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C-Band Working Group Update

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Agenda

- C-Band Overview
- Spectrum Use Trends
- Why Use C-Band
- C-Band Current Utilization
- C-Band Implementation Resources
- Conclusions

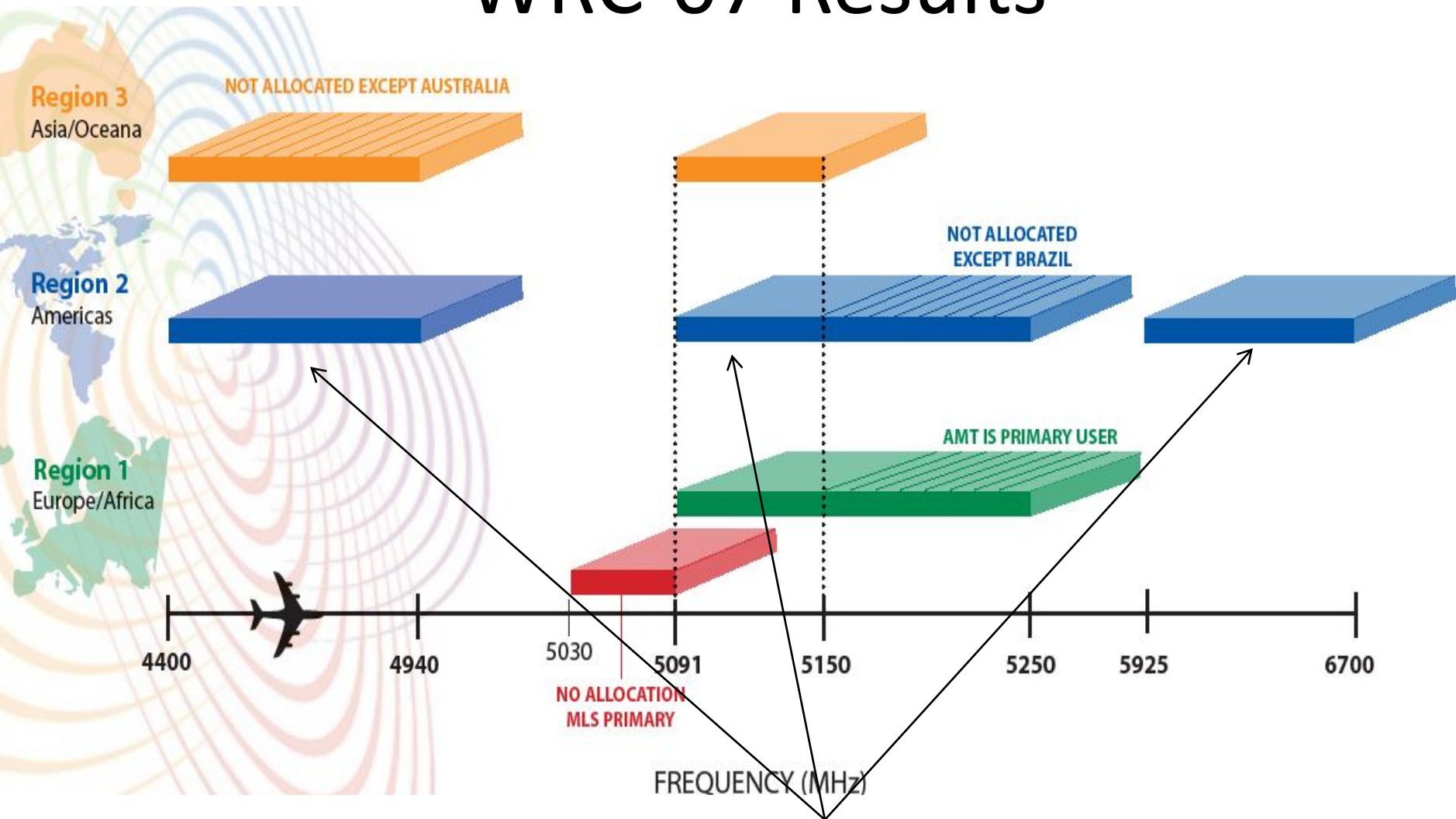
C-Band Overview

- **World Radio Conference (WRC) 2007 approved a C-Band allocation for “Airborne Mobile Telemetry” (AMT)**
 - 4400 to 4940 MHz ITU Region 2
 - 5091 to 5150 MHz All ITU Regions
 - 5150 to 5250 MHz ITU Region 1
 - 5925 to 6700 MHz ITU Region 2
- **IRIG STANDARD 106-11, Chapter 2 defined C-Band as**
 - Lower C-band 4400 - 4940 MHz
 - Middle C-band 5091 - 5150 MHz
 - Upper C-band 5925 - 6700 MHz

Reference: http://www.wsmr.army.mil/RCCsite/Documents/106-11_Telemetry%20Standards/chapter2.pdf

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WRC-07 Results



1.4 GHz of RF Spectrum Awarded to Support Aeronautical Telemetry

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Spectrum & Data Rate Trends



Now: F-35/JSF

- Data Rate: Links potentially capable of 14 Mbps
- Each test mission can generate ~ 1 TB of data, most of which is recorded



