

# Remotely Piloted Aircraft Systems Integration in Controlled Airspace

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Wissen für Morgen



# Content

RPAS

To be integrated within the European Roadmap

Spaceplanes

A new type of aircraft to be integrated



## The "Law"

- Pilotless Aircraft: Article 8 Chicago Convention (1944)

No aircraft capable of being flown without a pilot shall be flown without a pilot over the territory of a contracting State...

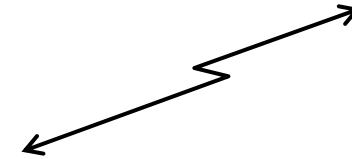
Each contracting State undertakes to insure ... to obviate danger to civil aircraft.

- UAS, RPAS: ICAO Circular 328 Unmanned Aircraft Systems, (2011)  
ICAO Manual on Remotely Piloted Aircraft Systems (2015)
- §1 Luftverkehrsgesetz: Unbemannte Luftfahrtsysteme



# Definition of Unmanned Aircraft

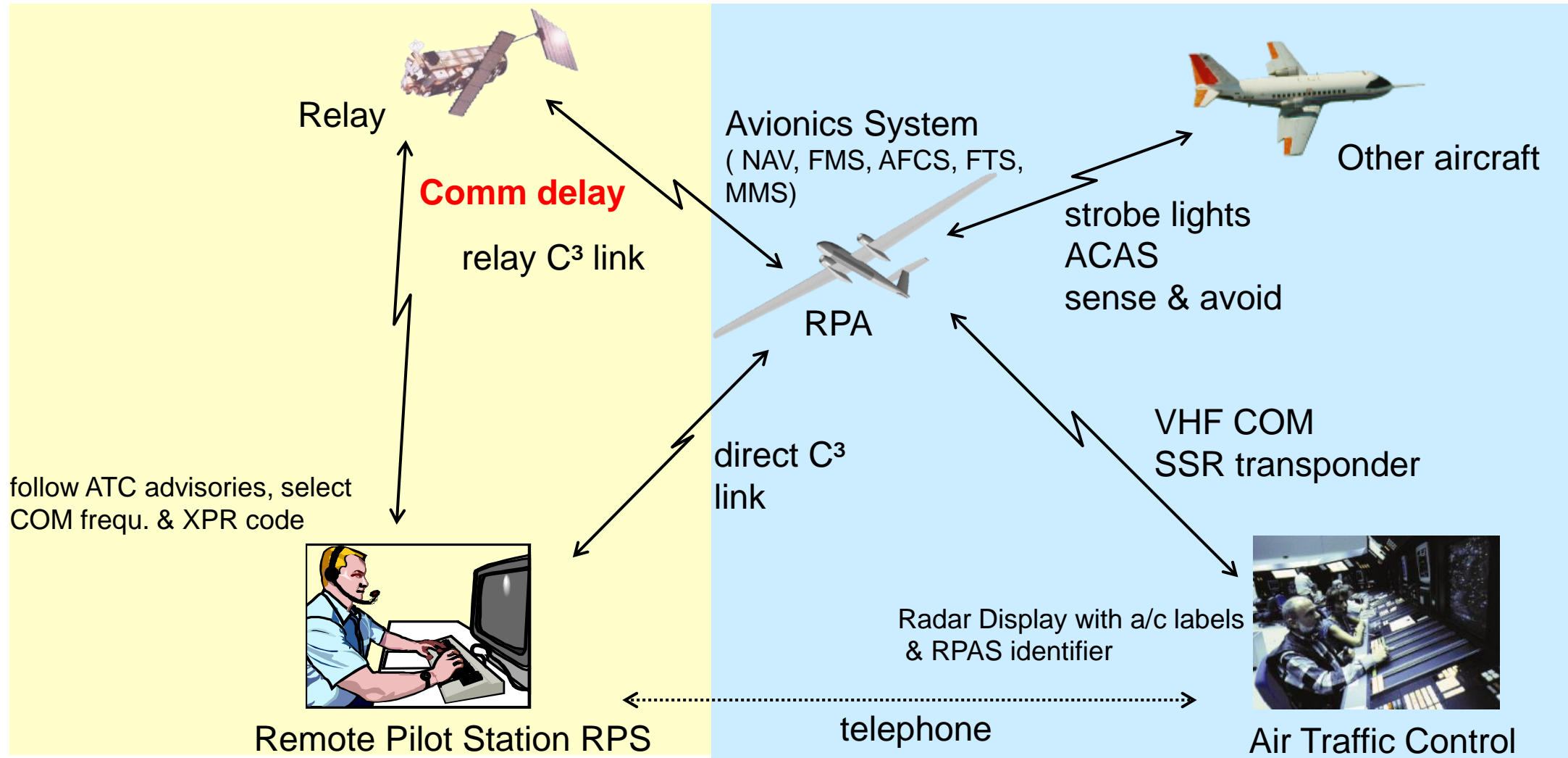
- Full autonomous UAS\*\*\* instead of RPAS  
→ System Manager at Ground
- RPAS\*\*  
→ Pilot at Ground
- Manned Aircraft
  - Single Pilot Cockpitt/OPV\*
  - Pilot as System Supervisor/-Manager



