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World ATM Congress 2017

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SESAR CNS STRATEGY

Marouan CHIDA

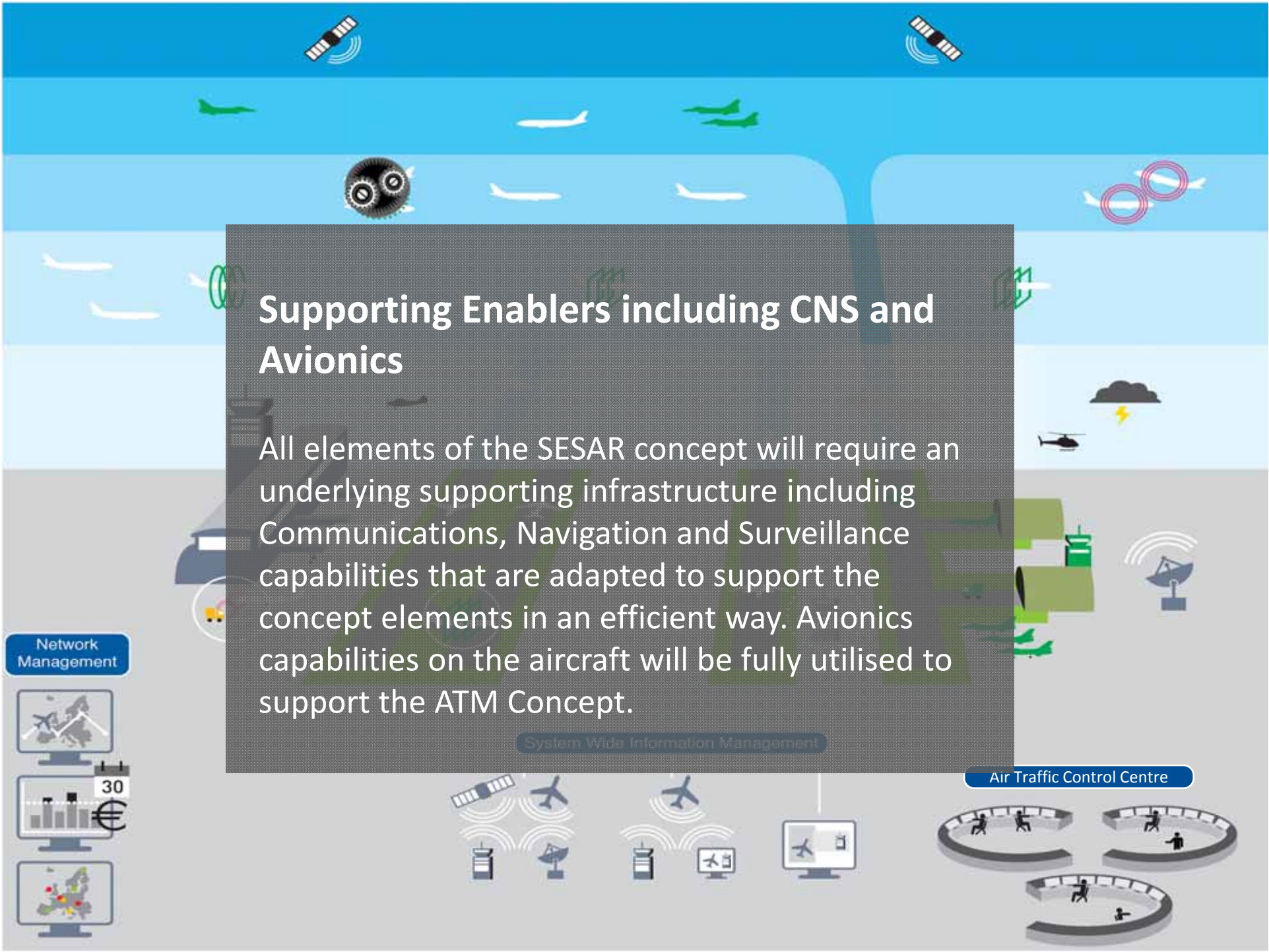
SESARJU





The SESAR Operational Concept



The diagram illustrates the SESAR (Single European Sky ATM Research) concept. It shows a multi-layered system. At the top, two satellites are in orbit. Below them, various aircraft (commercial jets, military fighters, a helicopter) are shown in flight. A central grey box contains the title and text. To the left, a 'Network Management' section shows a map of Europe, a bar chart with a '30' and a Euro symbol, and another map. At the bottom, a 'System Wide Information Management' section shows a network of satellites, ground stations, and aircraft. To the right, an 'Air Traffic Control Centre' section shows three circular control rooms with operators. The background is divided into horizontal bands of blue and grey, representing the sky and ground respectively.