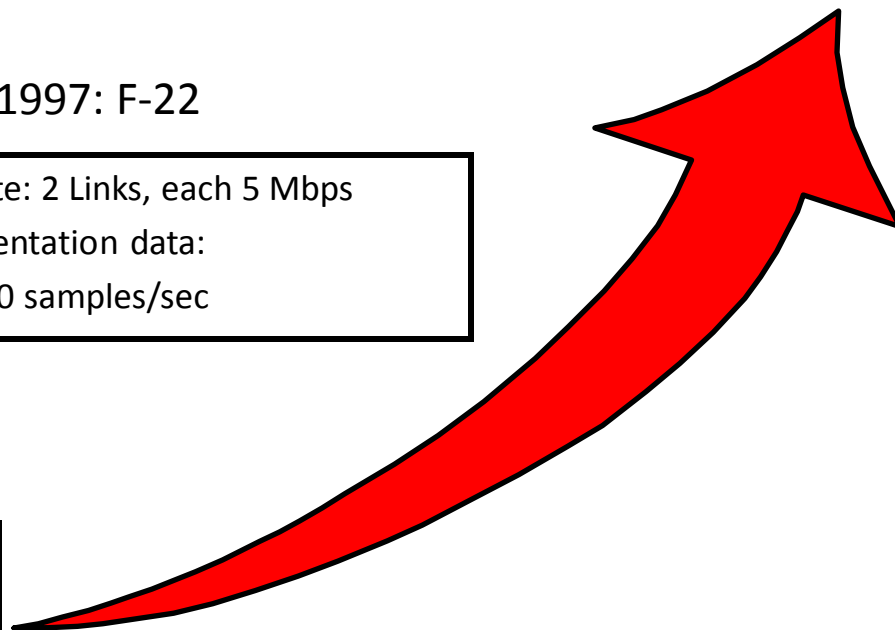
1997: F-22

- Data Rate: 2 Links, each 5 Mbps
- Instrumentation data:
 - 800 samples/sec



1986: F-15