\* Optionally Piloted Vehicle    \*\* Remotely Piloted Aircraft System    \*\*\* Unmanned Aircraft System

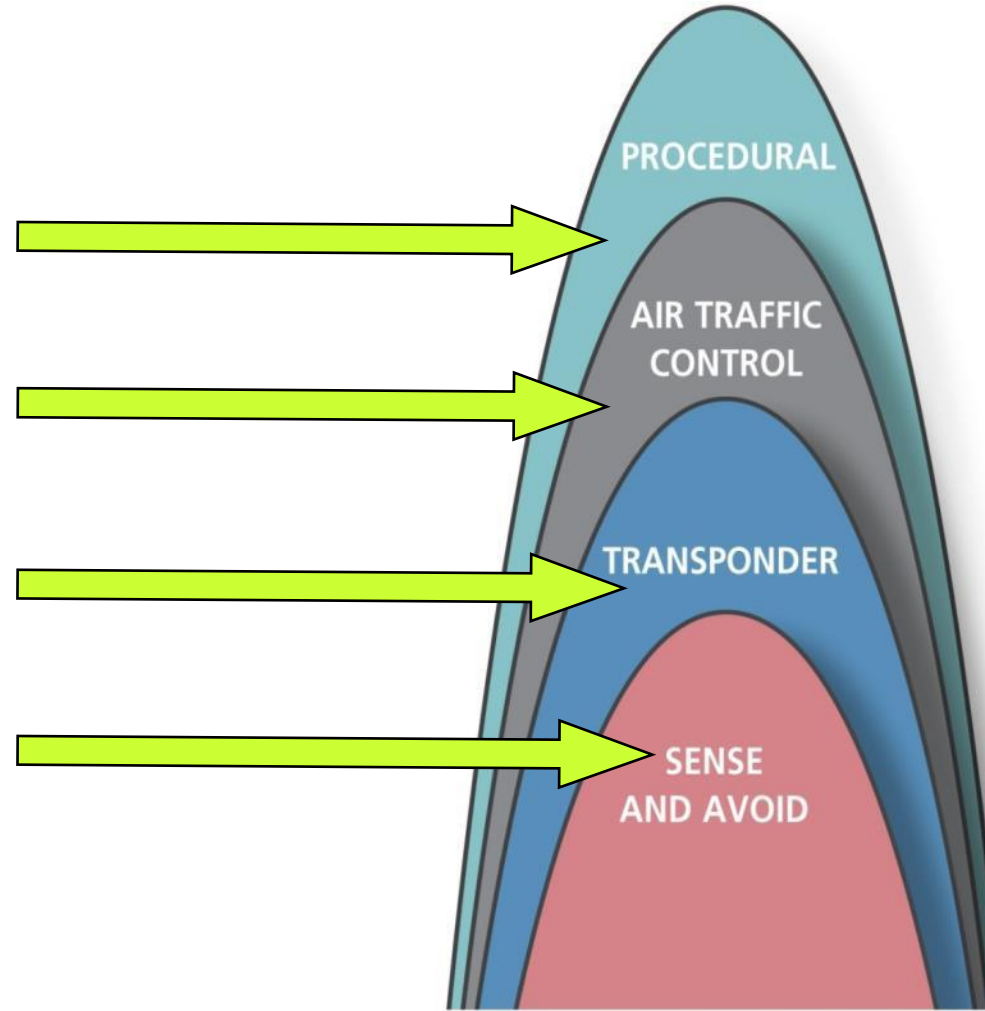


