



What is the Future of Telemetry at Armstrong Flight Research Center?

18 May 2022



Agenda



- Purpose
- Drivers Influencing Telemetry Evolution
 - DoD Investment
 - Technology Infusion
 - Relevancy
- Possible Solutions that support the Future of Telemetry
 - iNET discussion by Bruce Lipe - NASA's preparation efforts
 - Cellular based capability
- Reasons to Reimagine Telemetry at NASA Armstrong



Purpose



- Armstrong Flight Research Center executes aeronautical research and development for NASA. Telemetry is a key data component used to validate the R&D process and more importantly provide a critical safety element. This presentation will offer information that supports efforts to investigate the Future of Telemetry at a Test Range, specifically AFRC.
- There are several solutions that can support the next generation telemetry needs of Armstrong
- Cellular network telemetry is a plausible solution



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George Rumford (TRMC) Key Topics Discussed

– **Cellular TM**

- 5G/6G Focus

– **Hyper TM**

- Realtime downlink (strip-n-ship) network to include satellites

– Range Hawk

- Possibility of up to 27 Global Hawks (negotiating for Block 30s now)

– ~1.9 Billion – FY22/23 Congressional plus up

- Yearly TRMC infrastructure budget ~\$500M
- Three Investment portfolios (T&E S&T, CTEIP, JMETC - Joint Mission Environment Test Capability)

– **Next Spectrum Sell Off (AWS-X)** – 100Mhz of spectrum, what next?

– **Speed, Speed, Speed** - (to get technology to warfighter)

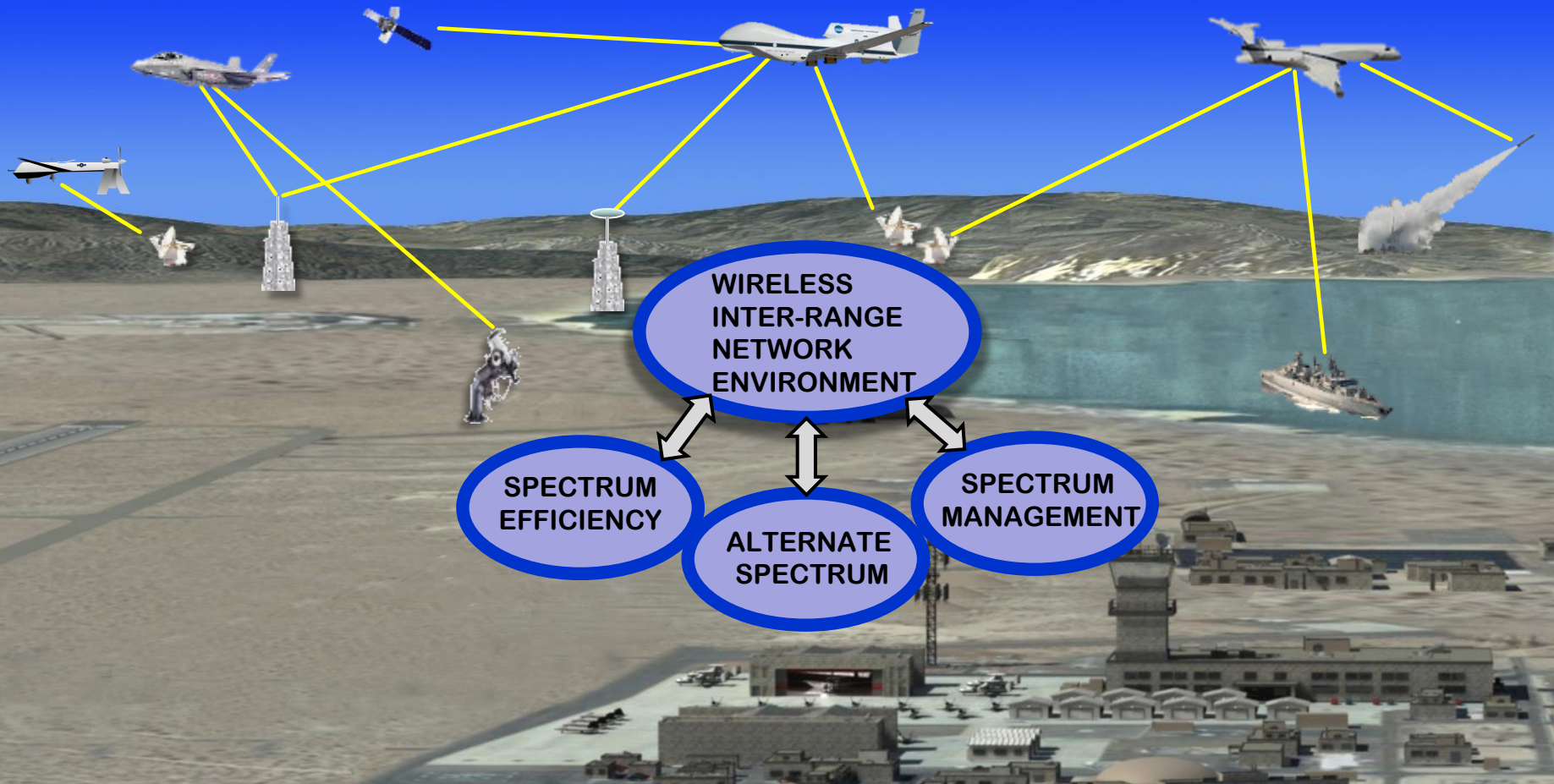
- Must improve processes to get to need faster
- Contracting – Other Transaction Authority (OTA)