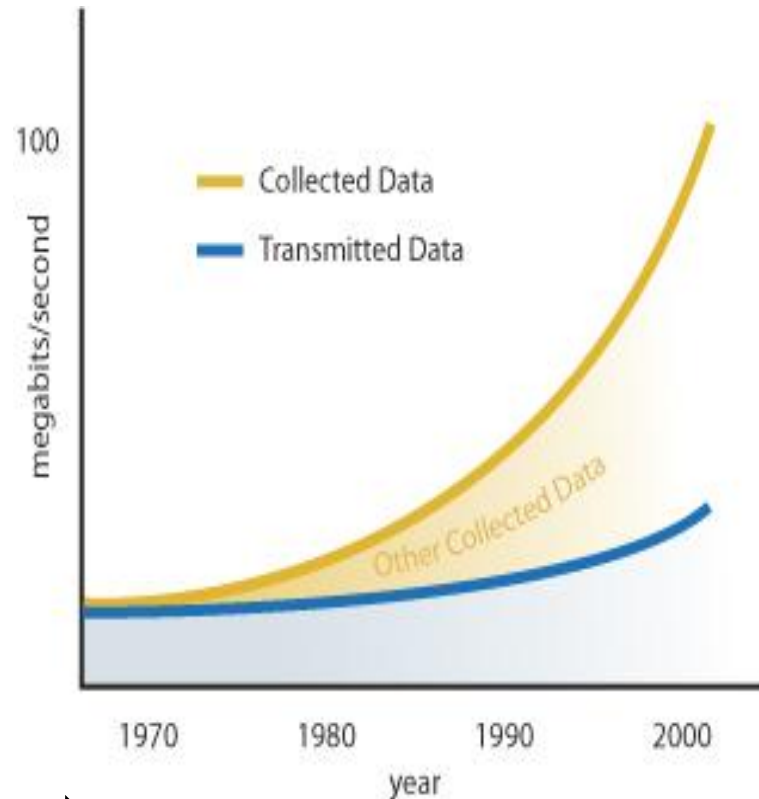
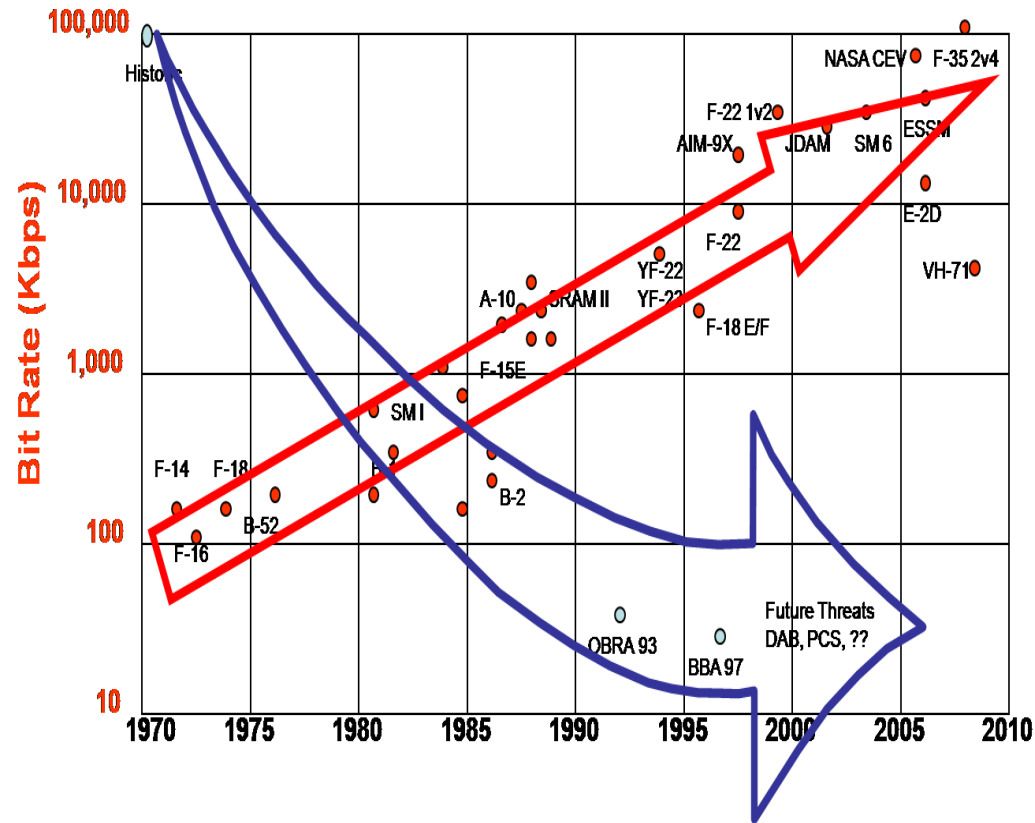
- Data Rate: 1 Link, 256 kbps
- Instrumentation data:
 - 20 samples/sec



