ITU WORKSHOP on SHORT RANGE DEVICES (SRDs) AND ULTRA WIDE BAND (UWB) (Geneva, 3 June 2014*)

Global SRD solutions for the aviation industry

Uwe Schwark, Airbus Operations GmbH

* in conjunction with the June 2014 block of meetings of ITU-R Study Group 1
Content

• Categories of wireless communications on-board civil aircraft
  • Safety vs. non-safety
  • phases of activity

• Use Cases
  • Cargo Tracking and Monitoring
  • Wing-Tip Anti-Collision System
  • Wideband data transmission

• Summary
Categories of wireless communications (1/2)

- Cabin Crew Data Comm.
- Crew Voice Comm.
- Electronic Flight Bag
- Crew Maintenance
- ...  

- PAX* / IFE* Oriented Communications (IFEC)

- Internet and Email
- Audio and Video Streaming
- Mobile Comm. (e.g. WiFi)
- ...

- Interior Lights Control
- Cabin Temp. Sensors
- Heating Systems
- Lavatory Control
- Wireless Window Shades
- ...

- Activity varies over flight phases

- Safety and non-safety Applications

- Wireless Sensor and Actuator Applications

- Ground Temp. Control
- Refuelling
- Cargo Loading Control
- ...

- Crew Mobile Applications

- Non-safety Applications

PAX: Passenger
IFE: In-Flight Entertainment
Categories of wireless communications (2/2)

Safety vs. Non-safety Wireless Applications

Examples for safety wireless applications
- Emergency lighting
- Smoke and fire detection
- Passenger address
- Cabin Temperature and pressure monitoring
- Door status monitoring
- Landing gear status and tire pressure indication
- Cockpit and cabin crew comm.
- …

Examples for Non-safety wireless applications
- Passenger comfort functions, e.g.
  - reading lights, seat functions, IFE functions control
- Baggage and cargo tracking and monitoring
- Maintenance functions
- Supplementary functions enhancing situational awareness of crew, e.g. anti-collision aids
- …

→ Focus area for SRDs
Use Case 1: Cargo Tracking and Monitoring
Use Case 1: Cargo Tracking and Monitoring (1/4)

Connected Bag

- **64% of airlines** plan to use self bag tagging until 2014
- **62% of passengers** would tag their own bag if they could at the beginning of their journey with trend indication growing
- **49% of airlines** plan to use self-service bag drop off by end 2014
- **65% of passengers** would be interested to use self-service bag drop-off kiosk

Secure Cargo

- **Integrity monitoring:**
  detection of unauthorised modifications / intrusions
- **Ambient condition monitoring:**
  detection of damage / deterioration of goods / event notification
- **Improved handling process for airfreight:**
  paperless processes / automatic generation of documents
- **Support of correct aircraft loading:**
  automatic verification of correct loading at cargo door
Combined active RFID- and WLAN-based communications

- enables efficient baggage and cargo handling functions
- provides the RFID-based interface between baggage and cargo items and the aircraft
- enables gathering and processing of load handling related information

ULD: Unit Load Device, RFID: Radio Frequency Identification, WLAN: Wireless Local Area Network
Use Case 1: Cargo Tracking and Monitoring (3/4)

Cargo Tracking System Architecture

Cargo Tracking System

- Active RFID
- Wi-Fi

On-Board Com.

AFT Cargo Compartment

FWD Cargo Compartment

A/C Vicinity

Cellular network coverage

Logistic Center / Airport

A/C: Aircraft
Global harmonization for use of RFIDs in the UHF Band

- Japan changed its regulations in 2012, now allowing RFID applications to operate in the frequency band 916.8 to 923.4 MHz.
- Recent activities within ETSI and CEPT led to proposed amendments for ECC Recommendation 70-03 allowing the use of RFID applications in the frequency band 915 – 921 MHz.
- Airbus welcomes current efforts in many countries aiming at **globally harmonized conditions** for use of RFID applications in the UHF band and encourages Administrations to continue this process.
Use Case 2:
Wing-Tip Anti-Collision System
Use Case 2: Wing-Tip Anti-Collision System (1/5)

Background

The US National Transportation Safety Board (NTSB) has recommended the US FAA require large aircraft be equipped with an ground anti-collision aid.

