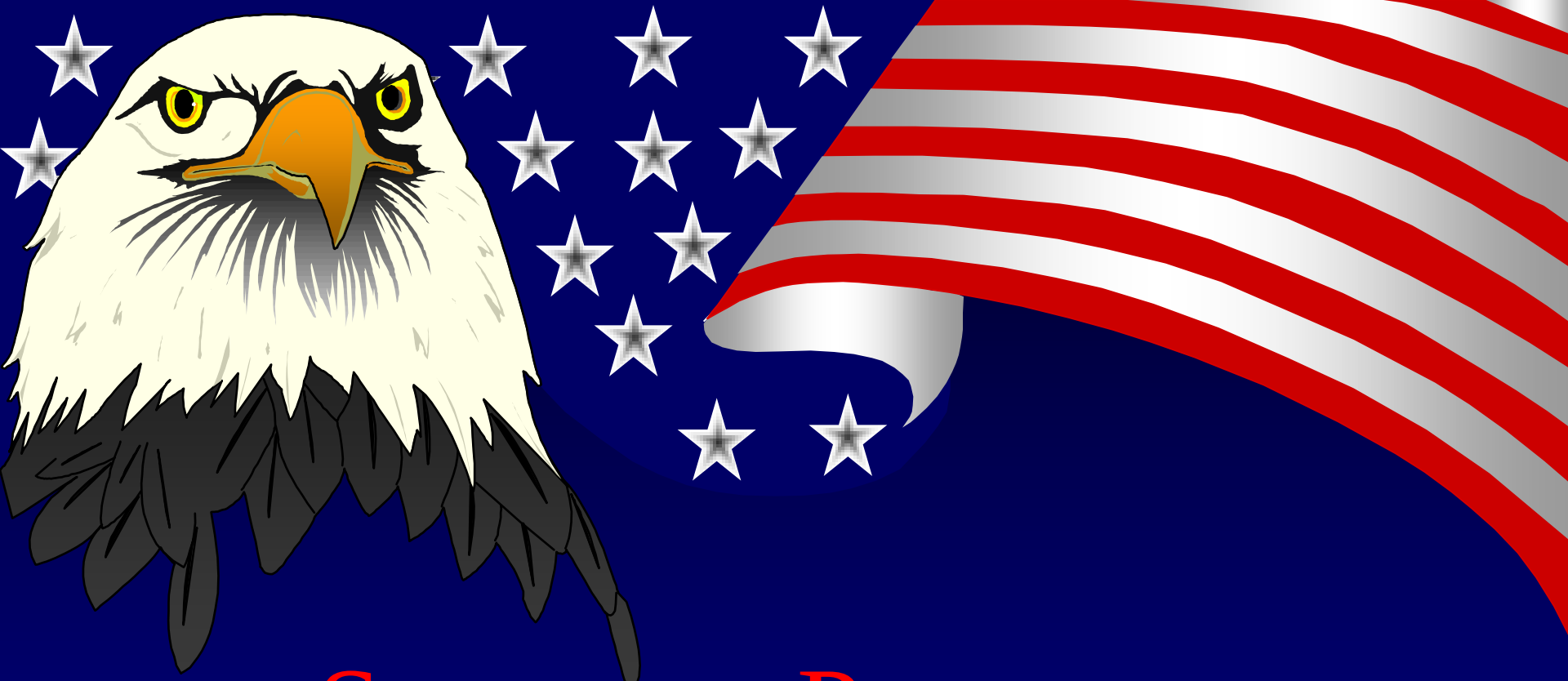

Spectrum Processes:
What does it take to Radiate?