Supporting Enablers including CNS and Avionics

All elements of the SESAR concept will require an underlying supporting infrastructure including Communications, Navigation and Surveillance capabilities that are adapted to support the concept elements in an efficient way. Avionics capabilities on the aircraft will be fully utilised to support the ATM Concept.

Network
Management



System Wide Information Management



Air Traffic Control Centre



The underlying vision

The future CNS environment shall be:

Performance driven

Cost effective

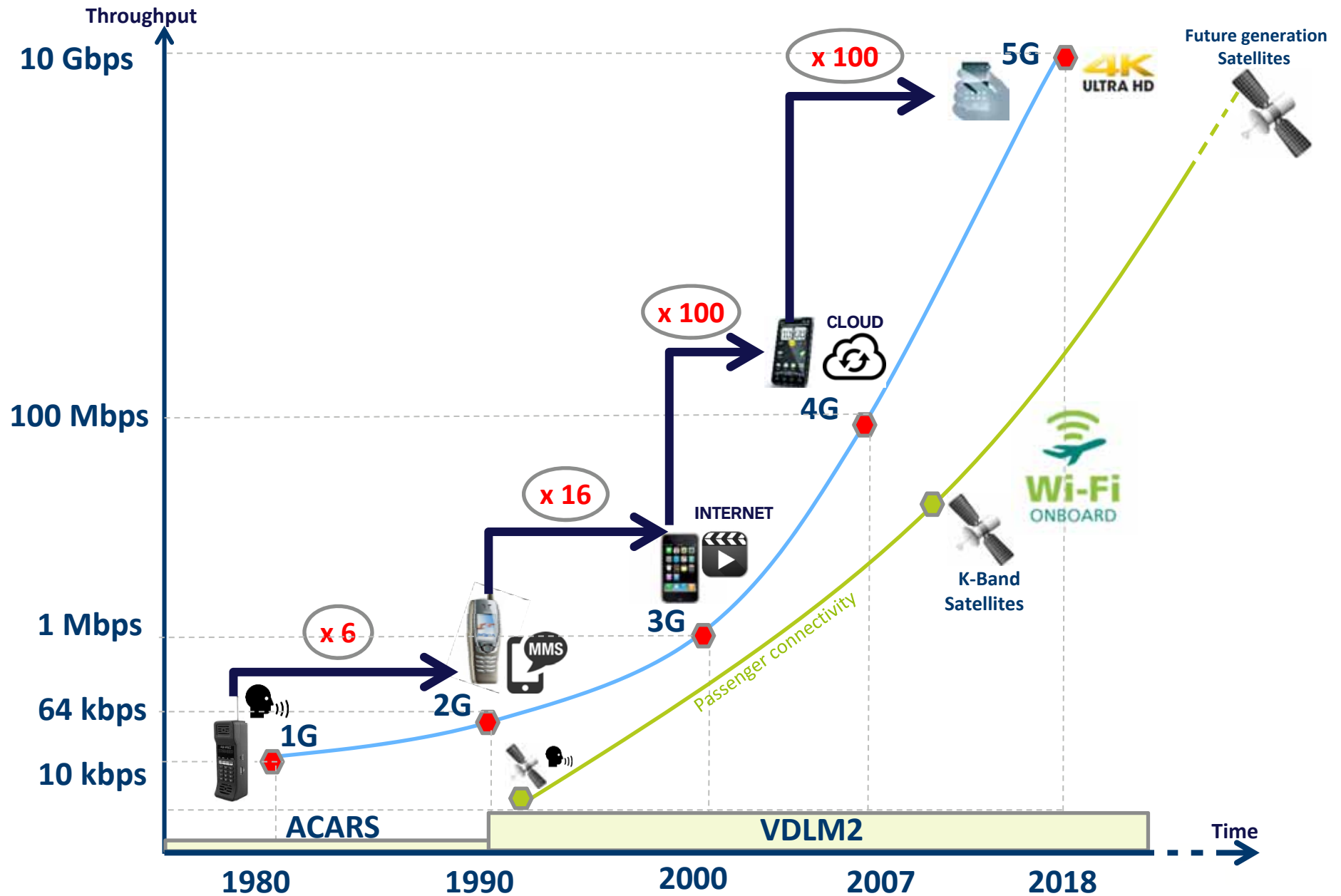
Enabling advanced operations

Spectrum efficient

Safe & Secure



Mobile Communication



Communication Roadmap

Technology	Year																				
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
						Focus Areas: Datalink primary means of communication Performance based comm Next generation high bandwidth comm systems (Transition to IPS) Multilink approach combining SatCom, terrestrial and Airport based technologies Spectrum															
A/G datalink over ATN/OSI-multi frequency (Baseline for ADS-C EPP)																					
A/G datalink over ATN/OSI-single frequency	◀																				
Future communication infrastructure-ATN/IPS and multilink																					
Future SATCOM for ATM long-term SATCOM/IRIS (class A SATCOM)																					
Future SATCOM for ATM: Precursor for INMARSAT SBB (class B SATCOM)																					
New A/G datalink using ATN/IPS over L-band)																					
New airport datalink technology (AeroMACS)																					
PENS-phase 2																					

Navigation Roadmap

Technology	Year																				
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Satellite																					
	GBAS																				
GBAS Cat I based on single-constellation/single-frequency GNSS (GPS L1)																					