The recommendation follows three recent ground collision accidents in which large aircraft collided with another aircraft while taxiing.

The anti-collision aids should be installed on newly manufactured and certificated airplanes and that existing large airplanes should be retrofitted with the equipment.

NTSB said it made the same recommendation to the European Aviation Safety Agency (EASA).

- More than 80 incidents occur per year (Europe only)
- More and more airlines make requests for anti-collision aids
Use Case 2: Wing-Tip Anti-Collision System (2/5)

Collision Examples
Use Case 2: Wing-Tip Anti-Collision System (3/5)

- **High-Level Requirements for a Wing-Tip Anti-Collision System**
  - Obstacle detection, recognition and avoidance system to **prevent impact damage** to aircraft structures during ground operations
  - System must work **reliably in all weather/day&night conditions** for providing advanced warnings to allow aircraft to be stopped safely.
  - System is an **advisory system**, intended for **enhancing situational awareness** of flight crew

- **Technology**
  - Automotive radar technology is available and well suited for aeronautical applications (low cost and mature technology, no moving parts, all weather operations, easy to install, small size, low weight and power consumption)
Predictive and Reactive Areas Definition

\[ f(A/C_{\text{speed}}, \theta_{\text{steering}}) \]
Use Case 2: Wing-Tip Anti-Collision System (5/5)

- **Regulatory Status**
  - The frequency bands 76-77.5 GHz and 78-81 GHz are globally allocated to the RLS and can be used for Long and Short Range Radar applications
  - Bands are used for automotive applications and intelligent transport systems
  - Aircraft ground maneuvering scenario is considered comparable to the general automotive use case

- **Airbus View**
  - Airbus is of the view that the Wing-Tip Anti-Collision System used to support the flight crew only for aircraft ground maneuvering can be considered as an automotive application under the existing regulatory provisions and no additional studies are required.
Use Case 3: Wideband data transmission
Use Case 3: Ground Service Network (1/2)

Emerging needs for high bandwidth / airport infrastructure independent wireless services for improved aircraft ground handling

- Aircraft Health Monitoring Records
- Engine Health Monitoring Records
- Post Flight Reports
- Aircraft Security Surveillance
- Software Loading
- Electronic Library Upload
- IFE Content Upload
- Data Security Batch Upload
- System Performance Data Logs
- Flight/Cabin/Services Log Books
- Cargo Loading Monitoring
- Ground Services Perform. Mon.
- Damage incl. Origination Detection
Use Case 3: Ground Service Network (2/2)

60 GHz broadband wireless for bulk data upload

Today strong dependency on local infrastructure
- overburdened Wi-Fi networks (GATELINK)
- high connection fees
- low availability
- SAT services mostly not adequate on cost and capacity

60 GHz (WiGig) Technology promises:
- license-exempt use on global basis
- independency on local comm. service providers
- multiple point-to-point connection capabilities (A/C-to-terminal, A/C-to-vehicle and vehicle-to-terminal links)
- several Gbit/s per beam
- range up to 1 km (@ 1 Gbit/s typ.)

Airbus View: Airbus supports every effort leading to globally harmonized conditions for the use of 60 GHz Wideband Data Transmission Systems used to improve aircraft ground handling.
Airbus supports the establishment of..

- harmonized conditions for global operation of active RFID systems, preferably in the UHF band, to simplify system design and harmonize logistics processes.

- globally harmonized conditions for the use of short & long range radar technology in the frequency range 78-81GHz for providing anti-collision aids to the flight crew during aircraft ground manoeuvring on the airport surface (e.g. taxiing) based on existing studies for automotive use case.

- globally harmonized conditions for the use of 60 GHz Wideband Data Transmission Systems used to improve aircraft ground handling procedures.
Thank you very much for your attention …

… any questions?