

# Future Connectivity for Aviation – FCAV

Webinar 1/2

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# FCAV Team

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# Agenda

- I. Context
- II. Task Force description
- III. Connectivity landscape: a common vision
- IV. Key takeaways
- V. Transition roadmap

# Terminology used to describe connectivity

## Applications

- Baseline 1 = B1, current Controller Pilot Data Link Communications (CPDLC) in Europe
- FANS 1/A in the US, other domestic airspaces and for Oceanic
- B2
- Custom AOC/AIS and ARINC standardized AOC/AIS applications

## Networks

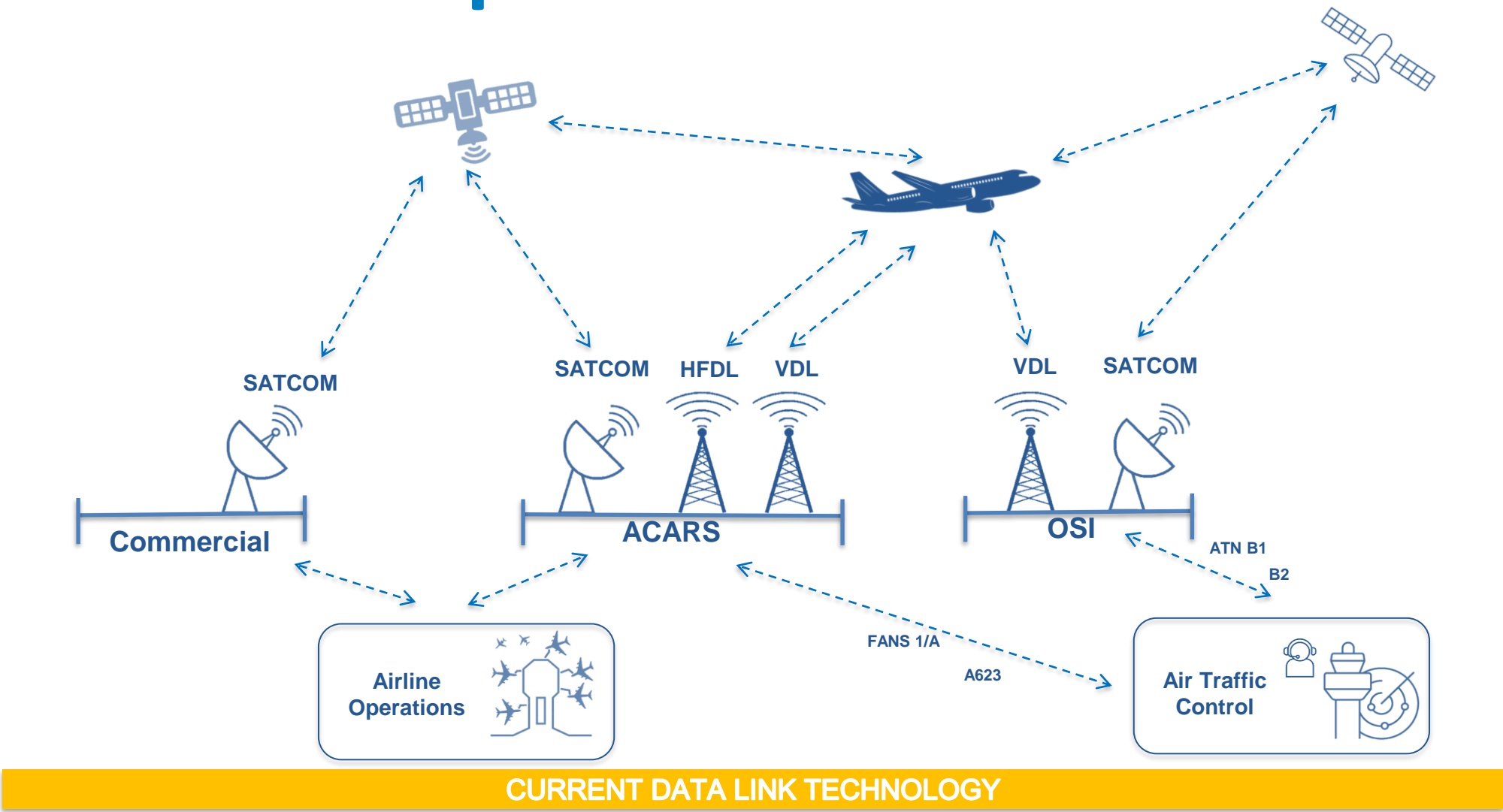
- Aeronautical Telecommunication Network (ATN) OSI (Open Systems Interconnection)
- ATN IPS (Internet Protocol Suite) in the future
- Aircraft Communications Addressing and Reporting System (ACARS)
- Internet Protocol (IP)

## Links

- VHF Data Link Mode 2 (VDL2)
- HF Data Link
- SATCOM (Classic, New SATCOM Performance Class B, commercial non-safety, etc.)