# Concept of Integration



# RPAS fully equivalent to Manned Aircraft

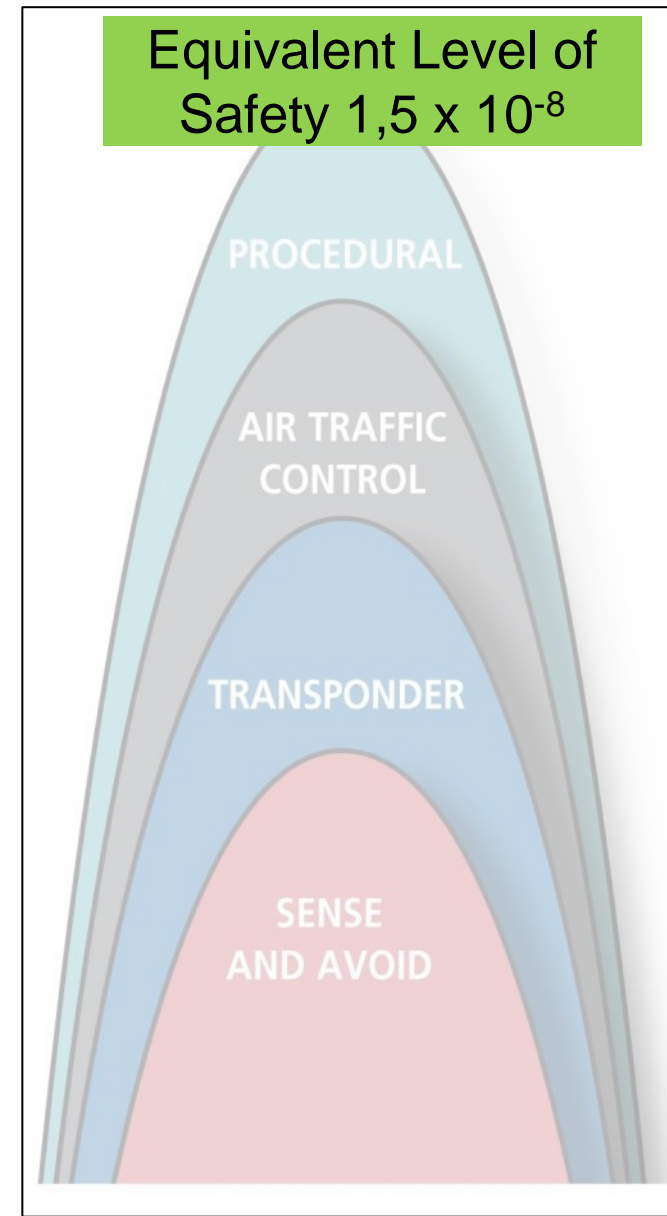
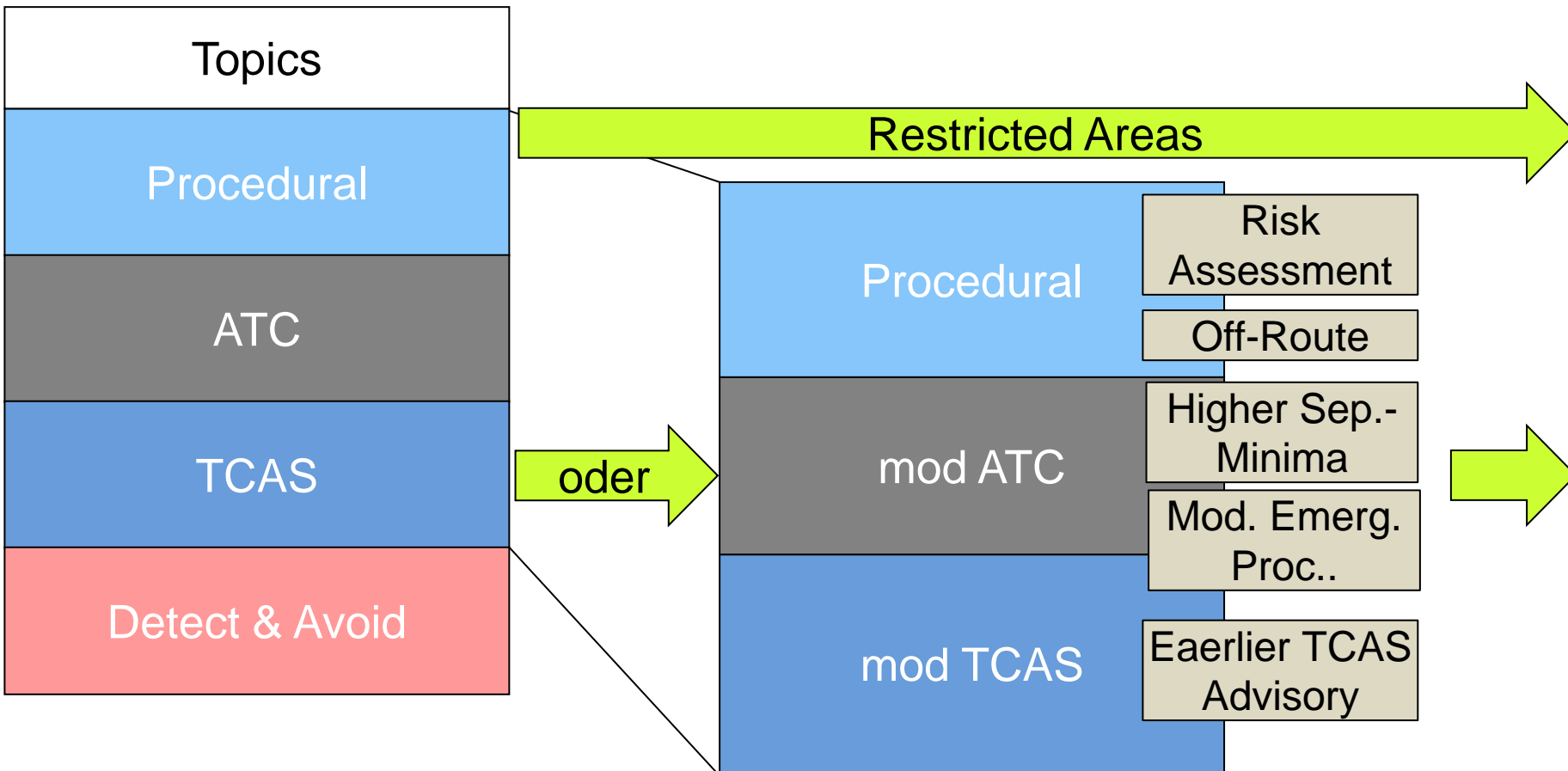
Topics
Procedural
ATC
TCAS
Detect & Avoid