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Briefing Outline

- Introduction
- Spectrum Certification Process
- Frequency Assignment Process
- Office Contact Information
- Presidential Broadband Plan
- Conclusion

INTRODUCTION

- Access to RF Spectrum Is Increasingly Critical to the AF Mission:
  - Needs Are Increasing –
  - Access Threatened by Commercial/International Competing Interests - Threat to Info Superiority Getting Worse
- High Value Spectrum Is Often Over-Allocated - Military Uses Are Often Lower Priority, esp. Outside US
- Spectrum Management Is a Complex, Highly Political Process:
  - Policy and processes governed by Federal Law and DoD Regulations
    - Federal Agency oversight by the National Telecommunications Information Administration (NTIA) as per CFR Title 47
  - Complex National/International Organizational Structures Affect AF's Ability to Influence Spectrum Decisions & Defend Interests
- Current Situation Is Heavily Biased In Favor of Commercial Interests:
  - National/International Spectrum Management Organizational Structure
  - Lack of Understanding of National Security Aspects of Spectrum Allocation In Congress & Most Agencies
  - Huge money maker

What is Spectrum Management

"Planning, coordinating, and managing joint use of the electromagnetic spectrum through operational, engineering, and administrative procedures, with the objective of enabling electronic systems to perform their functions in the intended environment without causing or suffering unacceptable interference."

DoD Operational Challenge

Spectrum Certification Process

Allocation vs. Assignment

- **Allocation (Equipment certification)**
  - **Builder's permit**
  - **Design Data (DD FM 1494)**
    - **Engineering focus**
  - **Customer = Mostly AQ**
  - **Interfere with another community? (broad view)**
  - **Emanation fits US/Host Nation use rules?**
  - **Can drive redesign**
  - **Outcome is MCEB directed operating restraints**

- Assignment (Specific use)
  - License to Radiate
  - Operating Data (Standard Frequency Action Format)
    - Location and Time focus
  - Customer = Warfighter
  - Interfere with neighbor?
  - Receive interference from others?
  - Adhere to Military Communications-Electronics Board (MCEB) operating restraints

Spectrum Certification Process
Spectrum Planning Subgroup Review

- All systems used by DoD in the US require NTIA certification and USMCEB review .
- NTIA review/approval is through the Spectrum Planning Subgroup (SPS)
- Other than the systems listed below, the AFSMO determines which DD Forms 1494 require SPS review.
  - New systems or subsystems and major modifications to existing systems involving use of satellites or spacecraft.
  - All new systems or subsystems and major modifications to existing systems previously reviewed by the SPS if there is a significant impact on the RF spectrum when considering geographical location and frequency availability.
  - Land mobile radio (LMR) trunked systems.
  - Other systems or facilities that the NTIA, Interdepartmental Radio Advisory Committee (IRAC), or other government agencies refer to the SPS.

Spectrum Certification Process

- DoD assigned the responsibility for military frequency engineering and management to the US Military Communications-Electronics Board (USMCEB). To obtain authority to Radiate, there are two processes:
  - DD Form 1494, Application for Equipment Frequency Allocation-certification of spectrum support
  - the frequency assignment proposal or request-operator's license.
- The USMCEB, through the SPS, reviews the characteristics of C-E equipment purchased or developed by the DoD.
- Joint Frequency Equipment Allocation Process (also called the J/F-12 Process)
  - defined by requirements established by NTIA/SPS, and military joint or allied system review groups.

Getting The Spectrum Support Process Started

- RF transmitting or receiving device design must be presented on a DD Form 1494 as early as possible in the acquisition (or modification) process. This is required regardless of power output.
- Inclusion of DFAR clause 252.235-7003 in contracts involving these (RF) devices is recommended.
- Including the DD Form 1494 in the CDRL for Stage 3 and Stage 4 is a requirement. These reflects the contractor's developmental and production equipment.
- Completed DD Form 1494 should be submitted to the Program Office (PO) designated as the lead agent for the program.

Spectrum Certification
Stage Definition

- DD Form 1494-Stage Definition
  - Stage 1 Conceptual: Usually for Lab concepts and development. Completed prior to possible obligation of Government funds.
  - Stage 2 Experimental: Usually for all PO's and approval is required prior to Government obligation of funds. The Form is completed by the PO and reflects the specified technical parameters as calculated by the engineering staff.