GBAS Cat II/III based on multi-constellation/multi-frequency (MCMF) GNSS (GPS + GALILEO / L1 + L5)																					
GBAS Cat II/III based on single-constellation/single-frequency GNSS (GPS L1)																					
GALILEO E1/E5																					
GPS L1/L5																					
EGNOS V2.4.X																					
EGNOS V3																					
Conventional																					
A-PNT (alternative position, navigation and timing)																					
DME ground infrastructure optimisation																					
NDB decommissioning																					
Rationalisation of approach and landing system																					
VOR/DME MON (minimum operational network)																					

Focus Areas:

GNSS prime means of Navigation

Multi constellation

Alternative Position Navigation and Timing

Rationalisation

Spectrum



INNOVATION TO SOLUTION

Surveillance roadmap

Technology	Year																				
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Surface																					
																				SMR	
Airport surface surveillance through SMR																					
																				MLAT	
Airport surface surveillance through MLAT																					
Ground based																					
ADS-B receiving station																					
Composite WAM/ADS-B																					
Primary surveillance radar																					
Multi-static primary surveillance radar																					
SSR Mode S																					
Wide area multilateration (WAM)																					
Video surveillance																					
Rationalisation of conventional surveillance infrastructure																					
Aircraft based																					
																				ADS-B	
Air broadcast of aircraft position/vector (ADS-B out) compliant with DO260B																					
Airborne traffic situational awareness to support in-flight operations (ATSA-AIRB) including reception (ADS-B in) processing and display																					

Focus Areas:

