



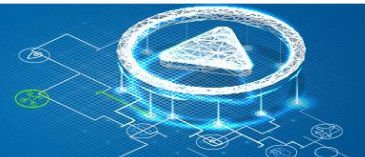
LDACS - From single function to integrated CNS

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Outline

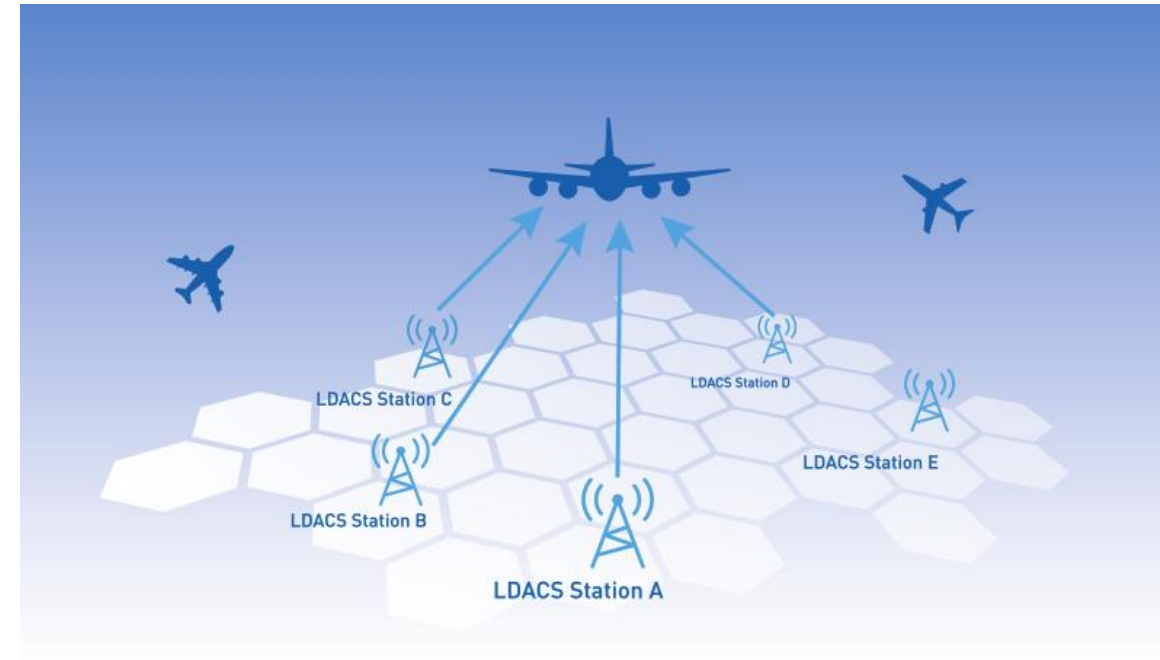
- LDACS Key Facts
- LDACS Deployment
- LDACS extensions (Navigation and Surveillance capabilities)
- LDACS Status
- Summary



What is LDACS?

LDACS stands for L-band Digital Aeronautical Communications System and is

- the upcoming broadband and secure terrestrial communications system for aviation
- exclusively designed for aviation use in protected aeronautical L-band with AM(R)S allocation
- essential part of FCI
- mature technology
- well reflected in ICAO's Global Air Navigation Plan
- under ICAO standardization (Communications Panel)



What does LDACS offer?

(1/2)

- Broadband connectivity to enable modern ATM concepts
 - LDACS is based on technology as applied for LTE/4G mobile radio systems
 - High-rate data communications with 550 kbps – 2.6 Mbps per channel (55 – 260 times VDLM2)
- Improved communications performance to overcome current deficiencies
 - LDACS provides both data link connectivity and digital voice
 - Low-latency transmission through coordinated channel access
 - Service priorities for safety-critical ATS and AOC
 - Secure transmissions through built-in cyber-security means, including mutual entity authentication



What does LDACS offer?