# I. Context

# Current landscape



# Current issues

## General

- Current communications reaching their limits, both in terms of capacity & performance

## ATM

- Maximum safety link capacity not sufficient
- Technologies are not fully interoperable

## Airline operations

- Increasing operational reliance and increasing volume of communications for operators
- Mostly using same link as ATM

# Expected evolutions

## ATM

- More demanding future ATM concepts
- Increased data volume (EPP, B2)

## Airline Operations

- More demanding enhanced airline operations concepts
- Increase of data volume
- Utilisation of aviation-protected spectrum could be optimised
- Increasing connectivity offer with non-safety (“public”) links

## Autonomy

- Autonomy concepts need connectivity for Pilot assistance or C2 link



## II. Task Force description

# Scope

## Type of communications

- ATM, operational, aeronautical information, and 'command and control'
- Air/ground connectivity
- Excluding passenger connectivity & RPAS payload connectivity

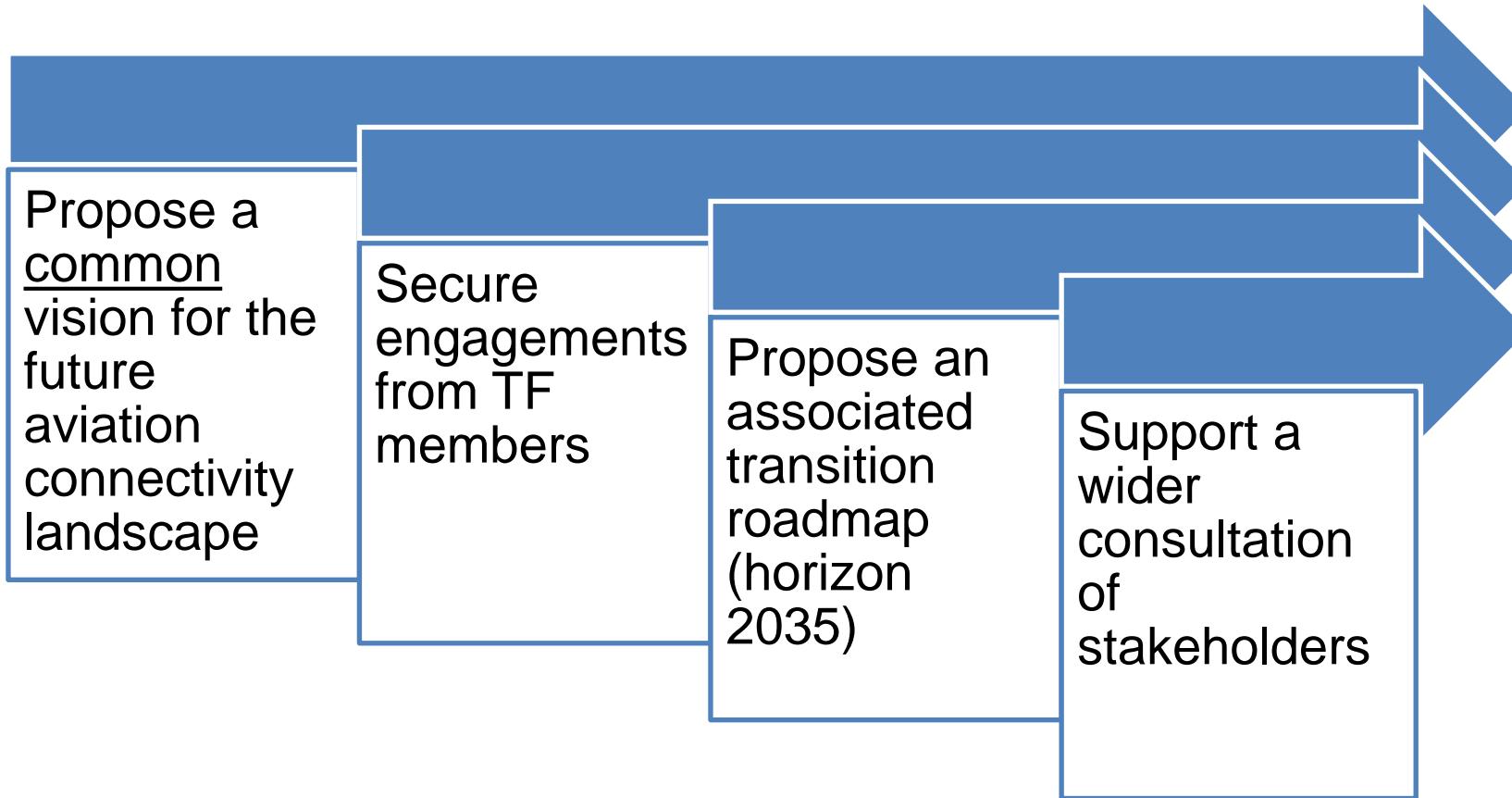
## Geographical areas

- US domestic airspace
- EU domestic airspace
- Oceanic/continental remote airspace

## Type of airborne vehicles

- Piloted large aircraft
- RPAS in IFR airspace + more autonomous large aircraft
- Excluding smaller UAS operating at low level altitude or in U-space