Spectrum Certification Stage Definition

- DD Form 1494-Stage Definition (cont)
  - Stage 3 Development: At this stage the contractor is responsible for completing the form. The program should have just completed its final technical review. This stage provides the contractor's position for the device and once approved, would allow the contractor to perform open air testing prior to a production decision. The approval of this stage will allow frequency assignments for test purposes only.
  - Stage 4 Operational: At this stage, the contractor is responsible for completing the form. The data provided shall be measured from one of the first production or LRIP units. With approval of this stage, operational frequency assignments are requested for the operating locations with the exception of OCONUS locations.

TRANSMITTER EQUIPMENT CHARACTERISTICS

1. NOMENCLATURE, MANUFACTURER'S MODEL NO
(U) TN-X/30

2. MANUFACTURER'S NAME
(U) Northern Radio and Wireless

3. TRANSMITTER INSTALLATION
(U) Fixed

4. TRANSMITTER TYPE
(U) QAM Communications

5. TUNING RANGE
(U) 7442 MHz - 7883 MHz

6. METHOD OF TUNING
(U) Synthesizer

7. RF CHANNELING CAPABILITY
(U) 7442 MHz, 28 MHz increments

8. EMISSION DESIGNATORS
(U) 28M0D7W (U) (U)

9. FREQUENCY TOLERANCE
(U) 10 ppm

10. FILTER EMPLOYED
(U) [X] a. YES [ ] b. NO

11. SPREAD SPECTRUM
(U) [ ] a. YES [X] b. NO

12. EMISSION BANDWIDTH
[ ] CALCULATED [X] MEASURED

a. -3 dB	(U) 22 MHz	(U)	(U)
b. -20 dB	(U) 26 MHz	(U)	(U)
c. -40 dB	(U) 36 MHz	(U)	(U)
d. -60 dB	(U) 44 MHz	(U)	(U)
e. OC-BW	(U) 28 MHz	(U)	(U)

13. MAXIMUM BIT RATE
(U) 171.7 Mbps

14. MODULATION TECHNIQUES AND CODING
(U) 128 QAM; FEC

15. MAXIMUM MODULATION FREQUENCY
(U) NA

16. PRE-EMPHASIS
(U) [ ] a. YES [X] b. NO

17. DEVIATION RATIO
(U) NA

18. PULSE CHARACTERISTICS

a. RATE	(U) NA	(U)	(U)
b. WIDTH	(U) NA	(U)	(U)
c. RISE TIME	(U) NA	(U)	(U)
d. FALL TIME	(U) NA	(U)	(U)
e. COMP RATIO	(U) NA	(U)	(U)

19. POWER

a. MEAN	(U) 1.4 mW - 1.35 W	(U)	(U)
b. PEP	(U) NA	(U)	(U)

20. OUTPUT DEVICE
(U) Solid state

21. HARMONIC LEVEL

a. 2nd	(U)	-45 dB
b. 3rd	(U)	-45 dB
c. OTHER	(U)	-45 dB

22. SPURIOUS LEVEL
(U) -109 dB

23. FCC TYPE ACCEPTANCE NO.
(U) CXP7UJ8X30A1

24. REMARKS (U) Item 10: 6-pole waveguide filter.

RECEIVER EQUIPMENT CHARACTERISTICS

NOMENCLATURE, MANUFACTURER'S MODEL NO.
(U) TN-X/30

2. MANUFACTURER'S NAME
(U) Northern Radio and Wireless

. RECEIVER INSTALLATION
(U) Fixed

4. RECEIVER TYPE
(U) Singel Conversion Superheterodyne

TUNING RANGE
(U) 7442 MHz - 7883 MHz

6. METHOD OF TUNING
(U) Synthesizer

8. EMISSION DESIGNATORS
(U) 28M0D7W

RF CHANNELING CAPABILITY
(U) 7442 MHz, 28 MHz incr.

