Spectral Efficient COMmunications for future Aeronautical Services

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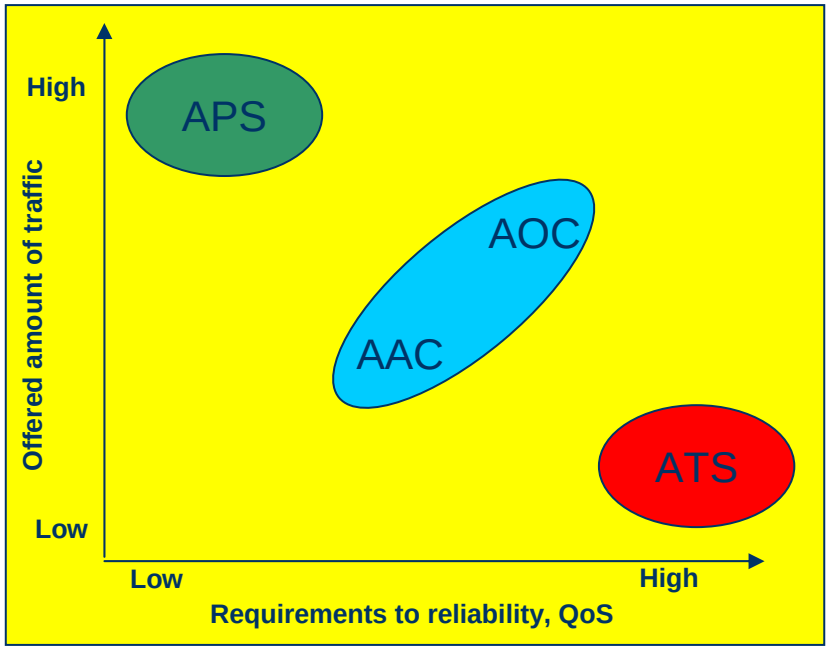
SINTEF

Outline

- Overview aeronautical communication today
- International activities
- SECOMAS activities
- Impact on Norwegian industry

Overview
Aeronautical communication services

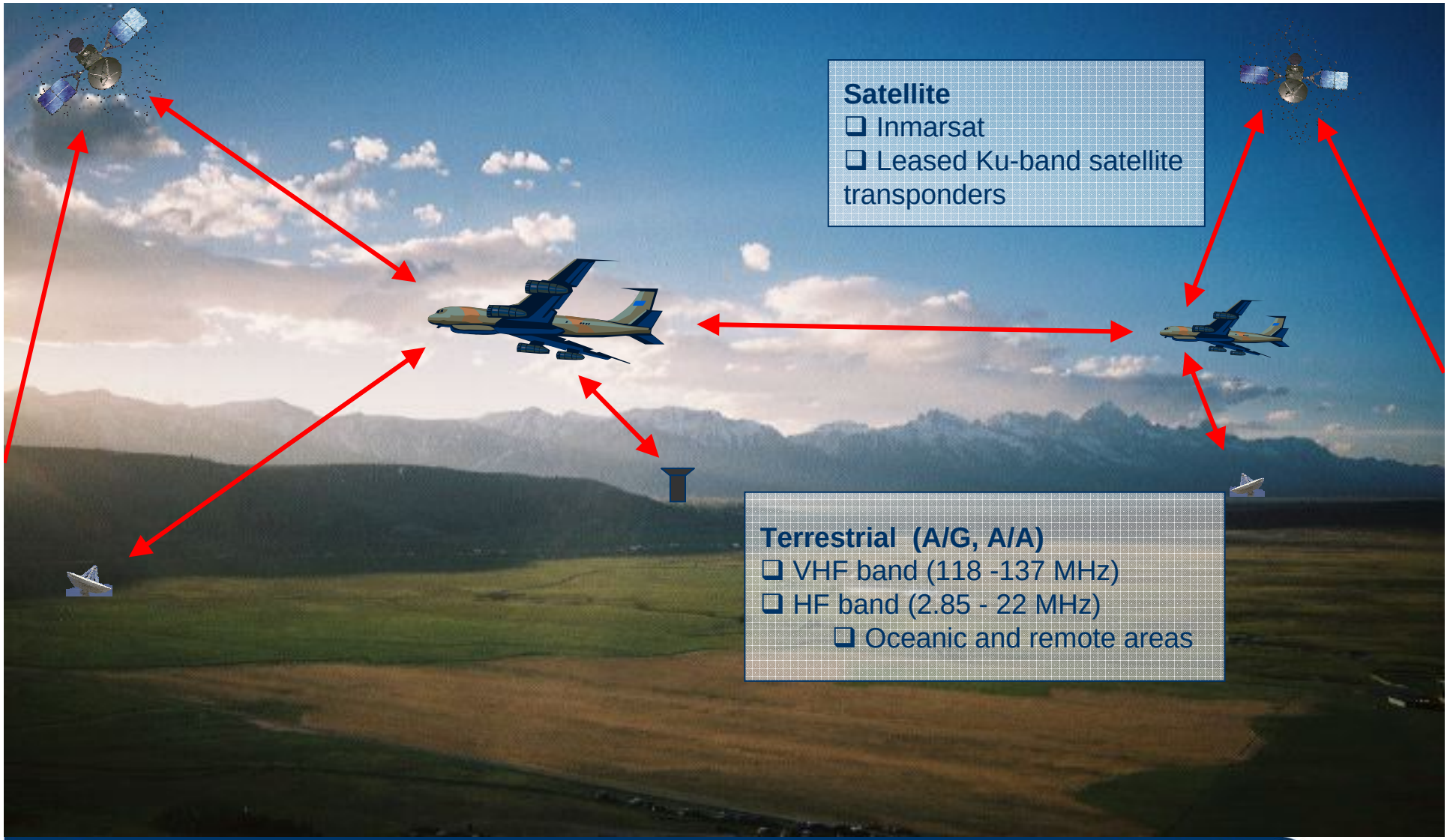
- Air Traffic Services (ATS)
  - Pilot – air space controller
    - Air Traffic Control (ATC)
  - Primarily voice
  - Simple SMS–type of digital services
- Aeronautical Operational Control (AOC)/ Airline Administrative Communication (AAC) Services
  - Aircraft – AOC centre/company/operational staff at airport
  - Voice and data
- Aeronautical Passenger Communication (APC)
  - Commercial services
    - Emailing
    - Broadband internet access
    - Telephony
    - Live-TV
    - Value added services (hotel reservation, car hire)
  - Ex: Connexion by Boeing (ended Dec. 2006)