safe Integration

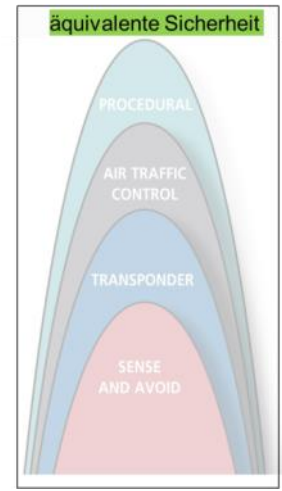
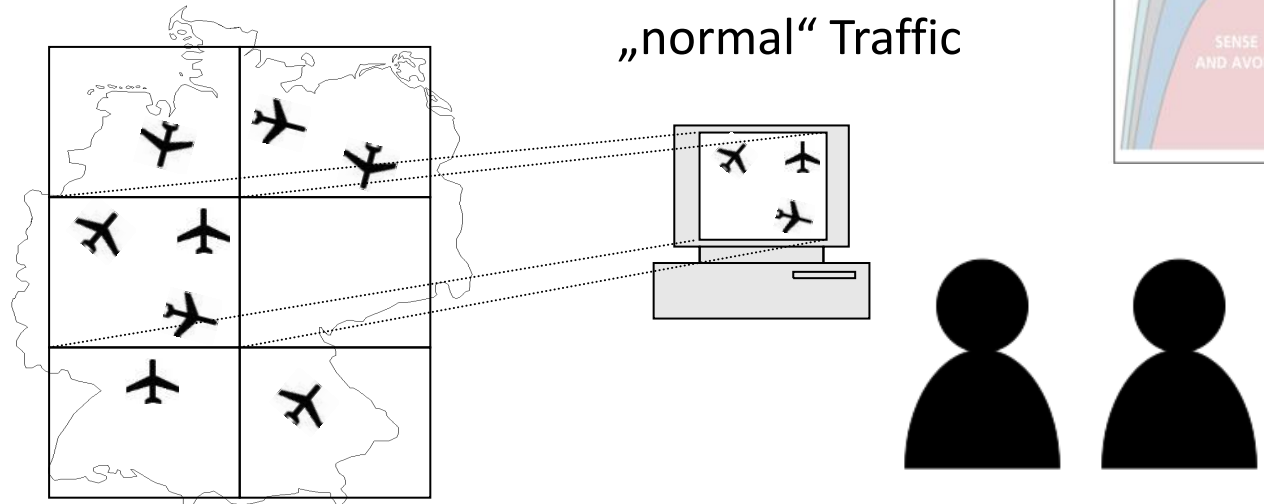
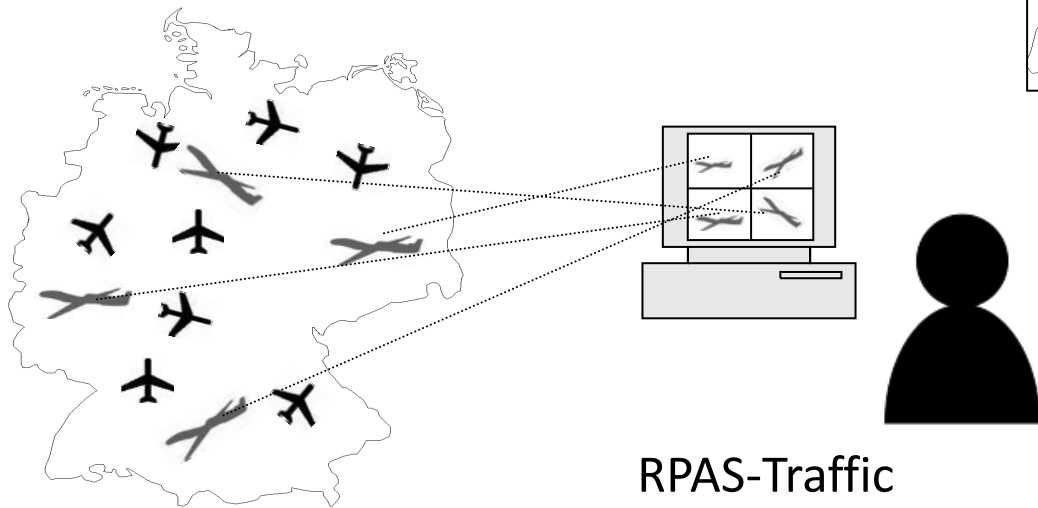


