International Consortium for Telemetry Spectrum

Encroachment Threats to Aeronautical Telemetry in the USA: Update #13

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Background: Where It Started

In furtherance of Presidential Directives (June 2010/July 2013) for reallocation of 500 MHz for commercial terrestrial ultra-broadband Internet access, the USA's National Telecommunications & Information Administration (NTIA) and Federal Communications Commission (FCC) extensively studied the feasibility of **sharing** (instead of total migration from) the Government 1755-1850 MHz band with commercial broadband mobile systems, known as **Fourth Generation** (4G) or **Long Term Evolution** (LTE) technology. Many crucial, pricy Department of Defense (DoD) systems, including Aeronautical Mobile Telemetry (AMT), heavily utilize this band, usually at the Research, Development, Test & Evaluation (RDT&E) Ranges.

1755-1850 MHz Band Sharing Studies 1

- Three major studies were conducted:

(1) NTIA led assessment 2011 – 2012 which determined complete band migration by Federal Agencies was possible but very expensive and would take too long, and . . .

(2) By the President's Council of Advisors on Science and Technology (PCAST), who released a groundbreaking report (2012) that concluded that the traditional approach of clearing spectrum used by government agencies and then auctioning it off for exclusive private sector use was becoming too costly, too time-consuming and too disruptive to be sustainable. The future, the PCAST report concluded, lies in sharing spectrum across time, space and other dimensions….. And Study (3):

1755-1850 MHz Band Sharing Studies 2

(3) A joint Government and industry group effort with representatives/experts (2012-2013) under the auspices of the Commerce Spectrum Management Advisory Committee (CSMAC), which determined sharing alone was impractical. (Note ICTS Member Tim Chalfant was the CSMAC AMT Sub-Working Group Co-Chairman, plus other ICTS Members directly contributed to this effort.) So . . .

- To break the stalemate the DoD submitted an alternative proposal.

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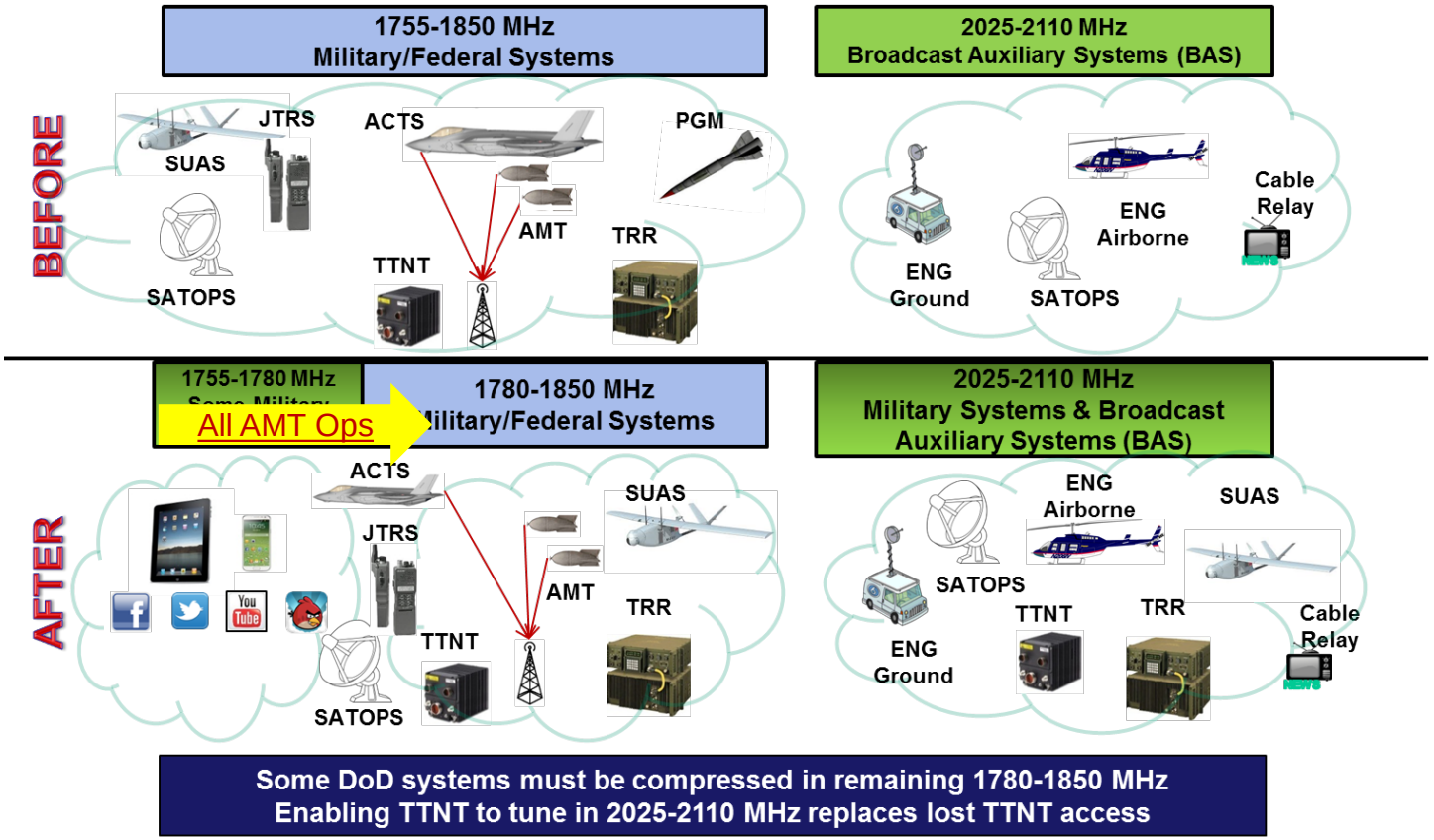
A Complex Hybrid Sharing Solution