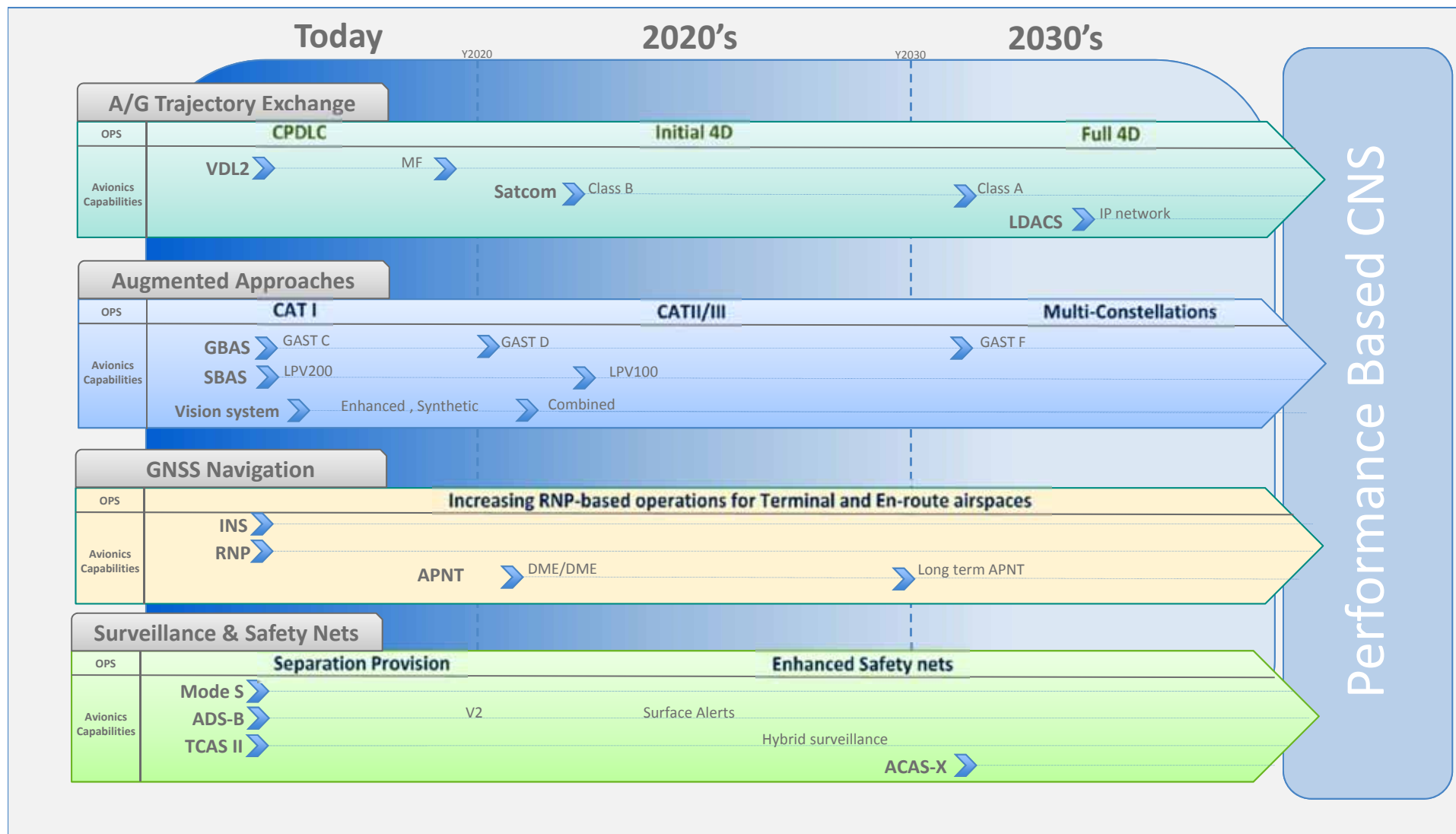
Performance based surveillance

Rationalisation

Synergies (composite...)