# Objectives



## FUTURE CONNECTIVITY FOR AVIATION

EU/US task force

White Paper

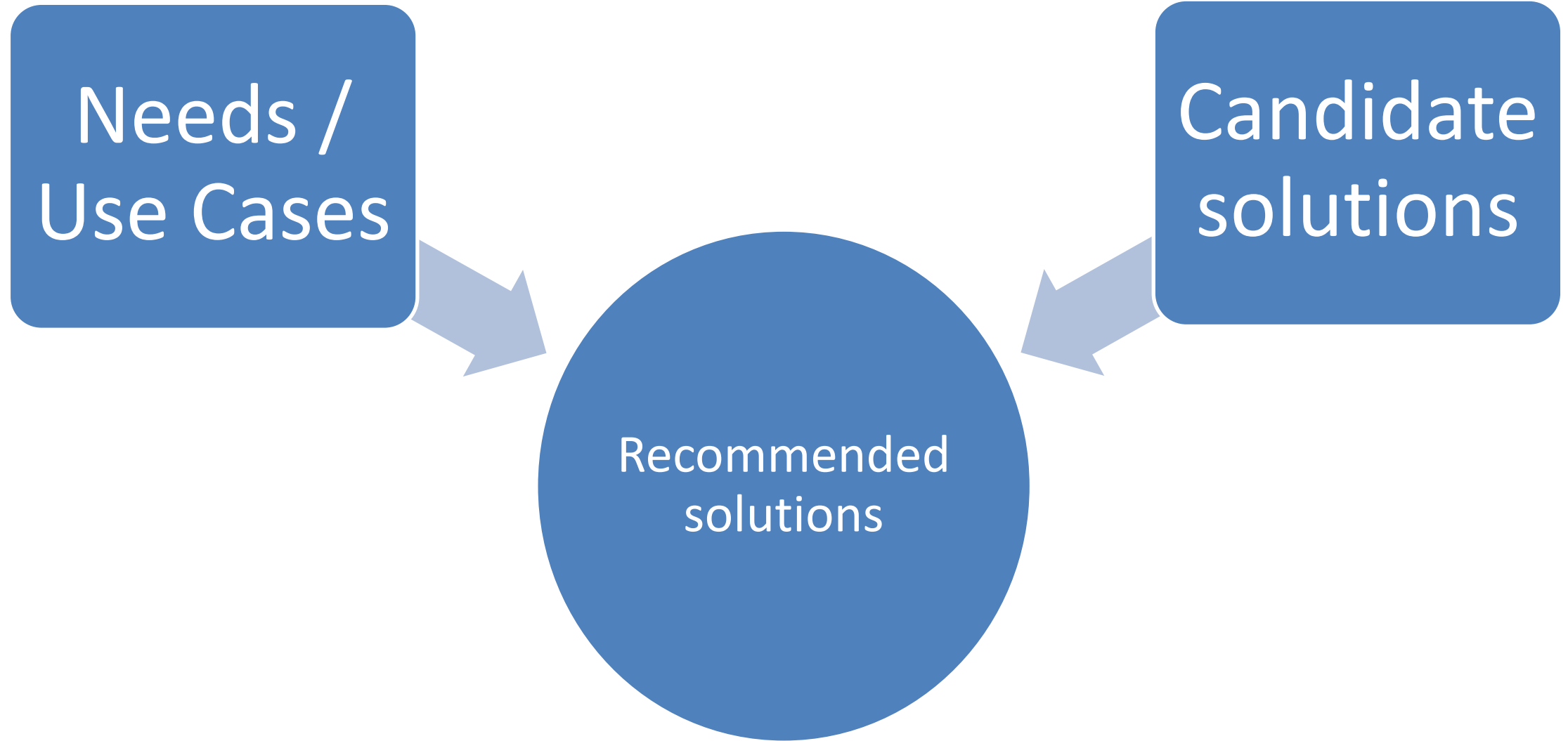


**AIRBUS**

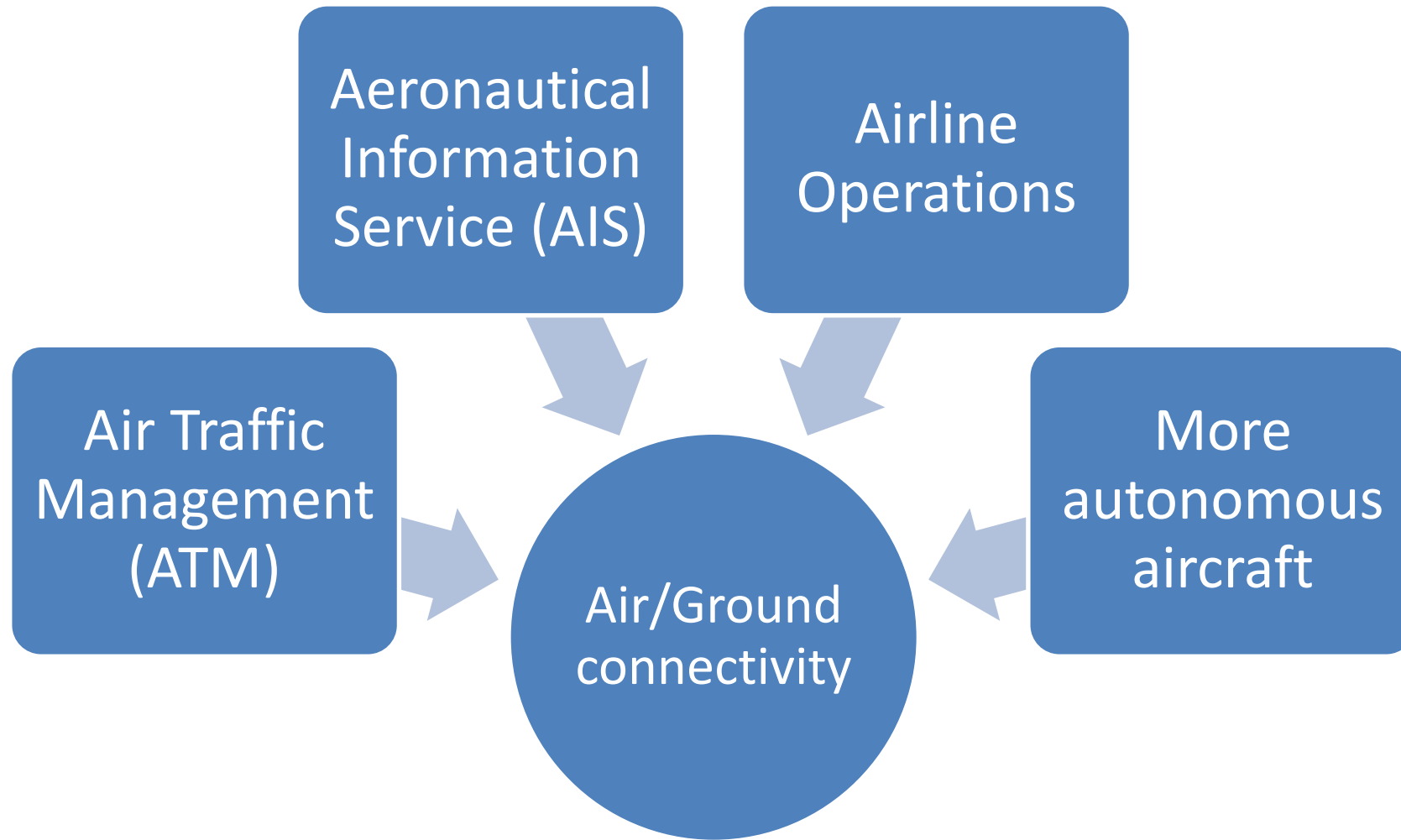


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# Methodology



# Summary of Use Cases (UC)



# III. Connectivity landscape: a common vision

# Key objectives for the target connectivity landscape

1. Adequate Capacity, Performance, Safety and Security
2. “State of the art” and “future-proof” technologies
3. Economic efficiency, at the **global industry scale**
4. Efficient usage of the available aviation protected spectrum