# Adapted Procedures



# Sectorless ATM: RPAS Working Position

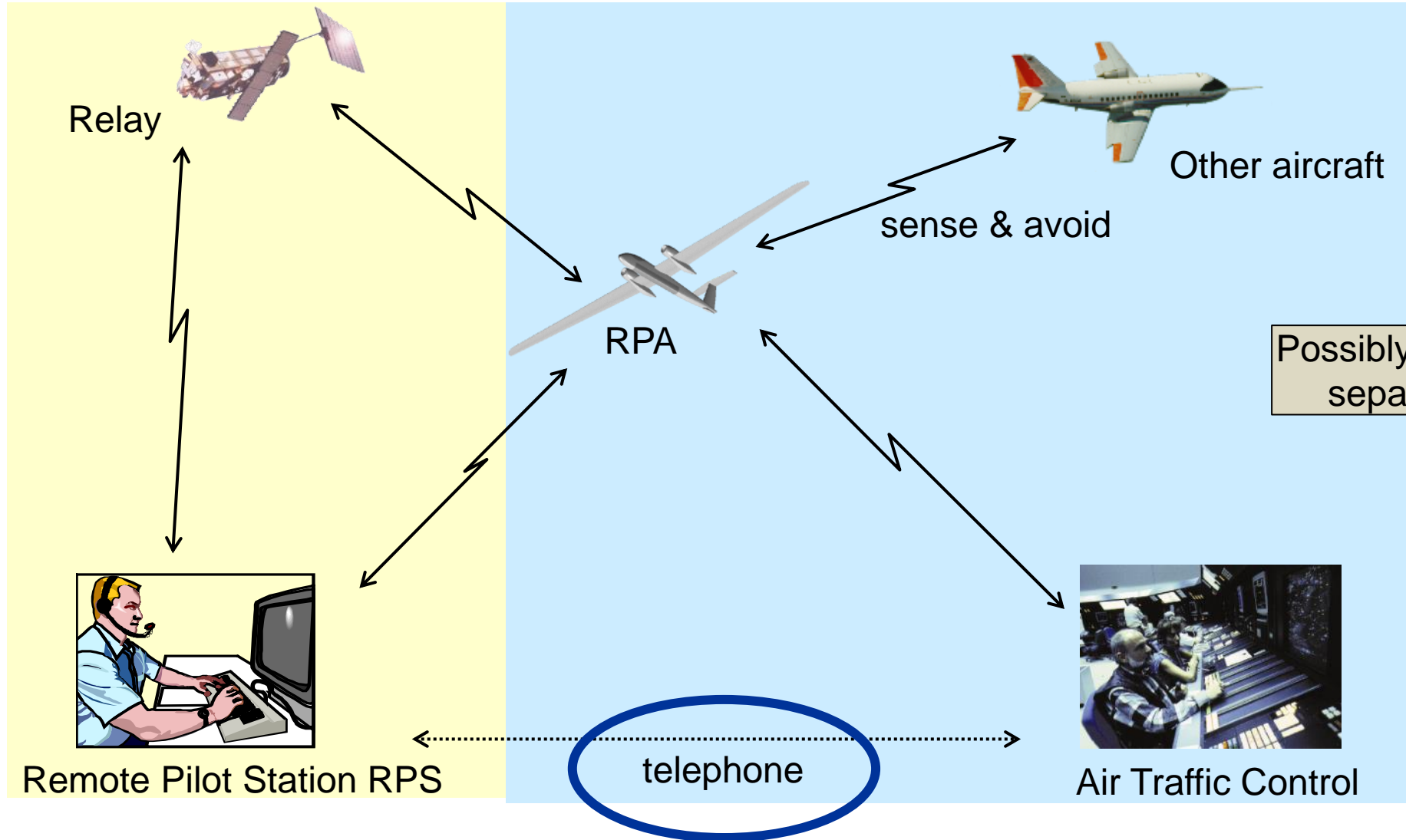
Specialist for  
RPAS-Traffic



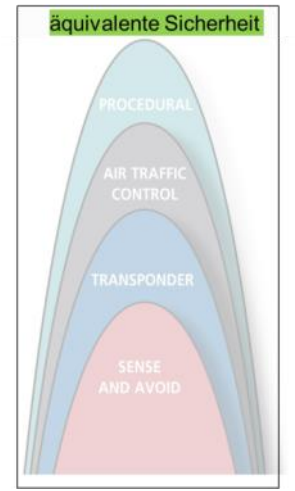
RPAS-specific separation Minima:  
e.g. 9 NM / 2000 ft  
RPAS must deviate  
S&A requirements reduced