Future Vision for DoD Test Range Infrastructure



Revolutionize the RF test range environment by leveraging network and cellular based technologies to support real-time wireless data communications



**Seamlessly support all range operations 24/7/365 in the most
Spectrum Efficient Manner Possible**



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- Why does the DoD think that leveraging network / cellular technology for telemetry is key?
 - Based on next generation support requirements
 - Ranges need to remain relevant
 - Provide efficiencies in TM infrastructure support
 - Ability to provide persistent capability while saving dollars
 - Ad hoc capacity to join a test
 - Reduce man in the loop
 - Efficiencies gained by leveraging commercial technologies and protocols
 - Reduce cost in development/maintenance, Range compatibility
 - Increase ability for the speed of test/ results
 - Shift focus from singular SUT to multiple
 - Reduce stovepipe solutions
 - As technology advances, processing increases, opportunity to modernize TM business

\$100M+ in DoD Investment in Network TM



NASA Armstrong TM Reimagined



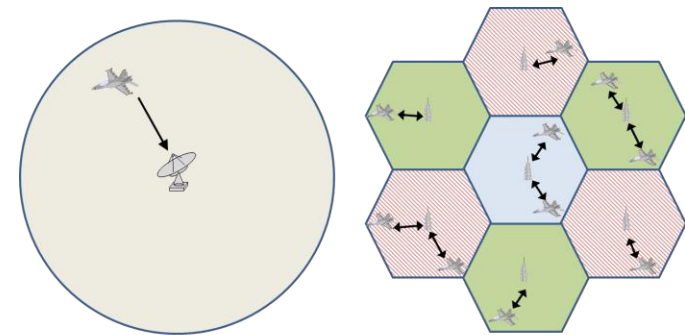
- Bottom line, NASA benefits from advancements made by the DoD Test Ranges
 - Leverage investments in Network Telemetry
 - Standards developed and maintained by the RCC-TG (iNET)
 - NASA Armstrong Associate members
 - Funding supporting Network TM Infrastructure
 - Integrated Network Enhanced Telemetry
 - Cellular Telemetry (4,5,6G)
 - Implement advances in encryption
 - Ability to support broader customer base
 - Internal NASA, external Federal, Commercial and Academia
 - Keep pace with DoD Test Ranges and Next Generation SUTs
 - Relevancy within the Aerospace Test Community is Key
 - Ability to Support Future Telemetry Needs
 - Spectrum Encroachment



Why a Cellular Approach to Telemetry



- NASA currently uses cellular devices to provide User Data
- Present unidirectional telemetry capability using expensive, high gain, single target tracker (Initial investment, O&M cost savings)
- IP based radio network that leverages the commercial wireless/cellular paradigm where multiple, shorter range ground stations provide telemetry/communications coverage over a large area
- Cellular network addresses several issues
 - Inflexibility of transmitted data format
 - Transmission of unnecessary or redundant data
 - Dedication of infrastructure resources
 - Enables ad-hoc bandwidth support
 - Inefficient spectrum scheduling and usage
 - Increases opportunity for Spectrum Re-use
 - Enables Support for Additional Test Missions/Events



Example of Traditional data transmission method
vs. Cellular Based Approach

Maintain compatibility with MRTFB while increasing capability



Summary



- NASA AFRC (DATR) is investigating the implementation of network telemetry capability to support R&D flight test missions
 - Several competing network solutions are being considered
- NASA AFRC uses cellular devices to support tests today!
- Reasons to Consider Cellular based TM Capability
 - Investment in Network telemetry solutions
 - Has flight test results to validate capabilities, short comings
 - Enhanced Capabilities
 - Network/ Encryption built-in
 - Benefits
 - Built in Efficiencies with Cellular (bits/Hz)
 - Higher Data Rates
 - Spectrum re-use
 - Possible Cost Efficiencies