Increasingly complex systems have exponentially increased data rate

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Spectrum & Data Rate Trends



Decreasing spectrum availability &
Increasing system complexity

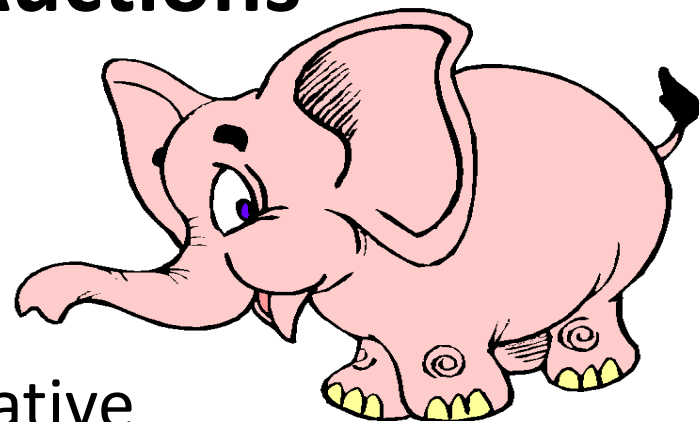
Leads to

Large amounts of data being
recorded onboard the test
platform

Why use C-Band Now ?

- As a way to alleviate today's Spectrum congestion by augmenting operations using C-Band
 - T&E mission execution delays caused by L/S spectrum assignments constraints
 - Improve mission capabilities with services not possible using current L/S allocations
 - “Use it or lose it”... Spectrum not being used is always a prime target for others who want additional spectrum
- Preparing for future spectrum auctions by experimenting with C-Band

The “Elephant in the Room” Future Spectrum Auctions



- Pending Policy & Regulatory actions
 - FCC “*National Broadband Plan*”
 - President Obama’s 500 MHz Initiative
- 1755 to 1850 MHz relocation report just released
- Other DOD Spectrum allocations may (will?) be proposed for auctions
- Spectrum Auctions are here to stay

Can C-Band be used **NOW?**

- Short answer **YES**
 - On any DOD *Major Range and Test Facility Base (MRTFB)*
 - National Telecommunications and Information Administration Agency (NTIA) Regulations, Paragraph 7.11 “Use of Frequencies by Certain Experimental Stations”
 - On any non-DOD MRTFB using “Temporary” assignments
 - FCC currently working with NTIA to formalize allocations allowing permanent assignments in *Manual of Regulations and Procedures for Federal Radio Frequency Management (Redbook)*

Who is using C-Band now ?

- United States Navy
 - PAX River
 - Carrier Suitability Test telemetry
 - Rotary Wing testing telemetry
- United States Air Force
 - Edwards AFB
 - Test Pilot School support telemetry
 - Foreign Military Sales support telemetry
 - Eglin AFB
 - Ground mobile target vehicles video links

C-Band Implementation Resources

- Working Group(s)
 - Range Spectrum Requirements Working Group
 - **Test Resource Management Center (TRMC) C-Band Working Group**
 - Missile Defense Agency C-Band Working Group
 - Raytheon C-Band Working Group
- TRMC C-Band Working Group
 - Monthly Telecons discuss current C-Band test results and Range Peer C-Band activities
 - Bi-Annual Face to Face Meeting held day prior to RCC/Telemetry Group meeting
 - On Line Information Portal (DOD ONLY)

C-Band Implementation Resources cont.

C-Band Deployment experts

– AFFTC/Edwards AFB

- Kip Temple, Instrumentation Systems
 - (661) 527-1604
- Robert Selbrede, Range Systems
 - (661) 527-1179

– AAC/Eglin

- Nathan King, Range Systems
 - (850) 882-3248

– NAVAIR/PAX

- Robert Myers, Range Systems
 - (301) 342-8739
- Bruce Johnson, Instrumentation Systems
 - (301) 342-3816

Conclusions

- C-Band Spectrum Assignments to support aeronautical Applications are available **NOW** !
- C-Band performance is very similar to S-Band
- C-Band implementation resources are available to assist anyone investigating use of C-Band to support T&E missions