11. RF SELECTIVITY
[ ] CALCULATED [X] MEASURED

FREQUENCY TOLERANCE
(U) 10 ppm

10. IF SELECTIVITY	1st (U)	2nd (U)	3rd (U)
a. -3 dB	32 MHz	NA	NA
b. -20 dB	52 MHz	NA	NA
c. -60 dB	64 MHz	NA	NA

a. -3 dB	(U)	52 MHz
b. -20 dB	(U)	70 MHz
c. -60 dB	(U)	140 MHz
d. Preselection Type	(U)	SAW/Waveguide

12. IF FREQUENCY
140 MHz

13. MAXIMUM POST DETECTION FREQUENCY
(U) NA

14. MINIMUM POST DETECTION FREQUENCY
(U) NA

NA

16. MAXIMUM BIT RATE
(U) 171.7 Mbps

15. OSCILLATOR TUNED	1st (U)	2nd (U)	3rd (U)
a. ABOVE TUNED FREQUENCY			
b. BELOW TUNED FREQUENCY			
c. EITHER ABOVE OR BELOW THE FREQUENCY	X		

17. SENSITIVITY

a. SENSITIVITY	(U)	- 68 dBm
b. CRITERIA	(U)	BER=10x-6
c. NOISE FIG	(U)	2.9 dB
d. NOISE TEMP	(U)	NA

18. DE-EMPHASIS
(U) [ ] a. YES [X] b. NO

19. IMAGE REJECTION
(U) 120 dB

20. SPURIOUS REJECTION
(U) 130 dB

21. REMARKS (U)

ANTENNA EQUIPMENT CHARACTERISTICS

1. (U) [ ] a. TRANSMITTING [ ] b. RECEIVING [X] c. TRANSMITTING AND RECEIVING

2. NOMENCLATURE, MANUFACTURER'S MODEL NO.
(U) PL4-71W

3. MANUFACTURER'S NAME
(U) Andrew Corporation

4. FREQUENCY RANGE
(U) 7100 MHz - 8500 MHz

5. TYPE (U) Parabolic Reflector

6. POLARIZATION
(U) Linear Horizontal/Vertical

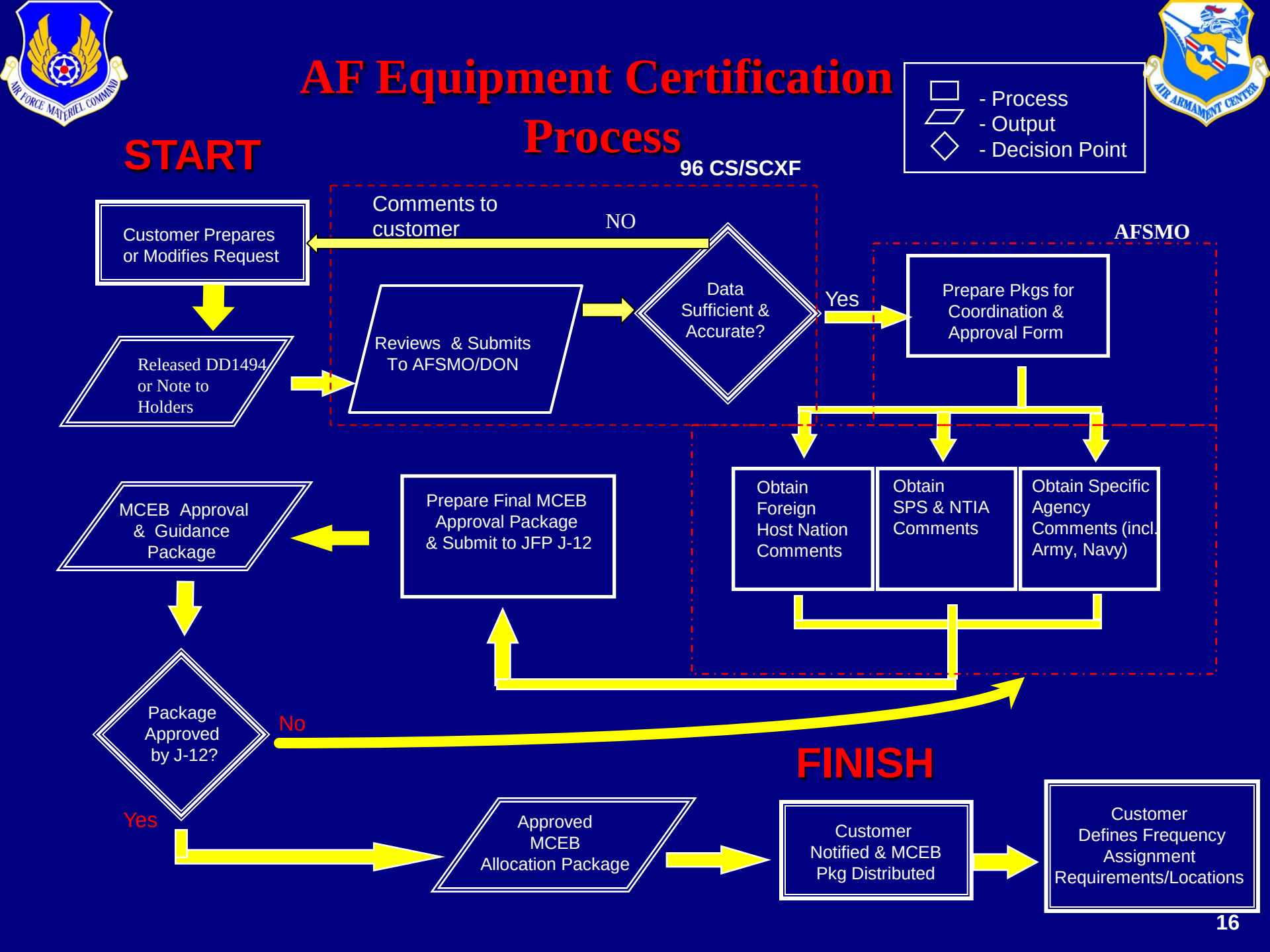
7. SCAN CHARACTERISTICS
a. TYPE (U) FIXED
b. VERTICAL SCAN (U) NA
(1) Max Elev (U) NA
(2) Min Elev (U) NA
(3) Scan Rate (U) NA
c. HORIZONTAL SCAN (U) NA
(1) Sector Scanned (U) NA
(2) Scan Rate (U) NA
d. SECTOR BLANKING (U) [ ] (1) YES [X] (2) NO

8. GAIN
a. MAIN BEAM
(U) 36.5 dBi
b. 1st MAJOR SIDE LOBE