# Simpler Communication



Possibly by using double separation minima



## But what is with Spacecraft?



- Lynx Suborbital Vehicle, XCOR Aerospace

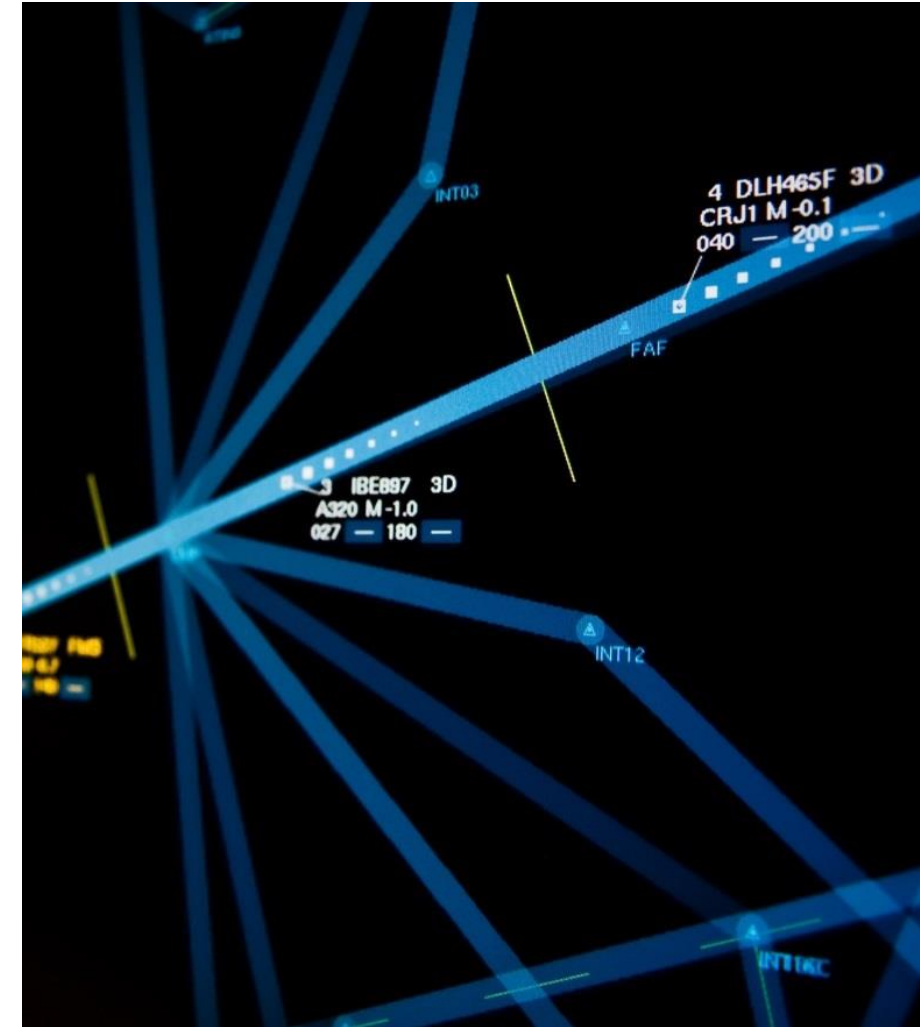
# Differences in handling aircraft vs. spacecraft in ATM

## Space Vehicles - current situation

- do not file a flight plan,
- trajectories are predictable but far away from 4D-contracts,
- provide limited capabilities to avoid other traffic, therefore have to be prioritized, therefore need restricted airspace,
- often have to delay launch / landing operations,
- will operate internationally - e.g. launch at KSC and land in Europe,

**are not (yet) fully integrated into ATS !**

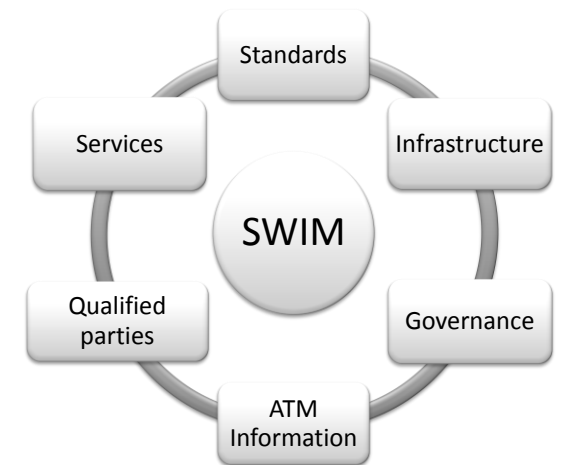
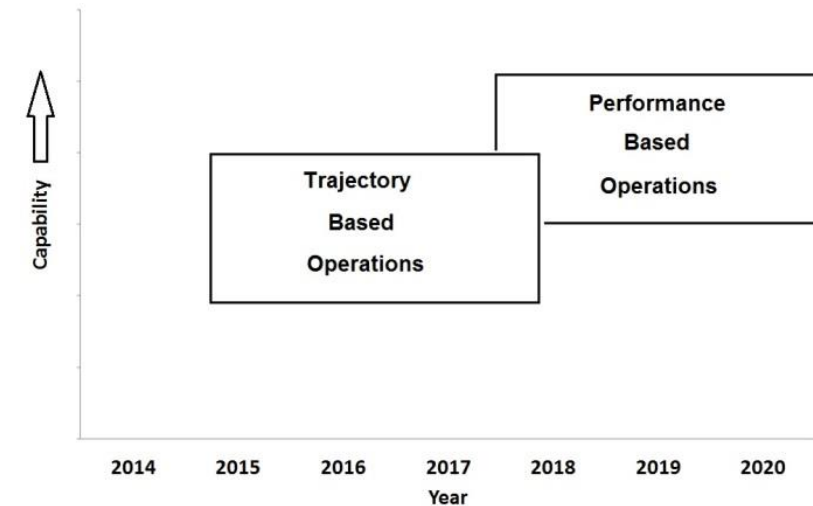
**International Intraoperability is required !**