5. **Global interoperability**, with a single aircraft avionics capability

# Target connectivity solutions

For use cases subject to required demonstrated performance<sup>1</sup>

		Applications / Services	Network / Protocols	Links Preferred Option	Links Fallback Option
Preliminary	ATM	B2	IPS	VDL2 SATCOM Performance Class B Commercial links as complement (Hyperconnected ATM <sup>2</sup> )	SATCOM Performance Class B+ LDACS
	AIS urgent	Standard applications			
	Autonomy (assistance)	Proprietary applications			
	Autonomy (C2)			C-band (SATCOM and/or ground-based)	Commercial link (FSS)

<sup>1</sup> Solutions (applications) for which performance requirements are established and standardized.

<sup>2</sup> Use of non safety links to complement safety links with timely backup mechanism for required performance demonstration.

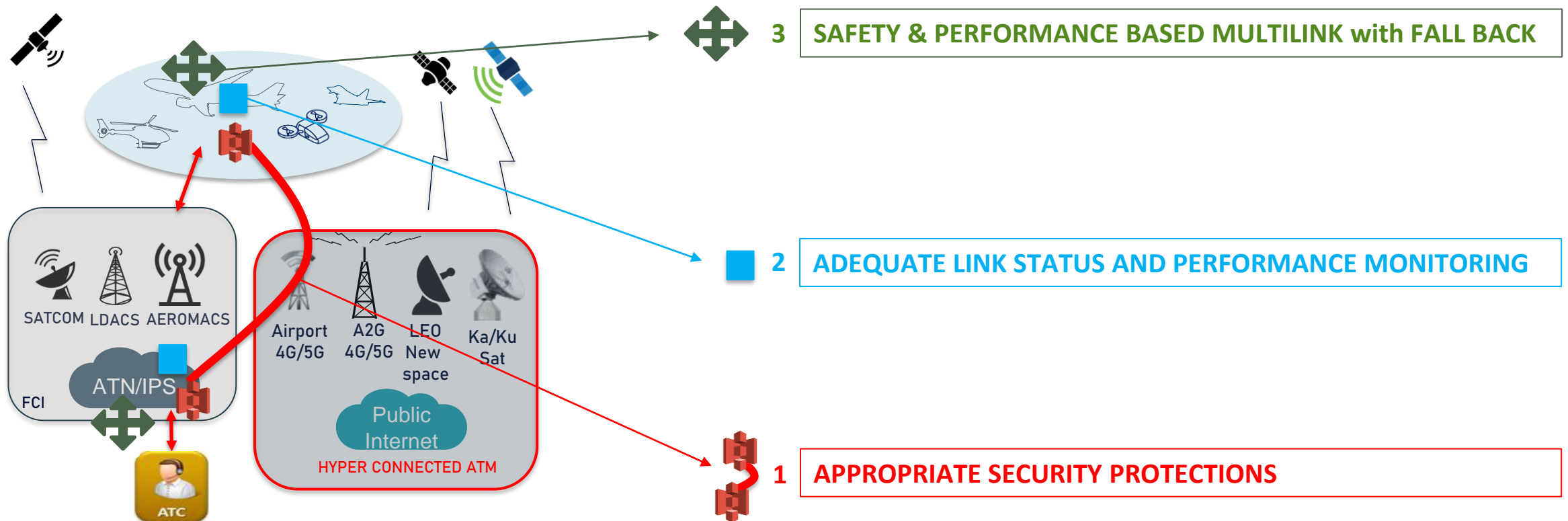


# Target connectivity solutions

For use cases not subject to required demonstrated performance

	Applications / Services	Network / Protocols	Links Preferred Option	Links Fallback Option
ATFM negotiation	Standard / Custom applications	IP	Non-safety links	N/A
Airline Operations				
AIS not urgent				