(U) 20 dBi @ 5 deg

9. BEAMWIDTH
a. HORIZONTAL
(U) 2.2 deg
b. VERTICAL
(U) 2.2 deg

10. REMARKS (U)

AF Equipment Certification Process



PROBLEM AREA
ACQUISITION REFORM

FAST TRACK PROCUREMENT

puts

FREQUENCY APPROVAL

on

Critical path

Spectrum Certification Process
Note to Holder

- Use the MCEB Note-to-Holder for amendments and updates to approved DD Forms 1494 (J/F-12) documents and MCEB memoranda.
- Note-to-Holder requests are sent through 96 CS/SCXF to the AFSMO and follow same process as DD Form 1494.
- Distribute host nation comments to applications by a Note-to-Holder. A Note-to-Holder to distribute host nation and CINC comments received about an application is created by the AFSMO, approved by the MCEB J-12 Permanent Working Groups, and distributed to the MCEB J-12 distribution list.

FREQUENCY

ASSIGNMENT PROCESS

Allocation vs. Assignment

- Allocation (Equipment exam)
  - Builders permit
  - Design Data (DD FM 1494)
    - Engineering focus
  - Customer = Mostly AQ
  - Interfere with another community? (broad view)
  - Emanation fits US/Host Nation use rules?
  - Can drive redesign
  - Outcome is MCEB directed operating restraints

- **Assignment (Specific use)**
  - **License to Radiate**
  - **Operating Data (Standard Frequency Action Format)**
    - **Location and Time focus**
  - **Customer = Warfighter**
  - **Interfere with neighbor?**
  - **Receive interference from others?**
  - Adhere to Military Communications-Electronics Board (MCEB) operating restraints

