

skyguide

› The Defragmentation of the Air Navigation Services Infrastructure

› *Legal Challenges of Virtualisation*

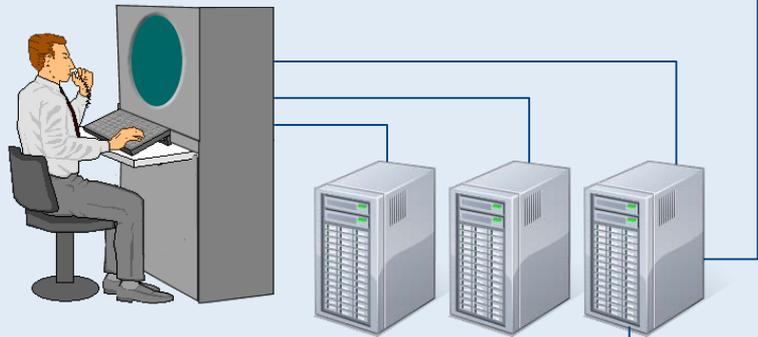
Francis Schubert

3rd SESAR Innovation Days

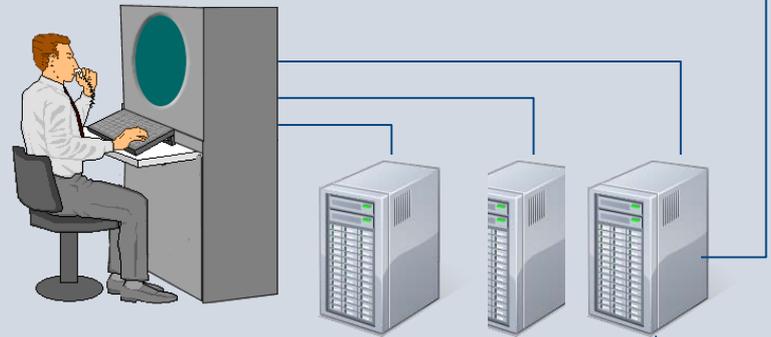
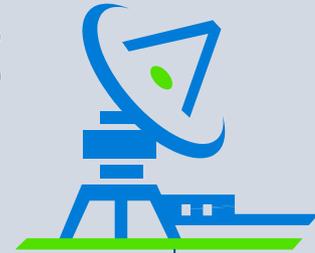
Stockholm / November 27, 2013



