The Radio Spectrum: An Essential Resource & Chessboard

- **VLF**
  - $3 \times 10^3$ to $10^4$
  - $3 \times 10^4$ to $3 \times 10^7$

- **LF**
  - $3 \times 10^4$ to $10^5$
  - $3 \times 10^5$ to $3 \times 10^8$

- **MF**
  - $3 \times 10^5$ to $10^6$
  - $3 \times 10^6$ to $3 \times 10^9$

- **HF**
  - $3 \times 10^6$ to $10^7$
  - $3 \times 10^7$ to $3 \times 10^9$

- **VHF**
  - $3 \times 10^7$ to $10^8$
  - $3 \times 10^8$ to $3 \times 10^9$

- **UHF**
  - $3 \times 10^8$ to $10^9$
  - $3 \times 10^9$

**L band**
L1 Capability for Civil Users of GPS

GPS L1 supports over 100 million users:
- maritime
- aviation
- space
- cell phones
- car navigation
- science
- emergency services
Juneau, Alaska
L5 Capability Launched for the FAA’s Wide Area Augmentation System (WAAS)

Launched on Sept 8 & Oct 13, 2005
with L1 & L5 payloads built by Lockheed Martin
L2 Capability for Civil Users of GPS
First Satellite Launched on Sept. 25, 2005

L band
L1
L5 L2
1 GHz
2 GHz
Autonomous Helicopter to Seek Unexploded Ordinance
L Band Capability for Civil Users of Galileo
First Satellite Launched on Dec. 28, 2005

E5  E6  E1

L band

1 GHz  2 GHz
Summary

• GPS is strong
• Soon, GPS will be mighty
• However, it does require our care – do not take success for granted.
  • Budget
  • Spectrum