(2/2)

- Simultaneous transmission of ATS and AOC services
 - LDACS covers ATN/B1 and ATS/B2 as well as emerging ATS/B3, and additional future services (e.g., full 4D trajectory-based operations or flight-centric ATM)
- Integrated CNS
 - Communications for ATS and AOC services – main task
 - Navigation/positioning through ranging to ground stations providing enhanced APNT capabilities
 - Surveillance through detection of airborne LDACS transmissions at ground stations

How will LDACS be deployed?

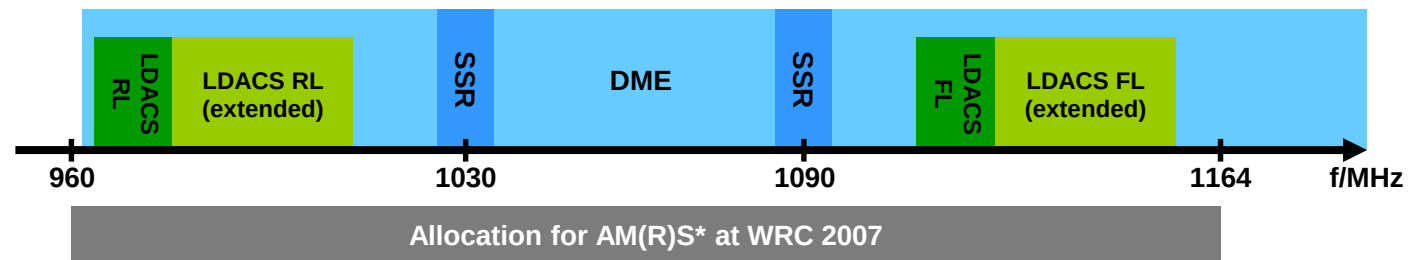
- Re-use existing infrastructure on-board and on ground as far as possible to reduce costs
 - **Combine technological advantages of LDACS with the existing VDL mode 2 infrastructure -> Develop combined multi-mode LDACS/VDL radio**
 - **Bring LDACS on-board without additional antenna or avionics box**
- **Advantages**
 - **Aircraft can use LDACS wherever deployed on ground, otherwise VDL is used**
 - **Almost one-to-one exchange of VDL with combined VDL/LDACS radio**
 - **Gradual introduction of LDACS possible starting where broadband connectivity is needed most**
 - **Use and return of investment starts with the first LDACS ground installation**

What is the relation to CNS transformation ?

- Frequency spectrum is a finite and limited resource
 - Availability of the necessary protected radio frequency spectrum is a critical prerequisite for the implementation of CNS/ATM systems.
 - As demand for radio spectrum from non-aviation users continues to grow, aviation faces an ever-increasing competition for the limited available spectrum.
- > the protected radio frequency spectrum for aviation has to be used more efficiently