Spectrum

SESAR Avionics Roadmap

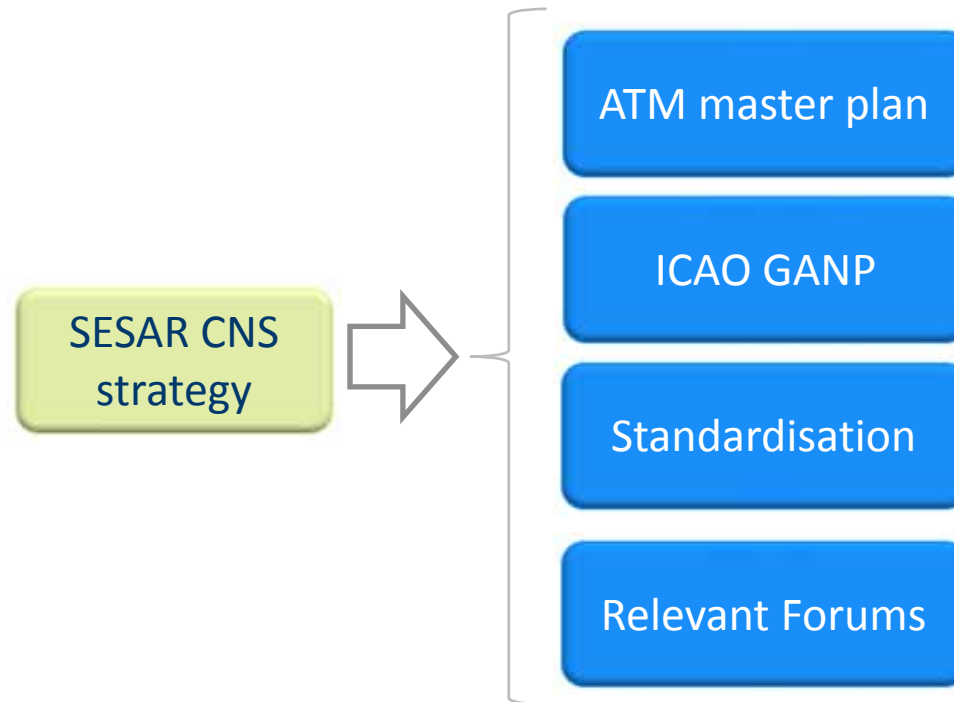


➤ Approximative IOC dates in Europe

Towards Integrated CNS

- Today, Com, Nav and Sur are managed and operated as separate threads.
- This creates significant duplication of means that have cost, performance and spectrum implications.
- Integration of C, N and S provides significant opportunities;
- A holistic analysis of technological synergies and architecture is required: Define an unconstrained integrated CNS architecture.
- Transition also has to be managed safely and cost-effectively.

Value chain



Conclusion

SESAR Operational Improvements are underpinned and enabled by **CNS capabilities** (infrastructure)

CNS evolutions focus on **delivering enhanced capability** and **rationalising** the use of scarce resources and take a **more 'business focused' approach** .

Spectrum availability fundamental to this evolution.

Integrated approach to C, N ,S and Spectrum will maximise the potential synergies in technology and infrastructure