# SESAR Requirements

## Single European Sky ATM Research Programme SESAR

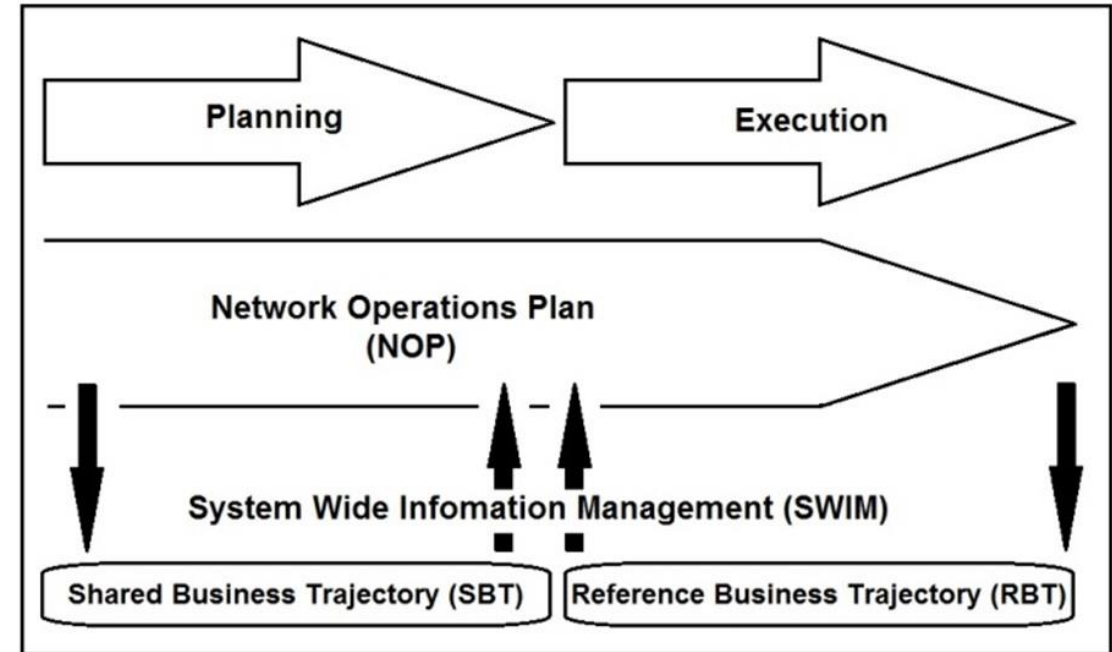
- From Business trajectory to Performance based trajectory
- System Wide Information Management SWIM
  - Integration also Controller-Pilot Data Link Communication (CPDLC)
  - Pilots, Airport Operations Centers, Airline Operations Centers, Air Navigation Service Providers, Meteorology Service Providers, Military Operations Centers