Several systems necessary to accommodate different types of services

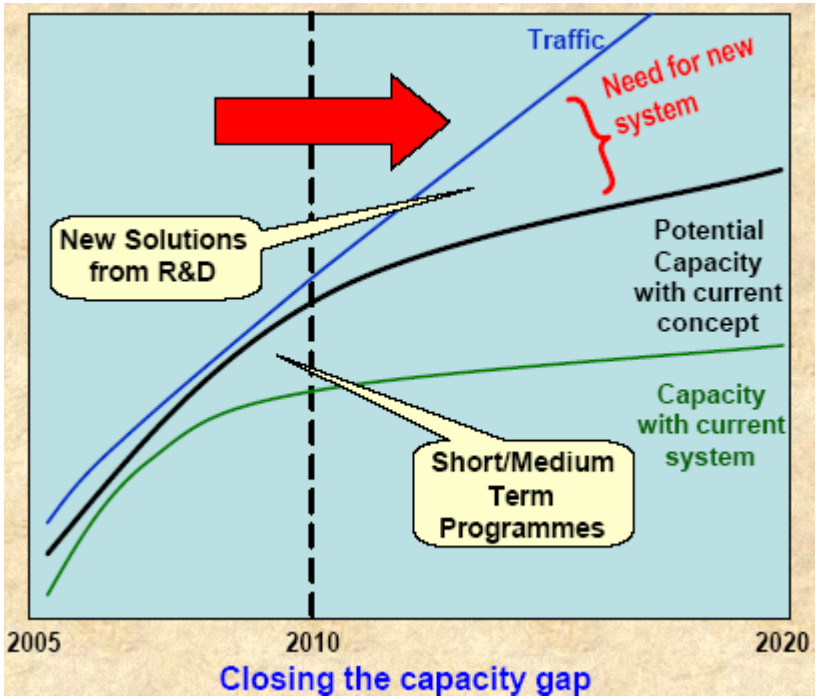
Aeronautical communications

Types of links



Why are new systems necessary?

- Traffic in 2005
  - 9.2 million flights per year
  - Peak day
    - 30 000 flights by commercial airlines
    - 200 000 flights by general aviation aircraft
    - Numerous military aircraft
- Estimated traffic in 2025
  - 22 million flights per year
  - Peak day
    - 72 000 flights by commercial airlines
    - 480 000 flights by general aviation aircraft
    - Numerous military aircraft



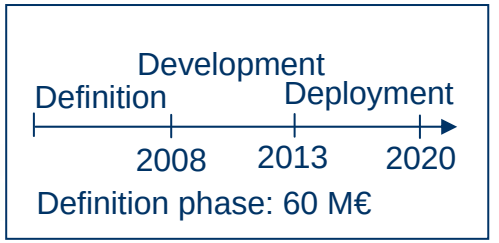
Source: Expectations of SESAR, Bernard Miaillier, D1 Forum

Increase by factor 2.4

Today's Air Traffic Management (ATM) systems are not capable to support this increase