Thank you
for your attention



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AIRBUS AVIONICS ROADMAP

Didier Delibes

Airbus



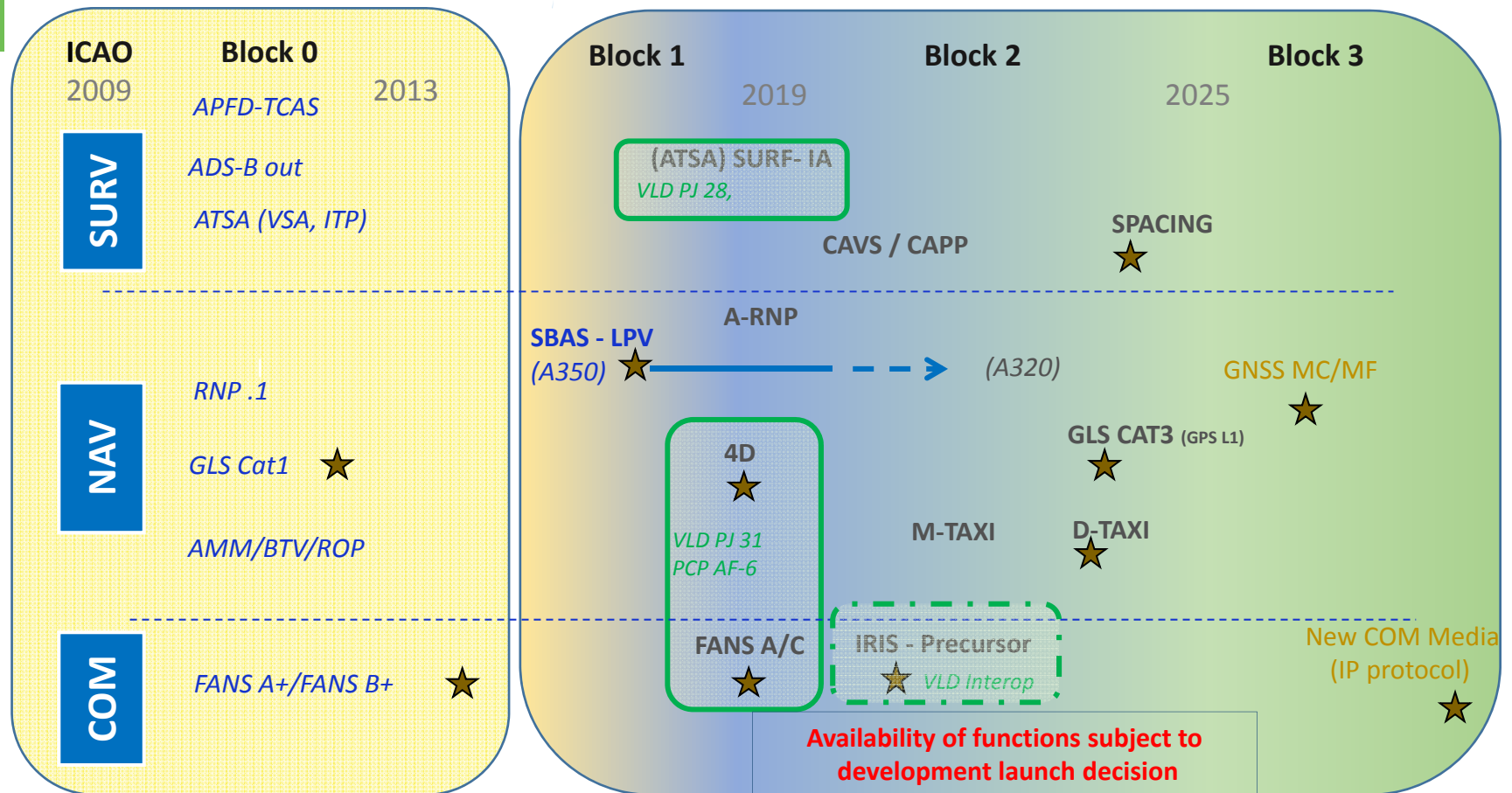
Airbus ATM Engineering Strategy

- The main objective of the Airbus Engineering strategy in ATM is to
 - Enable Air transportation growth
 - Deploy on aircraft new ATM capabilities that make value for airlines



Airbus Avionics road map

★ = additional equipment required on ground



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4D 4-dimensional navigation
ATSA Airborne Traffic Situation Awareness
CAPP CDTI Assisted Pilot Procedure

CDTI Cockpit Display of Traffic Information
CAVS CDTI Assisted Visual Separation
FANS Future Air Navigation System

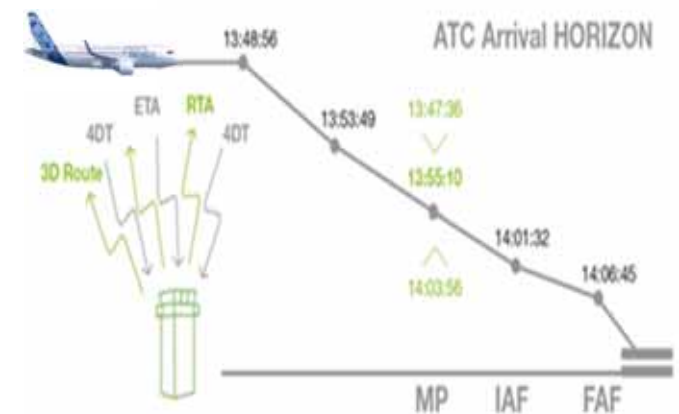
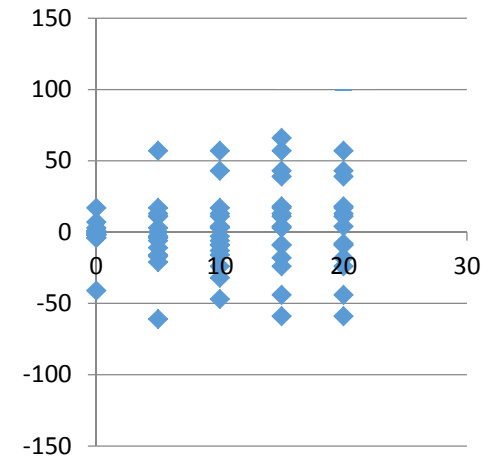
ITP In Trail Procedure
MC Multi Constellation
MF Multi Frequency