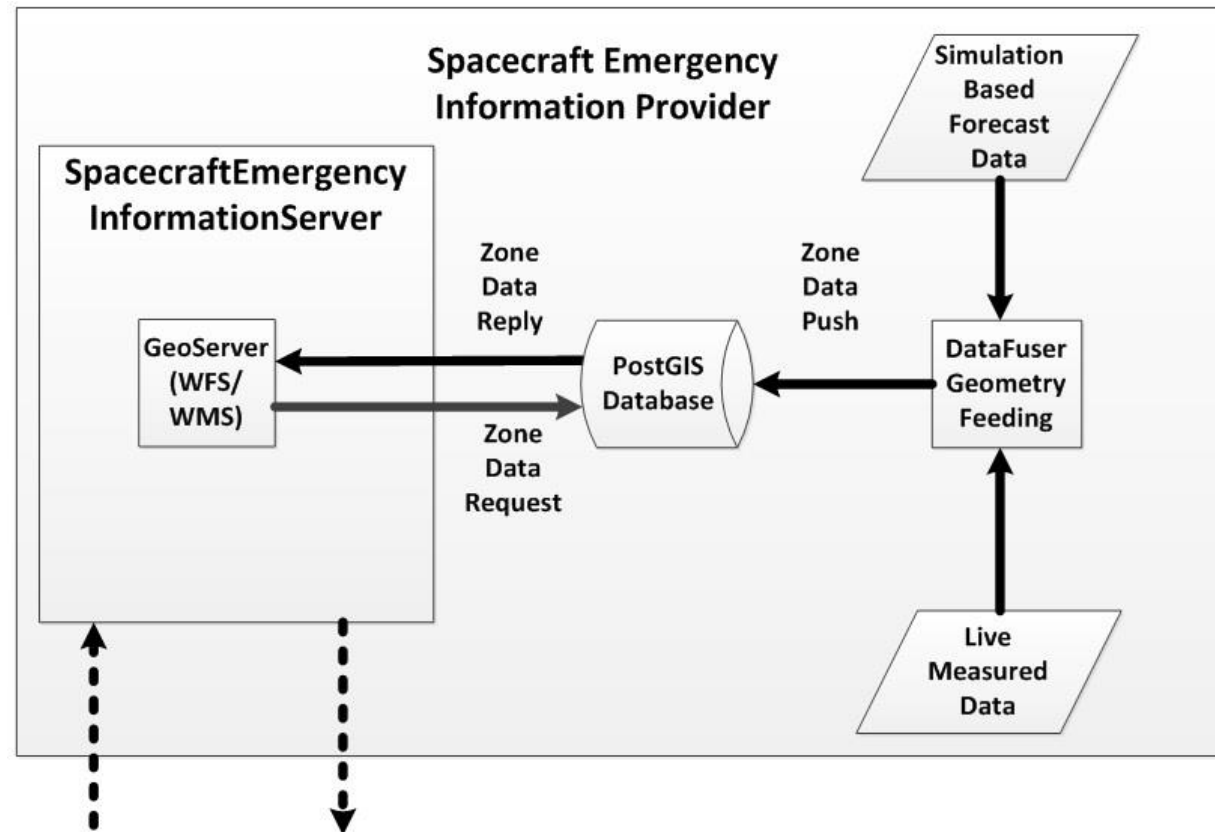
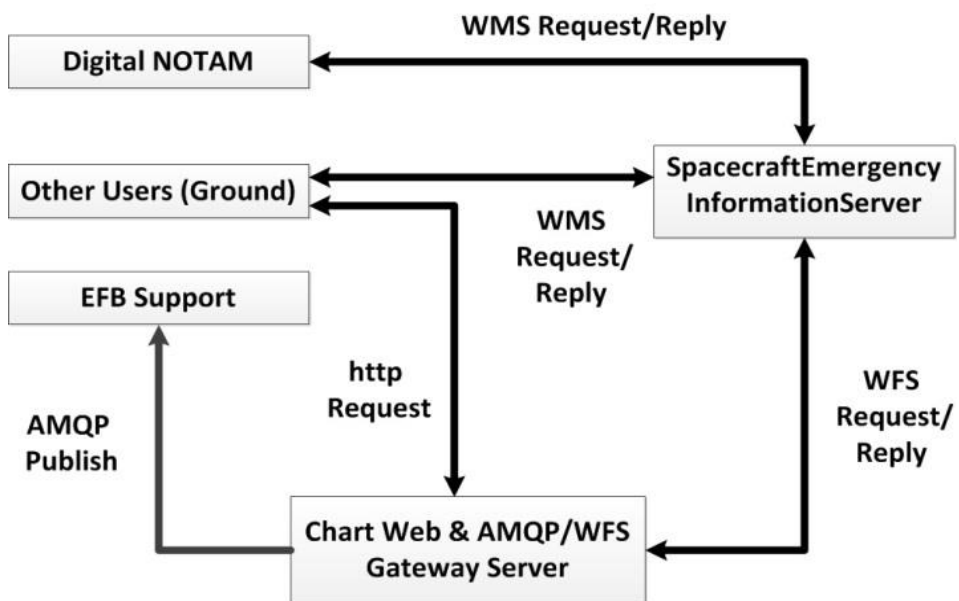
# SWIM in SESAR

## From Planning to Sharing to Execution

- Business Development Trajectory BDT
- Shared Business Trajectory SBT
- Reference Business Trajectory

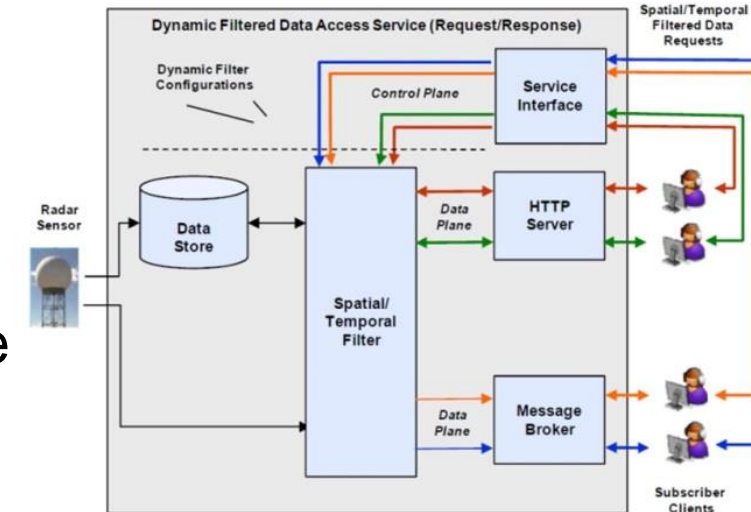


# SWIM SpaceCraftEmergencyInformationServer



# Spacecraft Flight Planning and Execution

1. Checking potential hazard areas by making the IFPS Validation System a SpaceCraftEmergency-InformationService consumer
2. Air traffic controller surveillance assistant tools consume the SpaceCraftEmergencyInformationService Issuing associated voice commands to other aircraft
3. Standard http requests for pre-formatted web charts to a chart web server
4. EFB software as an AMQP subscriber to the gate way server AMQP



O. Newell and B. Levesseur, "Shared Information Access Services in SWIM Segment 2: An Architectural Overview," Project Report ATC-383, Lincoln Laboratory MIT, 31 October 2012.



# The future is coming

- SESAR and NextGen are coming
- RPAS to be integrated in SESAR.  
New concepts can help to integrate faster.
- Spacecraft are another new type to be dealt with.  
Special emergency service to be implemented.



Thank you  
very much  
for your attention !