AMT - compress telemetry operations currently in 1755-1850 MHz into 1780-1850 MHz and leverage C-Band spectrum access

A Complex Hybrid Sharing Solution

- DoD/Federal Agencies/NTIA considered complete relocation of federal systems from the entire 95 MHz band. Assessed Cost: $18B, $12.9B for the DoD alone!
- The FCC and industry (particularly the CTIA/Cellular Telecommunications Industry Association & T-Mobile) said they *"can only use"* (translated: ***"afford for now"***) the lower 25 MHz: 1755-1780 MHz.
- Hybrid proposal has the DoD mostly vacating 1755-1780 MHz in exchange for $3.5 billion ($485 million for AMT), compression into and retention of 1780-1850 MHz, and shared access to the 2025-2110 MHz band:
  - 1780-1850 MHz remains a Government-only band with indefinite access by the DoD.
  - The DoD obtains access to the 2025-2110 MHz band, sharing with commercial Electronic News Gathering Services (ENG).

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What the DoD RDT&E Ranges Will Do

- Compress AMT capabilities currently between 1755-1780 MHz into the 1780-1850 MHz band as quickly as possible.
- The DoD RDT&E Ranges, with their Planning Charters already approved, will utilize the majority of the identified $483 million in migration compensation funds to:
  - * Re-design fixed frequency AMT transmitters.
  - * Replace remaining Tier 0 (FM waveform) transmitters with Tier 1 & (perhaps) Tier 2 spectrum efficient AMT transmitters
  - * Make all Ground Stations/aircraft L-/S-/C-Band capable
  - * Filter AMT receivers/antennas to protect them from 4G/LTE systems
  - * Buy new Mobile AMT transmitter capabilities
  - * Buy new frequency monitoring hardware/software/personnel
  - * Secure new 1780-1850 MHz band frequency assignments.

DoD RDT&E Ranges SRF Transition Plan

Aircraft

- Upgrade to remotely controllable spectrum agile transmitters:
  - Allows real-time control of transmitter characteristics during flight.
  - Center frequency, modulation type, power level, on/off, etc.
- Upgrade to multi-tier transmitters:
  - SOQPSK minimum, SOQPSK & CPM capable is preferred

Ground Stations

- Upgrade all multi-tier modulation receivers.
- Upgrade infrastructure to support remotely controllable spectrum agile transmitters.
- Make all Ground Stations L/S/C-Band capable (spectral flexibility):
- Protect all ground antennas against overload from LTE systems in 1755-1780 MHz (Mr. Kip Temple's 2016 NICHOL's Award).