LDACS as integrated CNS system

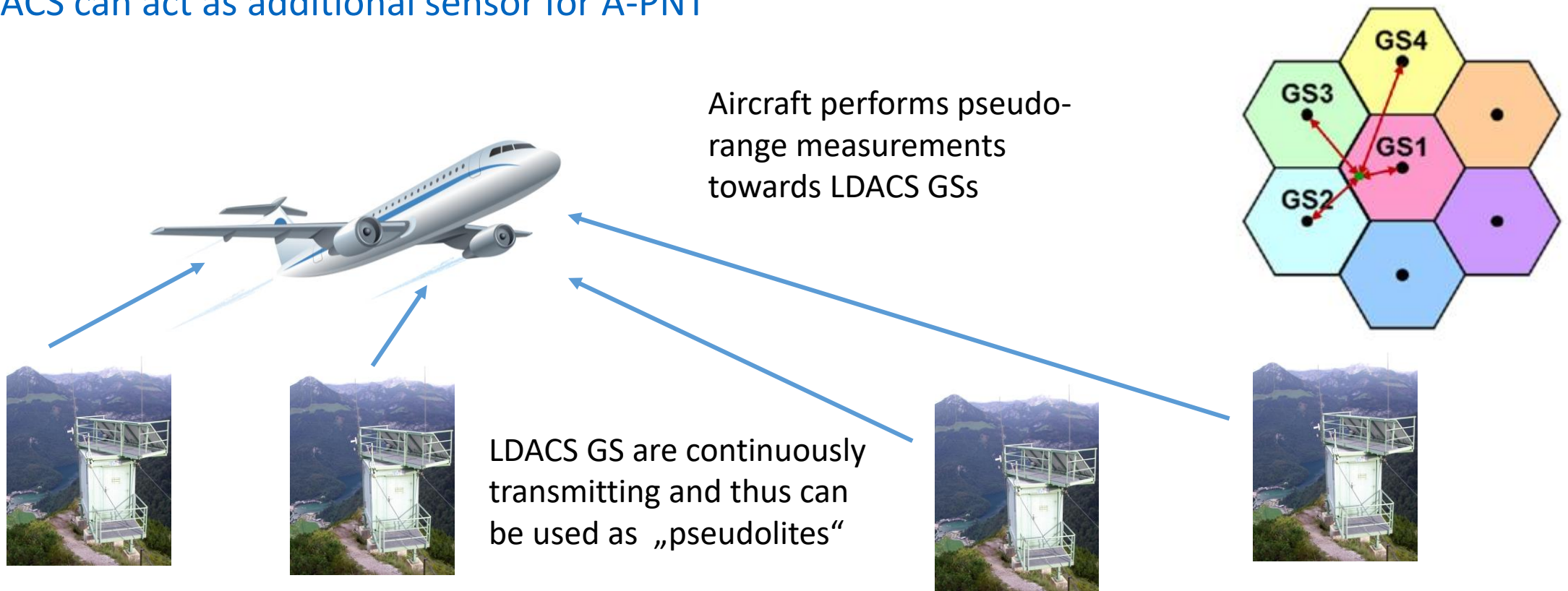
- One technology (i.e., LDACS) which provides following capabilities:
 - COM (A/G data and voice communications) – main feature
 - NAV (by using airborne-based distance measurements to nearby ground stations)
 - SUR (e.g., cooperative dependent surveillance by downlinking the AC position via datalink)



*AM(R)S - Aeronautical Mobile (Route) Service

LDACS – Extension towards Navigation

- Alternative Positioning and Timing (A-PNT) shall be the secondary means for Navigation in case the primary means fails (currently DME and in future GNSS)
 - **Real navigation substitute for En-Route (ENR) continental flights in case of DME or GPS outage**
- LDACS can act as additional sensor for A-PNT



LDACS – Potential usage for Surveillance

- With ADS-B (Automatic Dependent Surveillance - Broadcast), an aircraft autonomously determines and regularly broadcasts its position (and other data)
 - Position is derived from on-board navigation means (e.g., Global Positioning System (GPS))
- LDACS aircraft have to be authenticated before they can utilize the datalink
 - > it can be assured that the transmitted data are reliable
- LDACS periodically sends the position of aircraft via the Reverse Link (RL) down to the ground and can be shared with other systems on ground and thus it can also be used as LDACS-based multi-lateration system



What is the current status of LDACS?

- LDACS design is completed and technical specifications are available and published
- Demonstrator equipment has been manufactured by several vendors
- Flight trials using industrial demonstrator equipment have been performed in 2019
- LDACS is well established in ICAO's Global Air Navigation Plan (GANP) and SESAR's ATM Master Plan
- ICAO standardization was initiated in October 2016
 - **LDACS Draft SARPs have been endorsed by the Communications Panel in October 2018**
 - **Work on SARPs Validation and LDACS Manual is ongoing**
 - **The aim is to have an applicable standard from 2024 onwards**

Summary

- LDACS is well-suited to serve modern ATM applications
 - **High-capacity datalink**
 - **Highly flexible and scalable**
 - **State of the art security**
- LDACS is currently being standardised (Draft LDACS SARPs are available)
- A viable roll-out scenario has been developed which allows gradual introduction of LDACS for immediate use and revenues
- LDACS offers an excellent opportunity for extension towards navigation and surveillance (secondary means in case the primary system will fail)



Questions?