ANSP 1



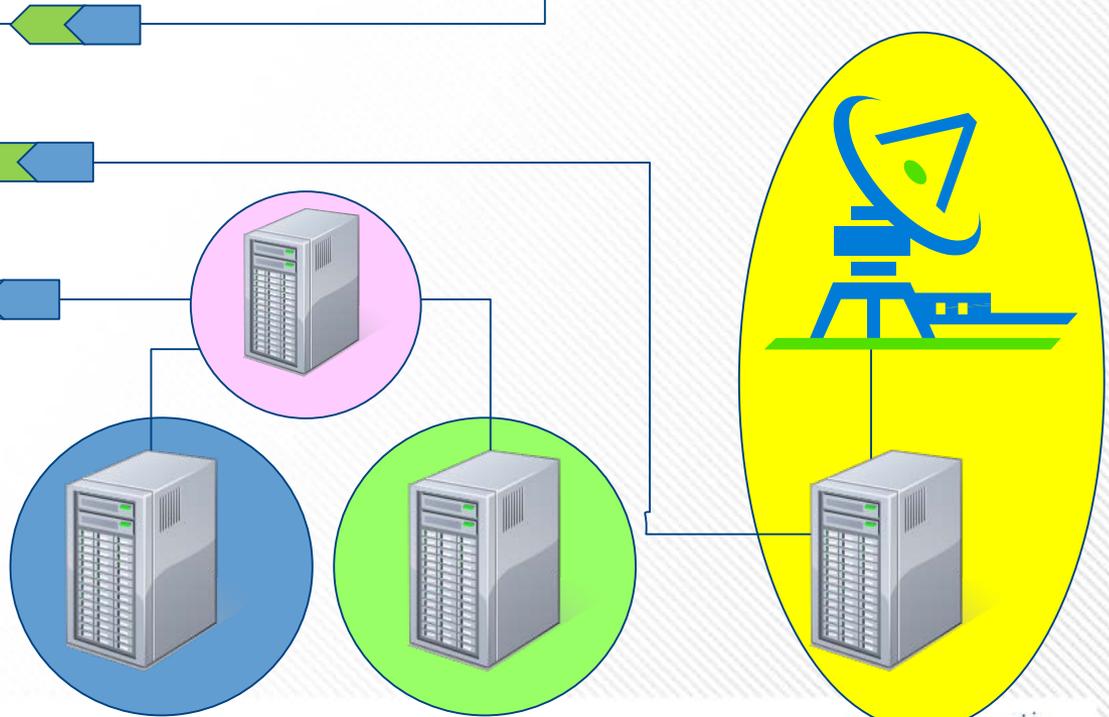
ANSP 2



ANSP 1



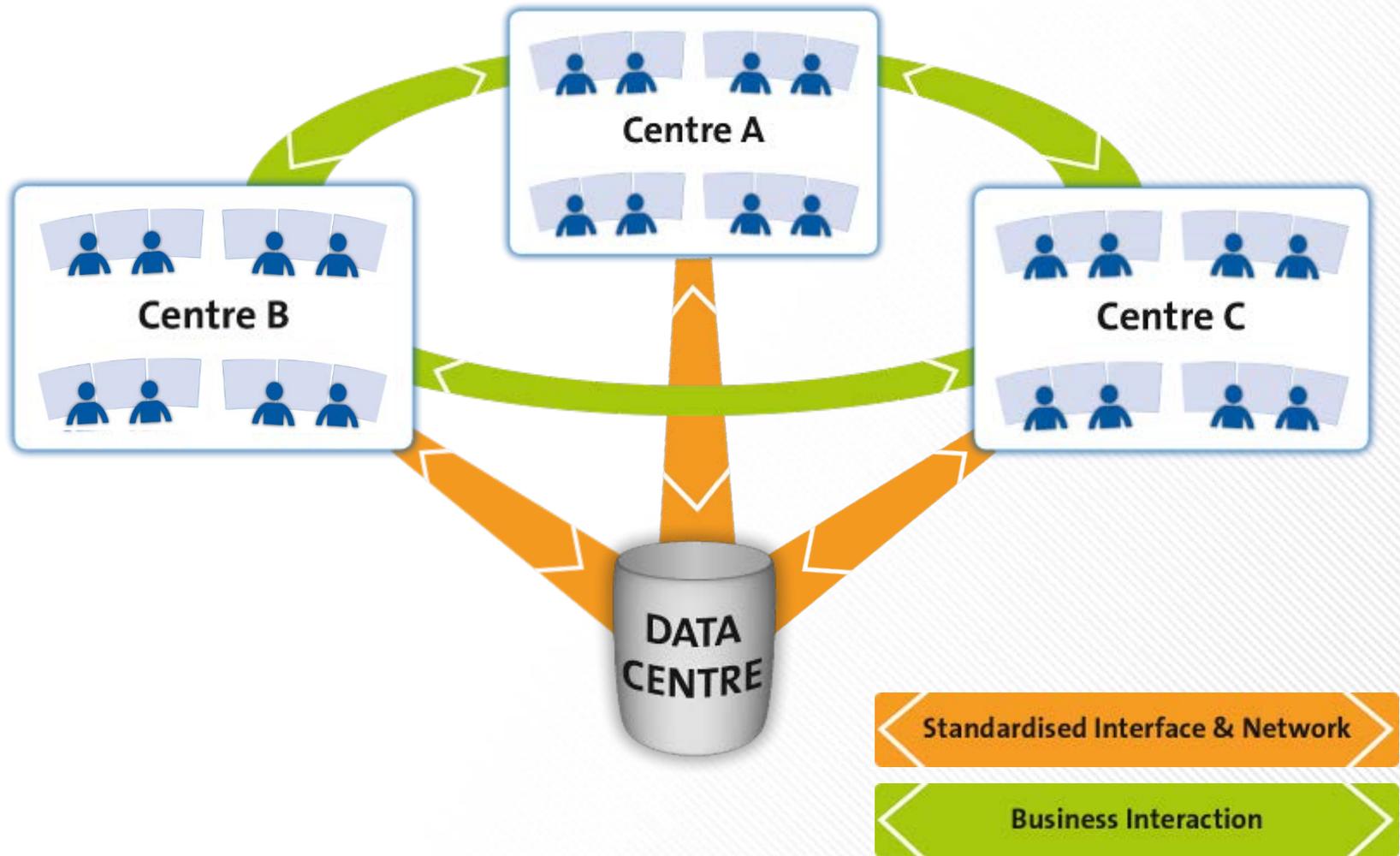
ANSP 1



Pioneering virtual initiatives

- › SWIM
- › Centralised Services
- › EAD
- › GNSS
- › Virtual Centers
 - *"a group of air traffic services units (under the responsibility of one or several ANSPs) operating from different locations which use fully standardized methods of operation, information, procedures, technical means and equipment in such a manner that they are perceived as a single system from an airspace user's perspective"*

The Virtual Centre Model



Regulatory challenges

- › Standardisation requirements:
 - Standardised interfaces
 - Standardised data formats
- › Quality management requirements
 - Data integrity, consistency and traceability
 - Timeliness of the information
 - Safety vs. security

Legal challenges for sovereign States

- › States obligations under Art. 28 of the Chicago Convention:
 - State undertakes to "*provide, in its territory, airports, radio services, meteorological services and other air navigation facilities to facilitate international air navigation, in accordance with the standards and practices recommended or established from time to time, pursuant to this Convention.*"
 - Availability, continuity and integrity of ANS
 - Institutional distance and dilution of control
 - National security considerations
 - Dependency on foreign based data supplier

Liability implications

- › Blurred responsibility/liability division lines between States, ANSPs and data suppliers
 - Multiplication of actors acting from different countries
 - Difficulty to allocate responsibility
- › 2 scenarios:
 - State/ANSP is relieved from any liability caused by suppliers:
 - Allocation of liability to the actor who has caused the damage
 - State/ANSP cannot argue negligence of suppliers:
 - State/ANSP primary liability
 - Recourse action against data supplier

