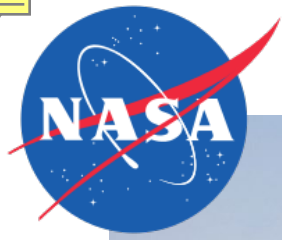


Wireless Sensing Network on Experimental Aircrafts

MARK HAGIWARA, JOHN RUDY

NASA ARMSTRONG FLIGHT RESEARCH CENTER



X59 LBFD QUESST

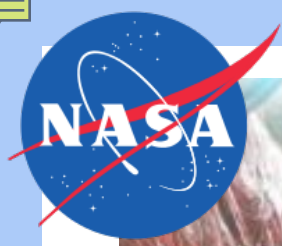


X57 MAXWELL

NASA AFRC

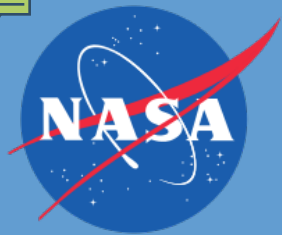
Armstrong Flight Research Center in Edwards, California, is NASA's primary center for high-risk, atmospheric flight research and test projects.

NASA AFRC has flown everything from light aircraft to high-speed jets and rocket-powered airplanes.



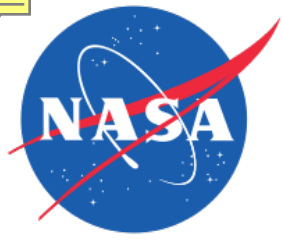
Current Aircraft Instrumentation

- Extensive cabling, documentation, and time required for current instrumentation.
- Adds weight, complexity for integration
- Sensors may have different communication protocols, the complexity increases with each additional sensor
- Additional maintenance cost for each additional sensor
- Less capable of adapting once aircraft cabling are complete



Objectives

- Interchangeable flight test sensors without extensive/new wiring
- Transmitting and receiving data across different protocols utilized by different sensors
- Faster flight test integration to test sensors
- Verify no interference on aircraft systems
- Verify no interference from aircraft systems



Wireless Sensing Network

Patented wireless hub technology by Matthew Waldersen.

- Detailed in NASA document DRC-TOPS-42.

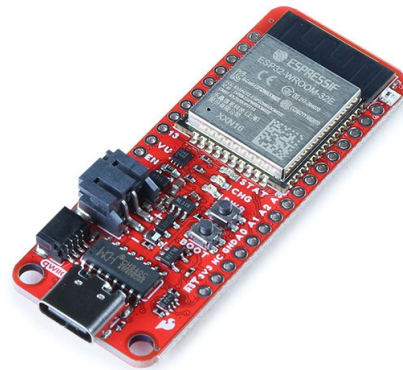
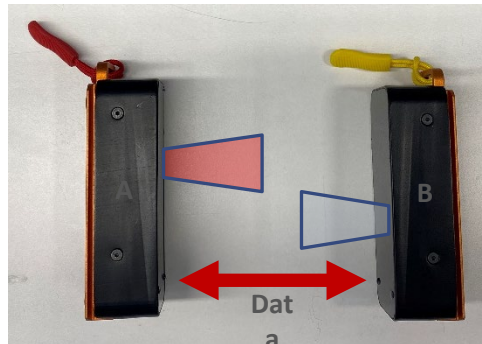
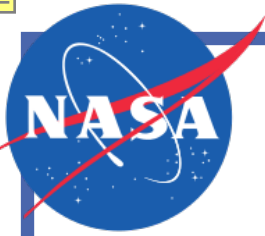
Use SDR (software-defined radio) as a frequency converter

- Centralize sensor information collection
- Control and interpret via a software module
- Change communication protocol in software without hardware changes
- Able to receive and transmit multiple protocols and frequencies

Eliminates the need for cables, reducing installation time.

Installation feasible post aircraft assembly—accessible to all panels/ports.





Flight Experiment

Sensor demonstration in-flight environment

Multiple sensors utilizing different protocols

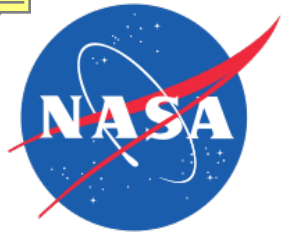
-Bluetooth

-LiFi

-WiFi

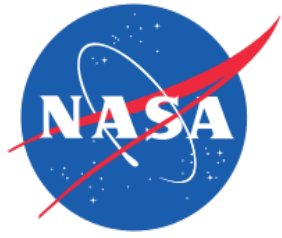
Flew on NASA N801 King Air B200

Pathfinding for realizing wireless hub



Future Plans

- Install sensors on other platforms
 - Test on high-performance aircraft
 - Higher noise environments, such as an electric aircraft
 - Explore space flight opportunities
- Display real-time data
 - Both on aircraft and ground station/control room
- Explore different type of sensors
 - Different protocols
 - Different measurements
 - Demonstrate compatibility
 - Include multiple networks



Questions?