# Hyperconnected ATM overview

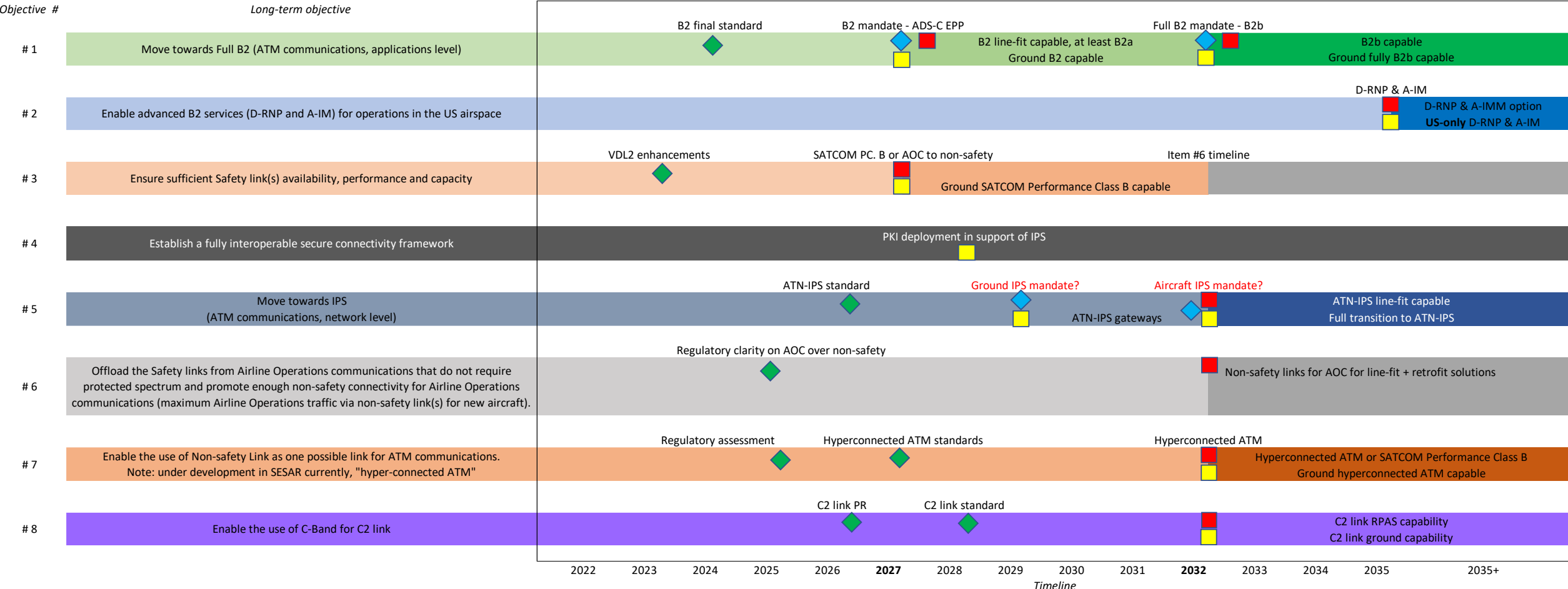


## IV. Key takeaways

# Key takeaways

1. **No new terrestrial communication infrastructure** on protected spectrum necessary
2. Agreed **aircraft equipage goals (B2, IPS)**. Ground required to **support different aircraft configurations** (OSI, IPS, ACARS), during transition phases
3. ‘Hyperconnected’ ATM technology = needs to be **further developed**
4. Communications not subject to RDP (a priori all AOC) → **offloaded from the** safety links when feasible
5. **Necessary regulatory clarity:** usage of protected spectrum
6. **C-Band solution to be further assessed and developed** to support C2 link for some autonomy applications