Liability implications

- › The need for traceability
- › The contractual chain concept
- › From human error, fault based, liability to technical failure, strict liability

Regulatory / Institutional / Legal solutions

- › Institutional framework
- › Technical Standardisation
- › Contingency and redundancy measures
- › Institutional solutions as a transitional measure
- › Contractual arrangements
 - Roles, responsibilities and liability of the actors
 - Essential requirements regarding the quality of the data supplied,

› The Integration of RPAs in the Air Navigation Services System

› Regulatory Requirements

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Introduction

- › " The current market for commercial RPAS services is practically inexistent due to difficulties for RPAS to obtain flight permissions and their restriction to segregated airspace. In the long-term, once safe but proportionate and reasonable rules are in place, the commercial and public RPAS markets will have huge growth potential as forecasted by several studies."
 - Notice of Proposed Amendment (NPA) 2012-10, draft Opinion of the European Aviation Safety Agency for a Commission Regulation amending Commission Regulation (EC) No .../... laying down the common rules of the air and operational provisions regarding services and procedures in air navigation and amending Regulations (EC) No 1035/2011, (EC) No 1265/2007, (EC) No 1794/2006, (EC) No 730/2006, (EC) No 1033/2006 and (EU) No 255/2010 'Transposition of Amendment 43 to Annex 2 to the Chicago Convention on remotely piloted aircraft systems (RPASs) into common rules of the air', p 14

Airspace sovereignty

› A State's ability to:

- retain full and permanent awareness of air navigation operations within its sovereign airspace;
- ensure that all aircraft comply with applicable rules: and
- to intervene at any location and moment within that airspace in case of infringement.

