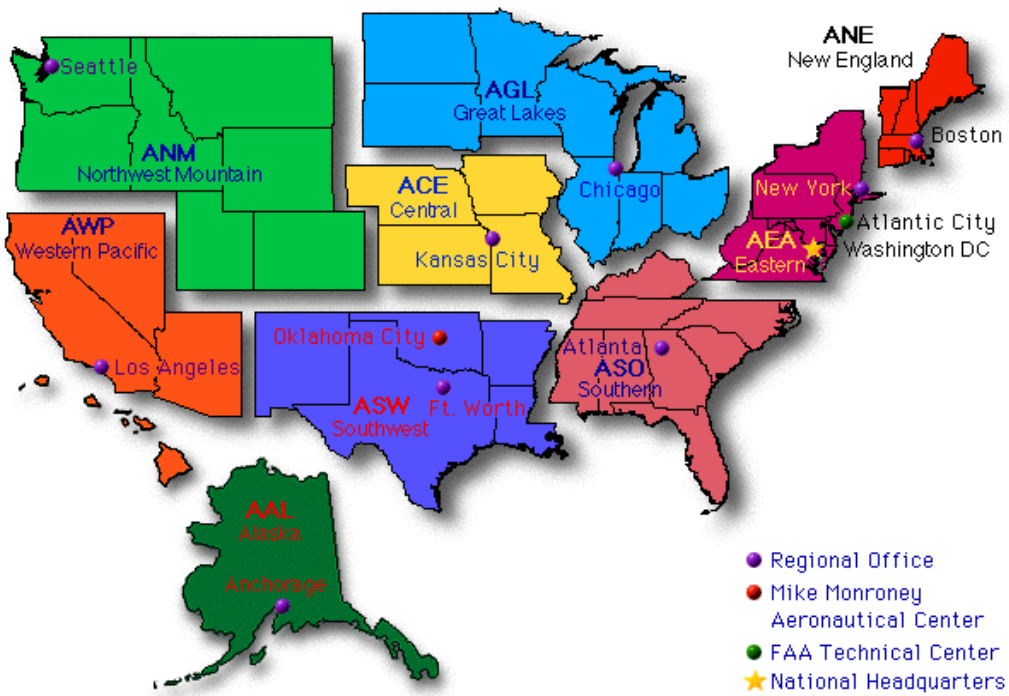
## Air Traffic Control Facilities

| | |
|---|---|
| - Air Route Traffic Control Center (ARTCC) | 21 |
| - Air Traffic Control Tower (ARTCC) | 496 |
| - Flight Service Station (FSS) | 75 |
| - Automated Flight Service Stations | 61 |
| - Airport Surveillance Radar (ASR) | 235 |
| - Air Route Surveillance Radar (ARSR) | 120 |

Over 50,000 frequency assignments to support these!! 7


International Telecommunication Union (ITU)
International Civil Aviation Organization
Communications Act of 1934
For Non-Government
For Government
Federal Communications Commission
National Telecommunications And Information Administration
FM Stations
TV Stations
AM Stations
etc...
Interdepartment Radio Advisory Committee (IRAC)
20 Government Departments are Members
FAA
.....etc.....
Aviation Bands

# FAA Frequency Coordination




- **Spectrum requirements begin at the FAA Region**
- **FAA automated system**
- **HQ FAA approves and forwards to NTIA**

# Bands Supporting Aviation

| | |
|---|---|
| 90 - 110 kHz | LORAN-C Navigation System |
| 190 - 435 & 510 - 535 kHz | Non-directional Beacon (NDB) |
| 2100 - 28,000 kHz | High Frequency Communication |
| 74.6 - 75.4 MHz | NAVAID (marker beacon) |
| 108 - 118 MHz | NAVAID (VOR, ILS localizer, and GBAS) |
| 118 - 137 MHz | VHF Air/Ground Communication |
| 162-174 MHz | Fixed, Mobile Communication |
| 225 - 328.6 & 335.4 - 400 MHz | UHF Air/Ground Communication |
| 328.6 - 335.4 MHz | NAVAID (ILS glide slope) |
| 406 - 406.1 MHz | Satellite Emergency Radiobeacon |

# Bands Supporting Aviation

| | |
|---|---|
| **406.1 - 420 MHz** | **Fixed, Mobile Communication** |
| **932-935 & 941 - 944 MHz** | **Fixed Communication** |
| **960 - 1215 MHz** | **NAVAID (TACAN/DME, GNSS, etc.)** |
| **1030/1090 MHz** | **Radar Beacon, TCAS, Mode S, etc.** |
| **1215 - 1400 MHz** | **Air Route Surveillance Radar, GNSS** |
| **1544 - 1545 MHz** | **Emergency Mobile Satellite Communication** |
| **1545 - 1559 MHz** | **Aeronautical Mobile Satellite (R) Service (downlink)** |
| **1559-1610 MHz** | **GNSS** |