International programs

- International activities to develop new ATM systems
  - In Europe: SESAR
    - 50 % financed by EC
    - 50 % financed by Eurocontrol
  - In USA: NGATS



- Provide input to ICAO for global solutions

Goal: to develop new ATM system providing:
- ❑ Increased capacity
- ❑ Improved safety and security
- ❑ Reduced impact on environment
- ❑ Reduced operating cost

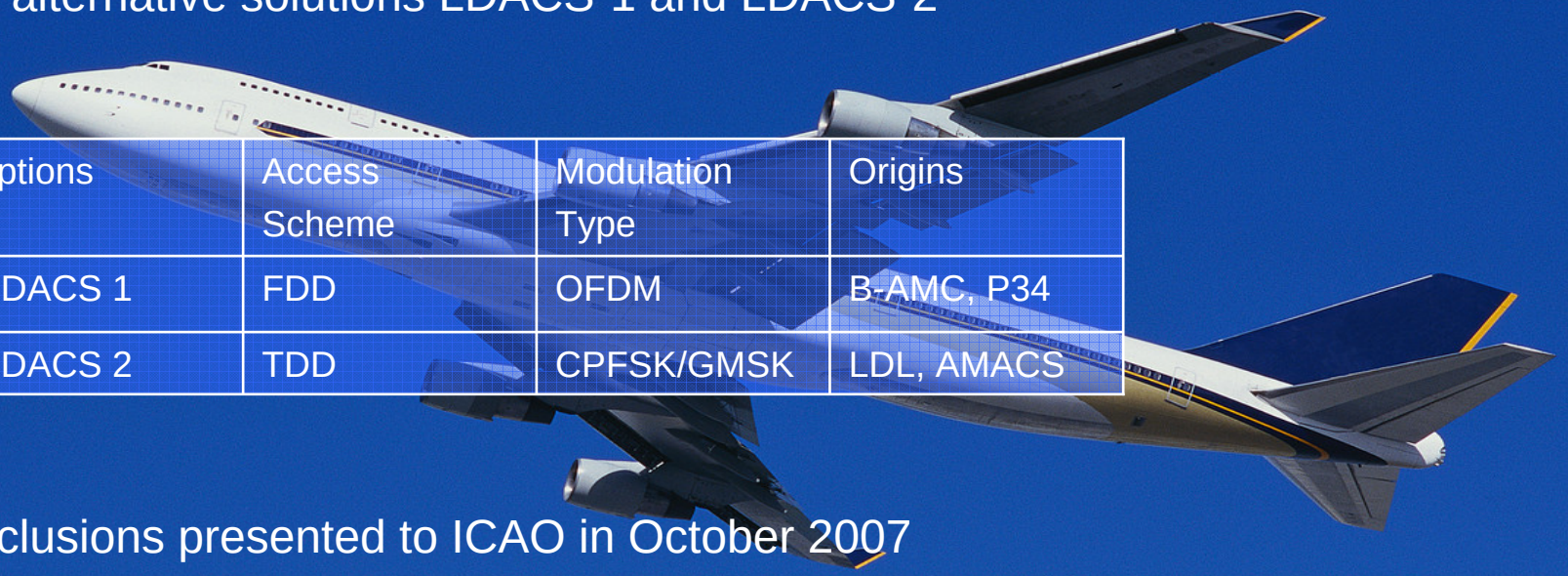
What is the impact on the communication systems?

- Bandwidth congestion
  - Primarily in the VHF band
  - High density airspace (e.g. Core Europe)

- Solutions:
  - Increase spectrum efficiency in the VHF band (8.33 kHz channels)
  - Migrate from voice communication to data communication (VDL 2/3/4)
  - Open new frequency bands for aeronautical communication and develop systems for these bands
    - VHF band: 108-118 MHz
    - L-band: Portions within the 960-1164 MHz
    - C-band: Portions within the 5000-5150 MHz (airports)
  - Develop a satellite component for ATM

L-band Digital Aeronautical Communication System (L-DACS)

- Future Communication Study (Eurocontrol/FAA)
- Two alternative solutions LDACS-1 and LDACS-2



Options	Access Scheme	Modulation Type	Origins
L-DACS 1	FDD	OFDM	B-AMC, P34
L-DACS 2	TDD	CPFSK/GMSK	LDL, AMACS

- Conclusions presented to ICAO in October 2007
- Decision on one system to be taken in 2009
- Deployment in 2020

