



Opportunities and Challenges to IoT Expansion on Aircraft

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Rockwell Collins:
The Most Trusted Source of High Integrity *Things* Solutions



IoT Successes in Aviation

- Engine predictive maintenance
- Engine efficiency
- System malfunctions relayed to the ground
-



But: Is this Really "Internet of Things???".

Challenges to IoT Expansion in Aviation

- Safety
- Security
- Value
-And Culture!



Aviation Safety

From This



To This



Systems need proof to 10^{-9} failures

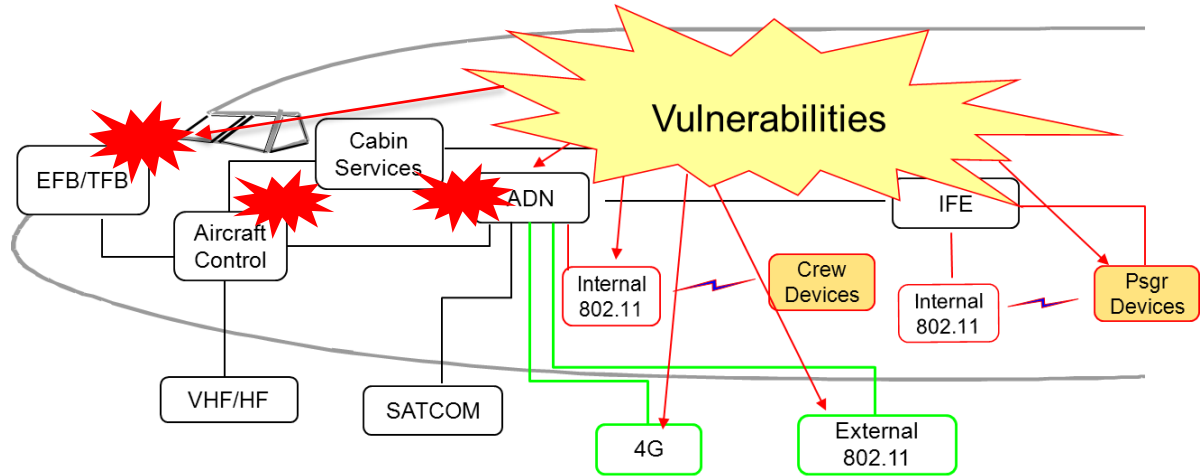


Continuous Improvement and Rigorous Processes Result in One Mishap per 10,000,000 Flights

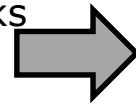
Aviation Security

Convergence of communications and network-centric information processing

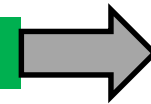
- Passenger Networks
- Maintenance Data Collection
- Wireless Sensors
- Electronic Software Distribution
- Navigation Data Processing
- Air Traffic Control Decentralization



GAO: Expanding connectivity and converging data networks across avionics is a growing risk



GAO Report



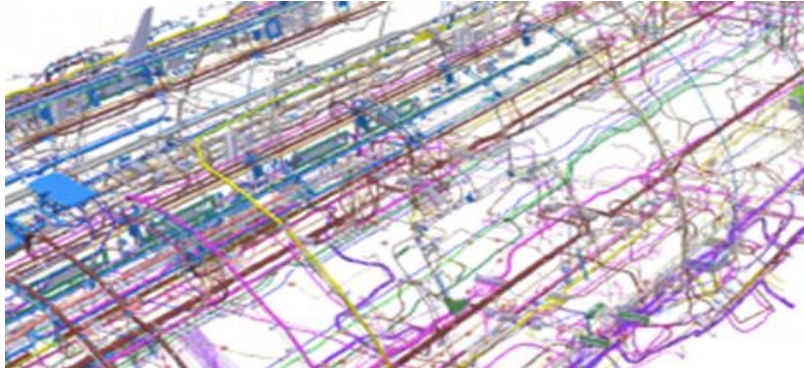
ARINC 811

Security Vulnerabilities Lead to Safety Hazards

IoT Connectivity is a challenge!

- **Wiring in modern aircraft is a highly complex, critical system**

- Total wire count: ~100 000
- Total wire length: 470 km
- Weight of wires: 5,700 kg
- (plus 30% for support)