# Bands Supporting Aviation

| | |
|---|---|
| **1645.5 - 1646.5 MHz** | **Emergency Mobile Satellite Communication** |
| **1646.5 - 1660-5 MHz** | **Aeronautical Mobile Satellite (R) Service (uplink)** |
| **1710 - 1850 MHz** | **Low Density Radiocommunication Link** |
| **2700 - 2900 MHz** | **Airport Surveillance Radar, Weather Radar** |
| **2900 - 3000 MHz** | **Weather Radar** |
| **4200 - 4400 MHz** | **Airborne Radio Altimeter** |
| **5000 - 5250 MHz** | **NAVAID (Microwave Landing System)** |
| **5350 - 5470 MHz** | **Airborne Radar and Associated Airborne Beacons** |
| **5600 - 5650 MHz** | **Terminal Doppler Weather Radar** |

# Bands Supporting Aviation

| | |
|---|---|
| **7125 - 8500 MHz** | **Radio Communication Link** |
| **8750 - 8850 MHz** | **Airborne Doppler Radar** |
| **9000 - 9200 MHz** | **Military Precision Approach Radar, ASDE-X** |
| **9300 - 9500 MHz** | **Airborne Radar and Associated Airborne Beacons** |
| **13.25 - 13.4 GHz** | **Airborne Doppler Radar** |
| **14.4 - 15.35 GHz** | **Television (video) Microwave Link** |
| **15.7 - 16.2 GHz** | **Airport Surface Detection Equipment (ASDE)** |
| **21.2 - 23.6 GHz** | **Microwave Link (multi-use)** |