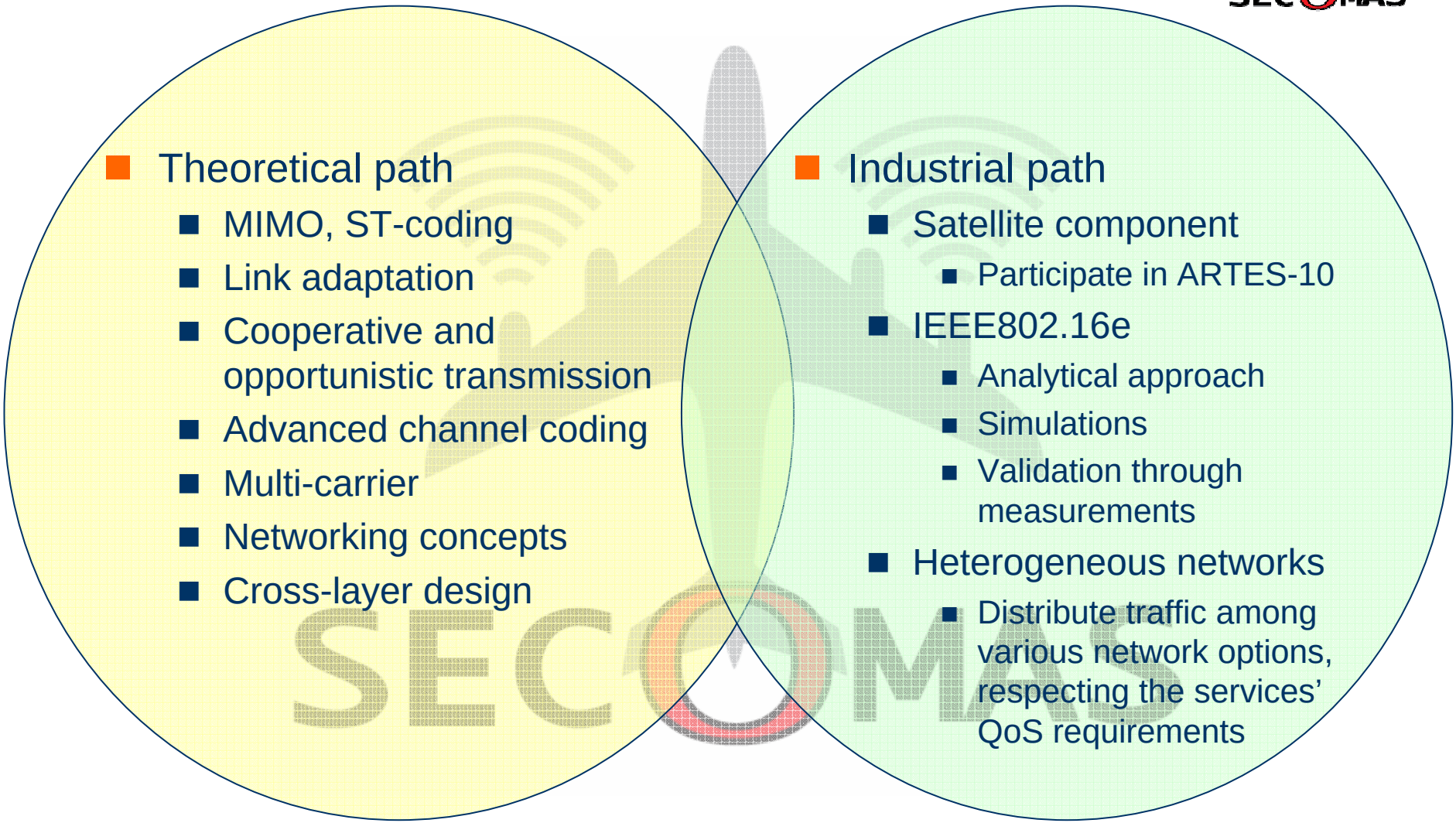
Airport communications

- Development of a aeronautical WiMAX standard
  - IEEE802.16aero
    - Identify the portions of the IEEE 802.16e standard best suited
    - Identify and develop missing required functionalities
    - Propose an aviation specific standard
    - Evaluate and validate the performance through trials and test bed development
    - Propose a channelisation methodology
    - Complete the investigation of compatibility of prototyped C-band components with existing systems in the C-band

Satellite component

- Two ARTES-10 (ESA) studies (K.O. Dec 2007):
  - Communication System Design
  - Analysis and Definition of Satellite System
- Objectives
  - Preparation work to support the SESAR Master Plan
    - Initiate development of the communication standard
    - Initiate identification of the satellite system architecture
  - Consider non-technical issues from the start
    - Business case
    - Service provision and governance model
    - ESA hand-over after development/deployment
    - Validation and qualification with SESAR
  - Support frequency allocations

SECOMAS activities



Impact on Norwegian industry

- Provide link to SESAR and other international activities
- Be updated on the development of future aeronautical communications solutions

- Access to relevant competence from the research communities
- Get access to general results that can be used in different types of systems


Thank you for your attention !