FREQUENCY ASSIGNMENT PROCESS

- Before making a frequency assignment, the USMCEB must review the RF equipment via an approved DD Form 1494 (J/F 12)
- For all equipment developed at Eglin, the Eglin Installation Spectrum Manager (ISM) is required to request assignments for **ALL LOCATIONS** in which that equipment is planned to operate.
- The Installation Commander, through the ISM, can prohibit use of ANY RF emitter (cease and desist) when anticipating interference to mission essential electromagnetic equipment.
- All RF emitters must have a frequency assignment prior to operation. DoD GAFC has inherent authority from NTIA to make assignments as deemed necessary to meet mission requirements. A DD Form 1494 must have been submitted before this is valid.

Frequency Coordination

- The DoD does not own any spectrum exclusively for military use. In fact, spectrum is not owned by any organization,
- It is “allocated” or managed by either the FCC (state, local, public and private users) or the NTIA (federal users). These two agencies manage all of the spectrum for the US.
  - Example: The DoD manages the spectrum between 225 MHz and 399.9 MHz for the federal government (NTIA) through the Military Assignment Group but is used by both DoD and FAA.
- When it is necessary for the Air Force to use frequencies managed by another federal department or agency, the Air Force must coordinate with the appropriate agency prior to submitting a frequency request to the NTIA for assignment action.