› Available means:

- Flight plan for aircraft crossing a national boundary (Annex 2)
- Diplomatic clearance for foreign State airspace (art. 3 Chicago Convention)
- Interception measures (art. 3 bis Chicago Convention)

Airspace sovereignty

› Article 8 Chicago Convention

- *“No aircraft capable of being flown without a pilot shall be flown without a pilot over the territory of a contracting State without special authorization by that State”.*

› An authorisation must be granted:

- Even for flights within the boundaries of a single country.
- For each individual flight and not for a specified period or for a certain number of flights (*“special authorisation”*)
- By each individual State overflown, in the case of a flight crossing the airspace of more than one country
- Independently from the requirement to file a flight plan

› Both Articles 3bis and 8 of the Chicago Convention apply to RPAs

The ANS contribution to airspace sovereignty

- › The primary mission of ANS is safety related, but they also play a key role in supporting airspace sovereignty
- › To fulfil this task
 - ANS need to:
 - be informed of all aircraft crossing the national border into the airspace under their responsibility;
 - be able to establish and maintain two ways communication with aircraft under their responsibility.
 - RPAs need to:
 - Be able to respond to ANS instructions
 - Be able to integrate and respond to standard (visual or other) signals

The ANS contribution to airspace sovereignty

- › The multiplication of cross-border factors
 - RPAs controlled from the territory of one State...
 - Flying over the territory of another State...
 - Where ANS are provided by an ANSP located in a third State
- › Dilution of State control over air navigation activities
- › Technical contingency features required to compensate for RPAs features (e.g. predictable automated control procedures in the event of a communication or remote control failure)

RPAs to be treated like “ordinary” aircraft

› Consequences

- RPAs differ from unmanned free balloons (treated as “obstacles” from an ANS perspective)
- Integration of RPAs in the ANS framework is more a matter of technical ability than one of producing new ATM procedures
- No intention to create a new category of air vehicles subject to specific flight rules and/or ATM procedures
- Presence of pilot on board or not should be (largely) irrelevant from an ANS perspective
- Impact on the division of responsibilities between (remote-)pilot and air traffic controller should remain minimal

Target Level of Reliability

- › "The information exchange between ATC and the remote pilot will likely require the same levels of reliability, continuity and integrity, referred to as QOS, that are required to support operations with manned aircraft in the airspace in which a UA is intended to operate.
- › The exchange of control information between the aircraft and its remote pilot station will require an extremely high level of availability, reliability, continuity and integrity."
 - ICAO Circ. 328
- › Social acceptability may however require higher standards of reliability

ATM Procedures

- › "There should be no difference in landline communications or transponder data procedures, nor should the controller apply different rules or different criteria. Therefore, the air traffic controller should adopt the same procedures when using telephony or landlines for both manned aircraft and UAVs".
 - Anna Masutti, "Proposals for the Regulation of Unmanned Air Vehicle Use in Common Airspace, [Air & Space Law](#), vol. 34, Issue 1, February 2009, Kluwer, p 7
- › "When operating in controlled flight, typically under instrument flight rules (IFR), the pilot-in-command has to maintain radio contact with the responsible Air Traffic Control (ATC) unit. The same has to apply when a UAV operates under the same conditions, except that this interface must be reliably established between the pilot on the ground and ATC. This can be achieved by radio or ground-based voice and data communication."
 - Stefan A. Kaiser "UAV's: Their Integration into Non-segregated Airspace", [Air & Space Law](#), vol. 36, Issue 2, April 2011, Kluwer, p. 164