DoD Ranges SRF Transition Plan cont.

Mobile Ground Stations

- To facilitate the transition mobile systems would provide telemetry coverage while a fixed ground station undergoes modification.

Spectrum Analysis, Software Upgrades and Conflict Mitigation Network/Capabilities:

- Necessary engineering studies and de-confliction software upgrades.
- New spectrum monitoring/interference-control/geo-locating systems, mix of mobile & fixed stations.

Scope of Technology Upgrades

Provide Spectrum Efficient Multi-Band Aircraft TM Systems

* Focus on new generation of transmitters, receivers, transceivers & antennas.

Evaluate Space-Time Coding & Low Density Parity Check Applicability

* New technology included in IRIG-106-15.

Coordination with the following:

* Between all the DoD Ranges via:
  - Range Commanders Council RF Committee & FM/TM WGs.
  - Range Spectrum Requirements Working Group.
  - Spectrum Stewardship Senior Steering Group.
* Technical interchanges with equipment vendors.
* Allies worldwide via the ICTS.

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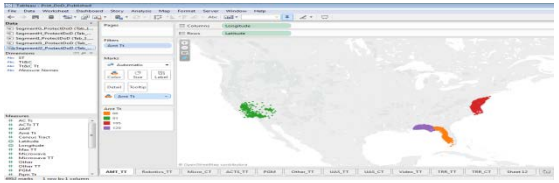
Shared Use Prior to AMT Migration via A New WEB-based Coordination Portal

- FCC Public Notice (DA 14-1023, 18 July 2014) provided guidance regarding coordination between Federal/non-Federal shared use of the 1755-1780 MHz band. This coordination between the commercial LTE users and the current DoD AMT operations will be done through a **Portal**.



This image provides graphical depiction of the coordination zones associated with DoD AMT systems operating in the 1755-1780 MHz band.

- Exclusion zones that are laid out will protect AMT from the AWS-3 LTE deployments proposed for operation within the coordination zones of an existing DoD AMT station. These zones are varied depending on locale *(roughly 80 kilometers for our Edwards AFB)* from the boundaries of our restricted airspace and warning areas. The **DoD Portal** is being set up to coordinate and facilitate industry requests to deploy systems ***INSIDE*** these exclusion zones **prior** to the completion of our transition out of the 1755-1780 MHz band into the 1780-1850 MHz band *(i.e., 102 months after our initial receipt of auction migration funds in June 2016.)*

What Happens If We Say “NO”? 1

❖ For example, if AT&T comes in and proposes to deploy a 4G/LTE network within 60-80 kilometers of our Edwards AFB before 2022, if the data/final analysis flashes **RED** we will say “**NO**.” Our ability to say "**NO**" is directly related to the approved Service Transition plans that were approved by NTIA, FCC and the Office of Management and Budget (OMB). OMB approved these plans on behalf of the White House.

❖ The political pressure will be there but a significant amount of pressure by the FCC and OMB is protecting us as well. The DoD Chief Information Office is using the fact that the NTIA, FCC & OMB approved these Service transition plans (per Public Law) and will insist they uphold those agreements.

What Happens If We Say "NO"? 2

❖ When DoD/a service does not support the carrier request ("**NO**") and the carrier still pursues access, this will key a separate process to get the National Advanced Spectrum and Communications Test Network (NASCTN) involved to see if there is anything that can be done to accommodate compatible operations with the incumbent Federal systems.

❖ The **NASCTN** was established by the Department of Commerce in 2015 in order to organize a trusted, collaborative national network and capability for Federal, academic, and commercial spectrum users that would provide testing, modeling and analysis necessary to develop and deploy spectrum-sharing technologies and inform future spectrum policy and regulations.

QUESTIONS?