# Typical Air Field

ILS Localizer

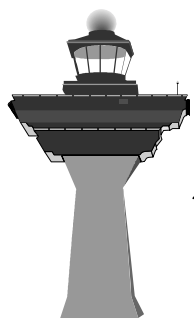
VORTAC

ILS Glide Slope

Inner Marker

Middle Marker

Airport Surface Detection Equipment



Control Tower

Airport Surveillance Radar

# Air / Ground Communication

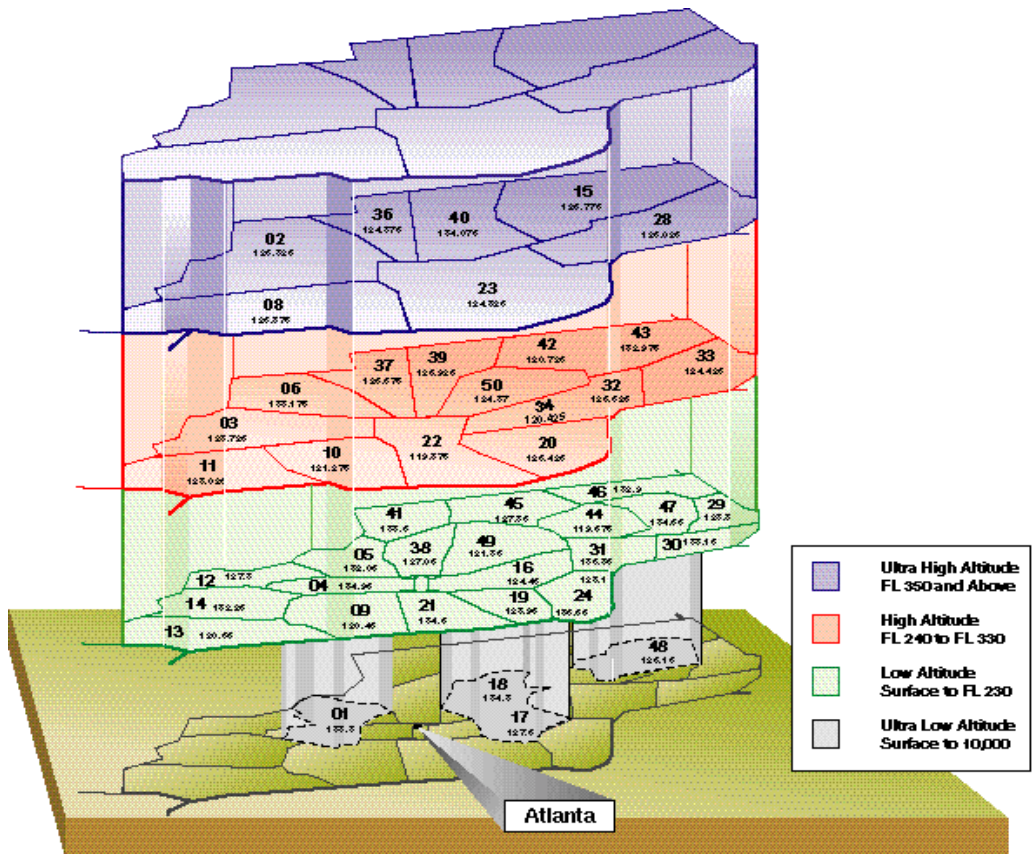
…118-137 MHz band plan in United States

| | |
|---|---|
| **118.000-121.925** | **air traffic control communications (less emergency channel)** |
| **121.950-123.575** | **UNICOM, FSS, Flight Test** |
| **123.600-128.800** | **air traffic control communications** |
| **128.825-132.000** | **aeronautical operational control** |
| **132.025-136.475** | **air traffic control communications** |
| **136.500-137.000** | **aeronautical operational control** |

# *Complexity of Airspace*

## Atlanta Center Airspace

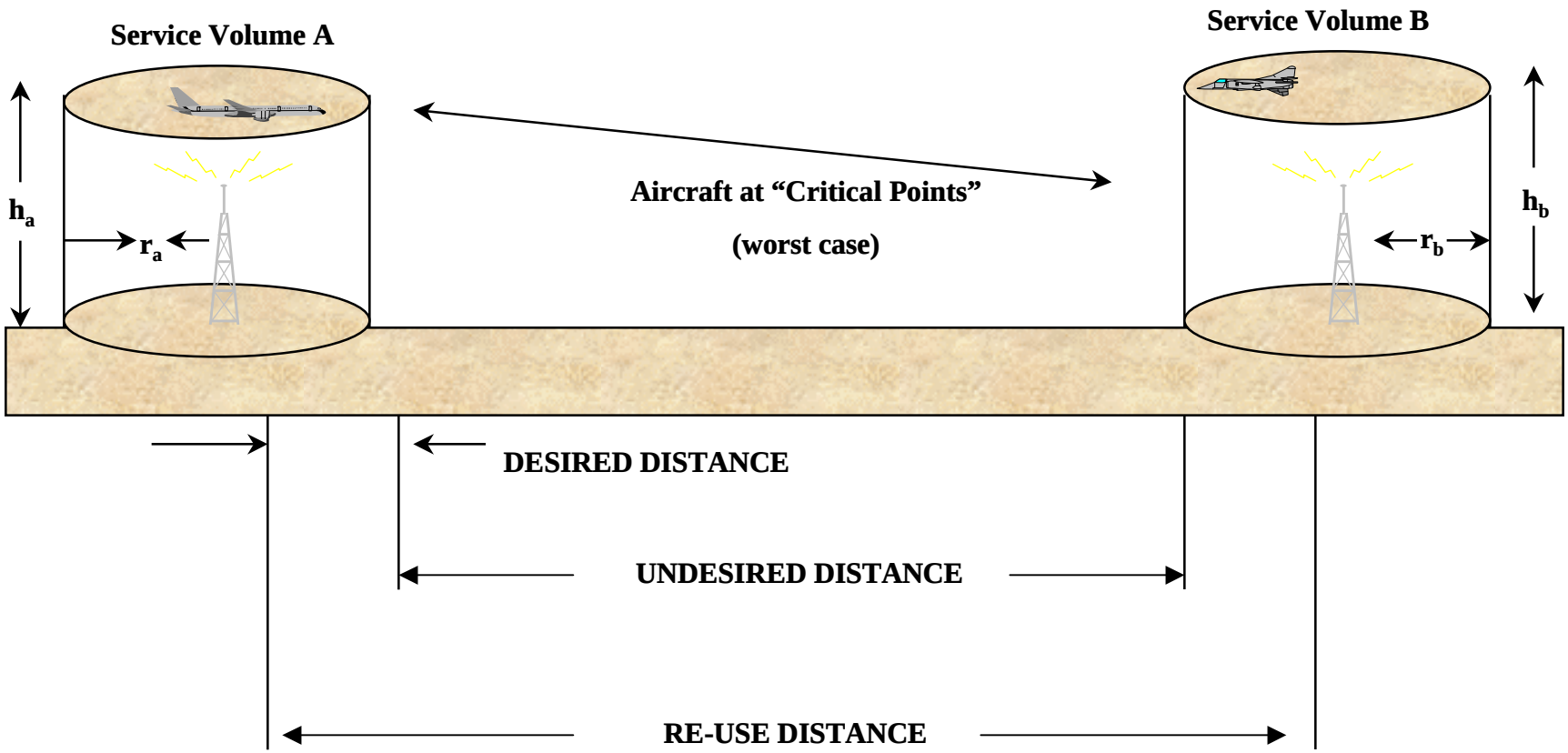
...46 3-Dimensional Sectors (“Cells”)