Limits to the assimilation of RPAs to ordinary aircraft

- › "ATM provisions may need to be amended to accommodate RPA, taking into account unique operational characteristics of the many aircraft types and sizes as well as their automation and non-traditional IFR/VFR capabilities;". It further concedes that "There will be some instances where the remote pilot cannot respond in the same manner as could an on-board pilot (e.g. to follow the blue C172, report flight conditions, meteorological reports). ATM procedures will need to take account of these differences." ICAO Circ 328, § 5.9
- › RPAs status is not fully irrelevant from an ANS perspective and must be known from ATC.
 - RPAs specific flight performance characteristics
 - Need for contingency measures
 - emergency recovery capability in case of failure of the command and control link (C2)

Division of responsibilities

- › The pilot-in-command of an aircraft shall, whether manipulating the controls or not, be responsible for the operation of the aircraft in accordance with the rules of the air, except that the pilot-in-command may depart from these rules in circumstances that render such departure absolutely necessary in the interests of safety.
 - ICAO Annex 2, § 2.3.1 Responsibility of pilot-in-command
- › "In accordance with Article 12 and Annex 2, the pilot-in-command is responsible for the operation of the aircraft in compliance with the rules of the air. This also extends to having final authority as to disposition of the aircraft while in command. **This is true whether the pilot is on board the aircraft or located remotely.**"
 - ICAO Circ. 328, p. 15
- › Motivation:
 - The aviation risk
 - The particular position of the pilot-in-command (situational awareness)

Liability Aspects

- › Liability aspects primarily related to the automation of flight functions
- › Shift from human fault based liability to product liability
- › Focus on the RPA operator / manufacturer
- › “[T]hird party liability for damage caused by RPAS should be developed on the basis of the principles for manned aviation. Automation creates an additional level of complexity to the question of responsibility and liability. However, legal experts concluded that strict liability will fall on the operator of the RPAS... The responsibility for accidents, liability claims and the obligation to take insurance for a RPAS falls generally on the operator of the system.
 - European Commission , Commission Staff Working Document, "Towards a European strategy for the development of civil applications of Remotely Piloted Aircraft Systems (RPAs), Brussels, 4.9.2012, SWD(2012) 259 final

Liability aspects

- › Lack of visual ability will not relieve (remote-) pilots from all liability as this handicap will need to be substituted by an alternative ability:
 - “Flight crew members have a continuing duty to be aware of dangers which they can perceive with their own eyes. Pilots cannot fail to use their own eyes and ears to be aware of danger. Pilots are charged with a duty to see that which is plainly visible.” (*PanAm v. Port Authority*, 787 F.Supp. 312 (E.D.N.Y. 1992 at 318).
 - "the pilot, after his clearance has been given remains primarily responsible for the movement of his aircraft" and is "required to follow his clearance, not blindly, but correlative with his duty to exercise care for his own safety." (*Hartz v. United States*, 249 F.Supp. 119 (N.D. Ga. 1965) at 125).
 - "The pilot has a continuing duty to be aware of dangers which are discernible with his own eyes and instruments.“ (*First of America Bank-Central v. U.S.*, 639 F. Supp. 446 (W.D. Mich. 1986) at 454)

Conclusion

- › Regulatory intervention
 - must focus on those areas where legal uncertainties exist and on those aspects that cannot be left to the discretion of the aviation industry stakeholders.
 - should be performance oriented, in the sense that it must serve the purpose of maintaining and enhancing the safety, operational efficiency, economic effectiveness and environmental efficiency of air transportation.
- › The challenge for the regulatory authorities is to allow the regulatory framework to evolve in such a manner that it supports the development of international air transportation, without jeopardising the public interests that that framework is intended to protect and without leading to excessive complexity.

Conclusions

- › Regarding specifically the regulatory integration of RPAs into the ANS framework:
 - The operation of RPAs in non-segregated airspace raises a double institutional and operational challenge
 - Amendment 43 to ICAO Annex 2 addresses the need for a prior authorisation and should satisfy the needs of ANSPs in their role to support States' airspace sovereignty protection
 - Integration of RPAs in the ANS framework is more a matter of technical ability than one of producing new ATM procedures
 - Presence of pilot on board or not should be (largely) irrelevant from an ANS perspective
 - Impact on the division of responsibilities/liabilities between (remote-)pilot and air traffic controller should remain minimal