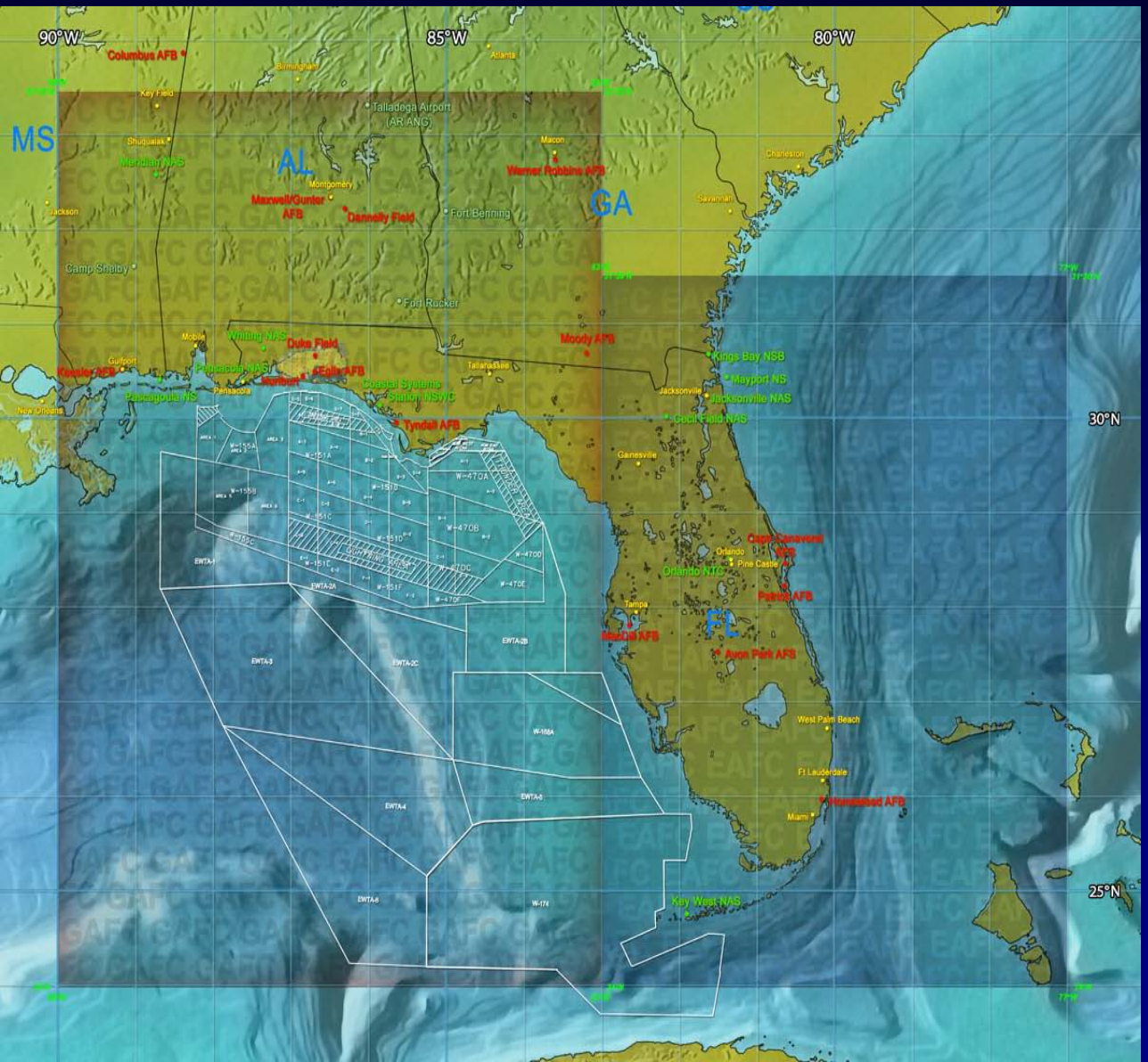
AFSMO lead-times

- For US&P operations
  - **Permanent Assignments. Sixty days.**
  - **Experimental Assignments. Sixty days.**
  - **In most cases, additional lead-time is required for all actions requiring coordination with the FCC or the FAA.**
  - **Requirements not in accordance with the national table of allocations, or have unusual technical parameters, may require additional engineering time or study, consequently requiring even longer lead-times. It is not uncommon for such requests to take more than six months at the national level.**

Contractor Use of Frequencies.

- Air Force contracts.
  - Contractors must submit frequency requests in direct support of Air Force contracts through the PO representative to the ISM.
  - The contractor must obtain frequency assignments from the FCC for requirements not in direct support of an AF contract. Example: Foreign direct sale of a military article.
- Multiple service contracts.
  - Contractors must submit frequency requests in support of a multiple service contract through the appropriate spectrum management channels to the military department that is the executive service for the contract.
  - The contractor must obtain frequency assignments from the FCC for requirements not in direct support of the contract.

DoD GAFC AOR/Contact Info



DoD GAFC AOR REPRESENTS 313,200 SQ MILES

EGLIN LAND RANGE 724 SQ MILES

TOTAL AIRSPACE AVAILABLE TO EGLIN INCLUDING MOAS APPROX. 134,000 SQ MILES

Contact

DOD Gulf Area Frequency Coordinator
96 CS/SCXF
201 W. Eglin Blvd., Ste. 256
Eglin Air Force Base, FL 32542-6829
Tel: 850-883-7535

Presidential Wireless Broadband Plan

- Signed in June 2010
- Locate 500 MHz of spectrum for wireless broadband application: plan signed in Oct 2010
  - Study 11 Bands-both Federal and non-Federal allocations
- Vacate bands within 10 years
- First priority to vacate: 1755-1850 MHz TM band
  - May sell off 1755-1780 in first round – Vacate in 5 years
  - Second round to include 1780-1850 MHz – Vacate in 10 years
  - NTIA rule: no new system allowed in this band-status quo
  - UAVs cannot co-exist with other systems merging into compressed band: 1780-1850 MHz
  - UAV operations impacted CONUS wide: may require exclusion zones for continued operations

Conclusion

- **RF Spectrum is a** scarce **and** finite **“**NATURAL RESOURCE**” and a “Cash Cow”.**
- **Certifications and Assignments required before authority to “Radiate” can be granted.**
- **Used world wide: processes must be followed for interoperability amongst all users .**
- **Certifications and Assignments are required under the authority of NTIA Manual/CFR Title 47 as well as DoD and Service Acquisition Regulations**
- **Loss of spectrum will see movement into new bands**
  - **New technical challenge: relocate without capability losses**

QUESTIONS ?????