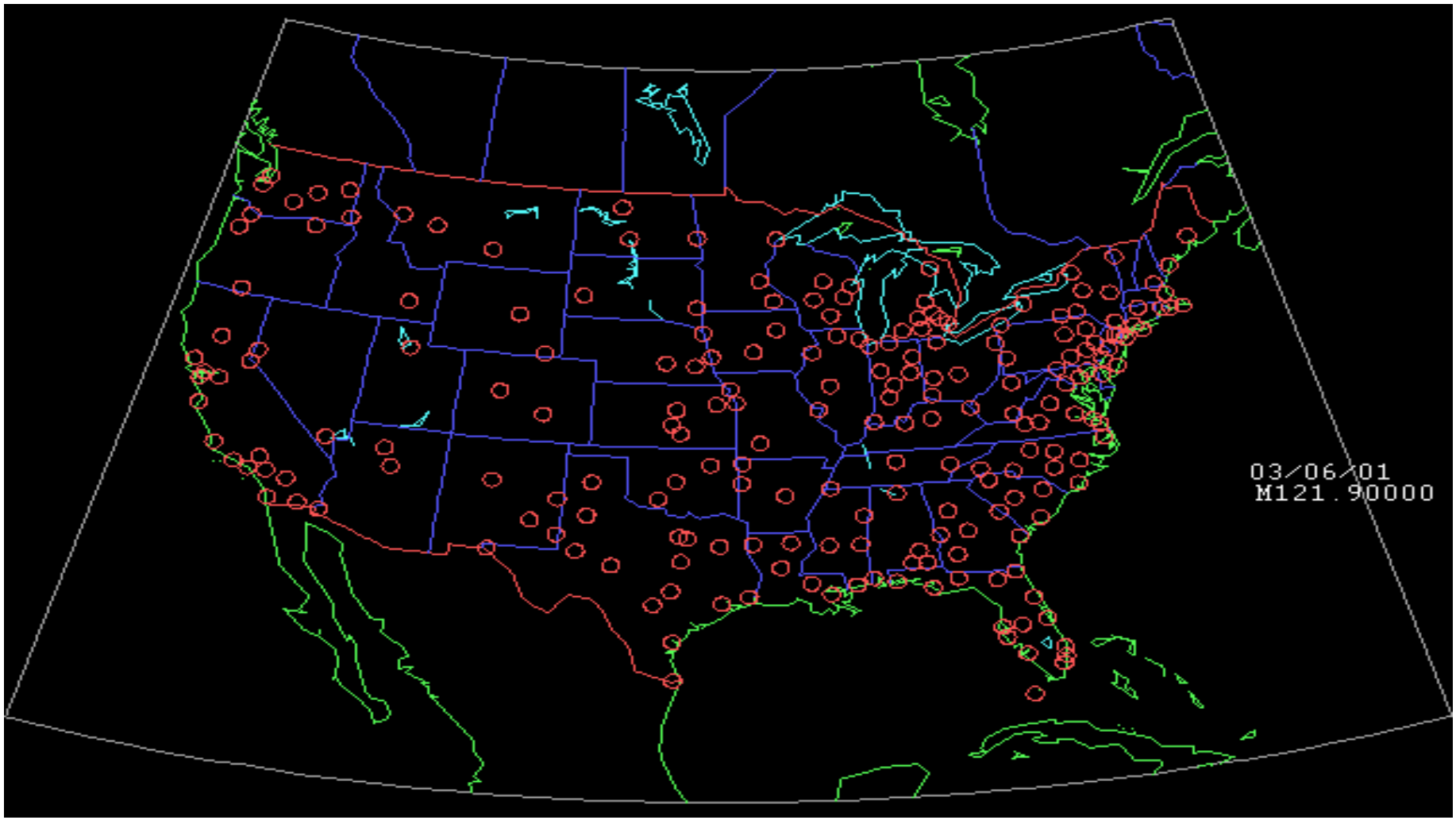

NOTE: each sector has a frequency protected VHF assignment

# *Co-channel Frequency Re-use*

## Air/ground communications
## "14 dB Frequency Protection"

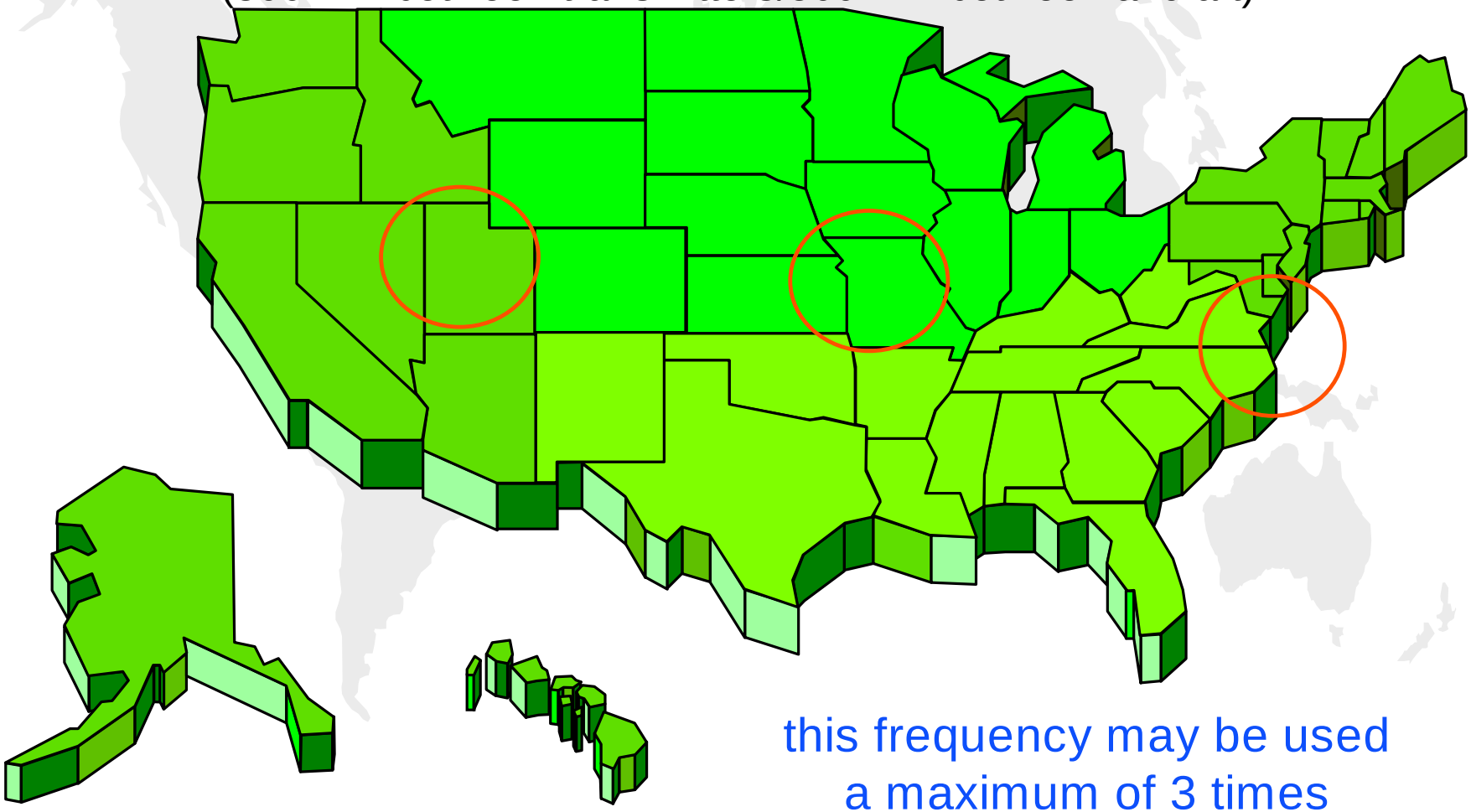


# Frequency Re-use
# Ground Control



# Frequency Re-use
# High En Route

...45,000 feet/150 nmi service radius
(800 nmi between transmitters/500 nmi between aircraft)



this frequency may be used
a maximum of 3 times

# Other Spectrum Management Activities

- Support ICAO
- Strategic Spectrum Planning
- WRC's
- Promote Spectrum to Support New Aviation Capabilities
- RFI Investigation
- Develop Transition Plans
- Radiation Hazard Measurements
- Airspace Case (FM, TV, etc.)

# Summary

**Proper spectrum planning requires committed, forward looking, energetic activities and leadership to support aeronautical safety services**

# National Airspace System (NAS) Infrastructure