# V. Transition roadmap



Mandate

Standard or Rule update

Aircraft equipment upgrade

Ground equipment upgrade

# Airframers

	2027	2032	2035
Application	All linefit <b>B2</b> (Europe)		<b>B2 advanced services for FAA</b> available linefit as an option
Network		All linefit <b>IPS</b>	
Link	If <b>B2</b> , linefit <b>VDL2</b> + <ul style="list-style-type: none"> <li>➤ <b>SATCOM Class B</b></li> <li><b>AND/OR</b></li> <li>➤ <b>Cabin SATCOM/A2G and AOC offload</b></li> </ul>	All linefit with <ul style="list-style-type: none"> <li>➤ <b>SATCOM Class B</b></li> <li><b>AND/OR</b></li> <li>➤ <b>Cabin SATCOM/A2G + Hyper Connected ATM and AOC offload</b></li> </ul>	

# Operators

	2027	2032	2035
<b>Application</b>	<ul style="list-style-type: none"> <li>➤ All line fit equipped with <b>B2</b> (EU Mandate)</li> <li>➤ Voluntary retrofit to <b>full B2</b></li> </ul>		Voluntary retrofit to <b>B2 advanced services</b> for US.
<b>Network</b>		Voluntary retrofit of existing aircrafts for <b>ATN/IPS</b>	
<b>Link</b>	<ul style="list-style-type: none"> <li>➤ Voluntary retrofit with <b>SATCOM class B</b> and</li> <li>➤ Voluntary <b>move AOC traffic over non safety links</b></li> <li>➤ Prioritize use of SATCOM vs. VDL2 for ATM traffic</li> </ul>	When equipping existing fleets with non-safety connectivity, <b>ensure hyper-connected ATM capability</b>	



# Standardisation bodies and regulators

	2027	2032	2035
<b>Application</b>	<ul style="list-style-type: none"> <li>➤ <b>Freeze B2 standard by 2023</b></li> <li>➤ Update definition of services that can or should use protected spectrum</li> </ul>		FAA to develop and issue policy for tailored procedures for advanced B2 services
<b>Network</b>	<ul style="list-style-type: none"> <li>➤ <b>Freeze ATN/IPS standard by 2023</b></li> <li>➤ Standardize ACARS over IP protocol and ensure compatibility with existing ACARS services</li> </ul>	<ul style="list-style-type: none"> <li>➤ <b>EU to develop the ATN/IPS mandate (TBC)</b></li> <li>➤ FAA to develop the IPS policy (including OSI compatibility)</li> </ul>	
<b>Link</b>	<ul style="list-style-type: none"> <li>➤ Finalize VDL2 improvements</li> <li>➤ <b>Allow the use of non safety links for ATM</b></li> <li>➤ <b>Develop standards for Hyper connected ATM by 2027</b></li> </ul>		

# ANSPs

	2027	2032	2035
<b>Application</b>	EU ANSP <b>Ensure B2 ADS-C capability</b> and maintain B1 CPDLC compatibility US ANSP Ensure FANS 1/A backward compatibility for B2 aircraft	US & EU ANSP <b>Ensure Full B2 (CPDLC + ADS-C) capability</b>	US ANSP Ensure advanced B2 capability
<b>Network</b>		US & EU ANSP <b>Ensure support of ATN-IPS</b>	
<b>Link</b>	US & EU ANSP <ul style="list-style-type: none"> <li>➤ <b>Ensure transparent integration of Satcom class B in DL infrastructure</b></li> <li>➤ <b>Deploy VDL2 improvements</b></li> </ul>	EU & US ANSP <b>Ensure seamless and transparent integration of multiple datalinks, i.e. Hyper Connected ATM</b>	

# Data Link SPs

	2027	2032	2035
Application			
Network		EU DSP <ul style="list-style-type: none"> <li>➤ Maintain compatibility with ATN-OSI</li> <li>➤ Ensure compatibility with ATN-IPS</li> </ul> US DSP <p>Maintain compatibility with FANS/ACARS, ATN/IPS and ATN/OSI</p>	
Link	<ul style="list-style-type: none"> <li>➤ Deploy VDL2 improvements</li> <li>➤ Ensure transparent integration of SATCOM class B in Data Link infrastructure</li> </ul>	<p>Ensure non-safety communication networks can be connected to the ANSPs and implement Hyperconnected ATM mechanisms</p>	

# Thank you for your attention!

Questions are welcome.