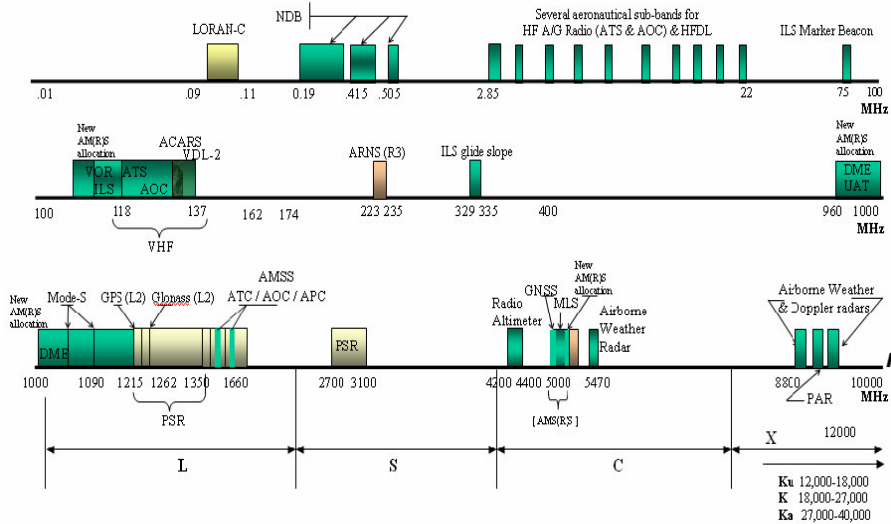


- **Wireless is only used for Level E functions!**

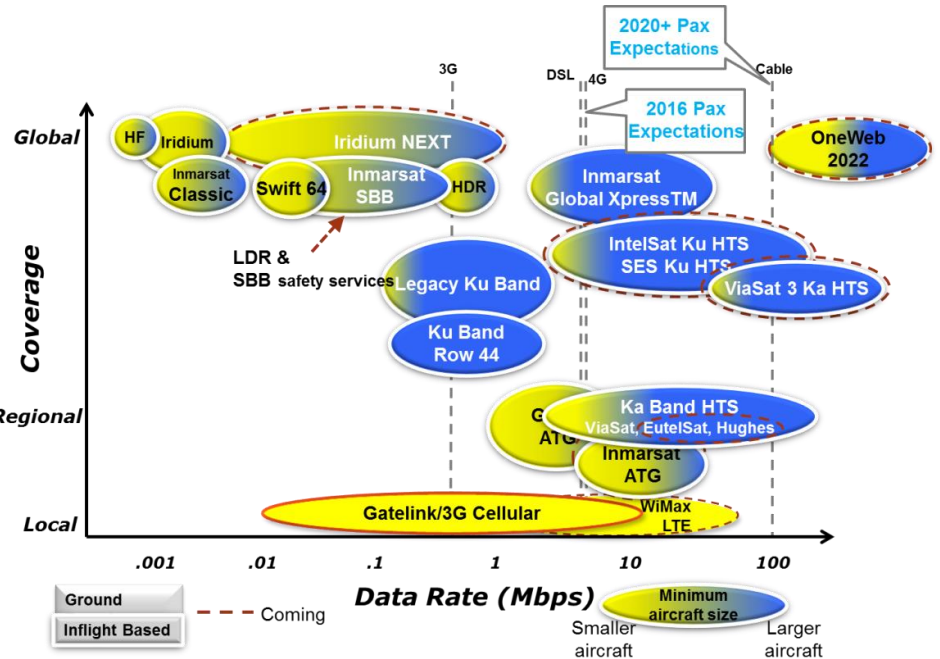
- WiFi to passengers and crew
- Initiative underway for 4.0 GHz wireless for certain safety functions
 - Standards being developed
 - Focus is to reduce current wire weight

External Aircraft Connectivity: Limited but Growing

Aircraft Comm & Nav Spectrum Not Growing



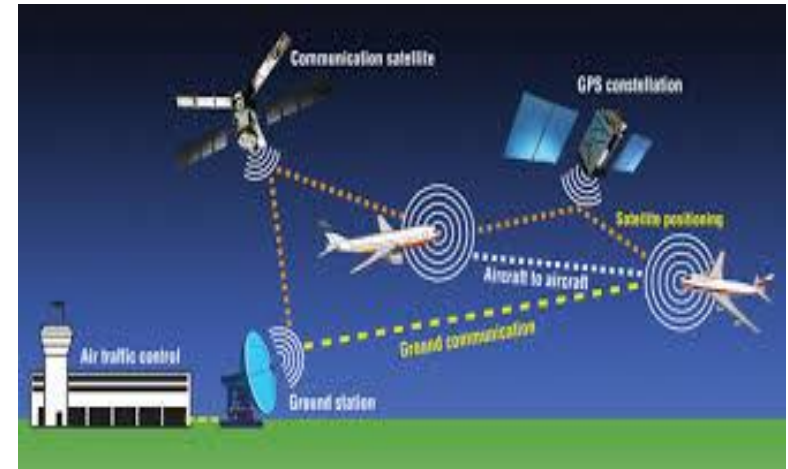
Aircraft Satcom Spectrum Growing



Value to the Stakeholders

- Airline ROI on new investments is ~ 18 months
- New Systems/Products and Services need to “buy their way” on an aircraft

- Opportunities
 - Improved Weather status and prediction/Advisories
 - Autonomous Flight Rules (UTM/ATM)



IoT Improved Weather Status and Forecasting



UTM/Autonomous Flight Regulations

UTM: Automated Traffic Management for UAVs under 400 feet



ATR: Autonomous Flight Rules for self separation and efficient routes without FAA intervention



Conclusion

- IoT could provide significant benefits to Aviation
- Until now, IoT use is limited mostly to electromechanical systems' maintenance functions
- Limitation is due to concerns over aviation safety, security and value
- Improved connectivity and high integrity IoT will provide significant benefits to aviation and the national aerospace system