GLS Ground Based Augmentation Landing System
SURF I/A Surface - Indications and Alerts
VSA Visual Separation Assistance

Initial 4D

- AIRBUS investment in FANS A/C to support PCP AF-6 and Trajectory Based Operations
- Use of **EPP** in ground trajectory predictions should be the game changer for ATM transformation with potential for wide use in ATM services (e.g. MTCD, DCB, CM, ...)
 - EPP in “open” loop : ETA accuracy < 1 min on predictions 20-30 min ahead (ref PEGASE)
 - EPP in “close” loop (with RTA) : accuracy < 10 sec when needed
- Industrial product available by end 2018 to support SESAR VLD and fine tune use cases with addition of operational incentives (BEBS) and demonstration of benefits for AUs

ETA accuracy



CM

Conformance Monitoring

DCB

Dynamic Capacity Balancing

ETA

Estimated Time of Arrival

MTCD

Mid Term Conflict Detection

RTA

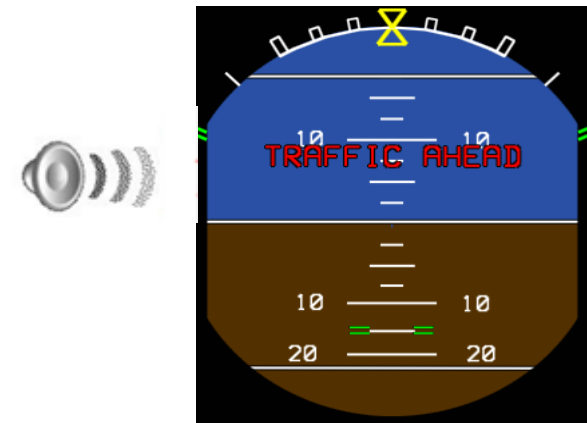
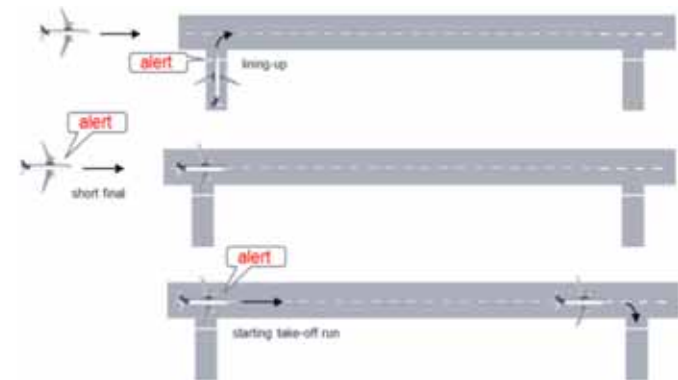
Required Time of Arrival

VLD

Very Large scale Demonstrations

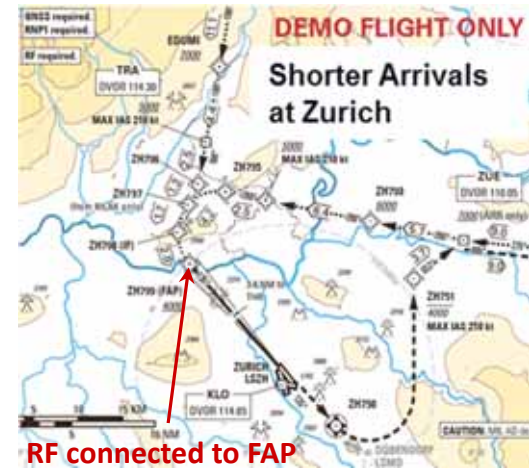
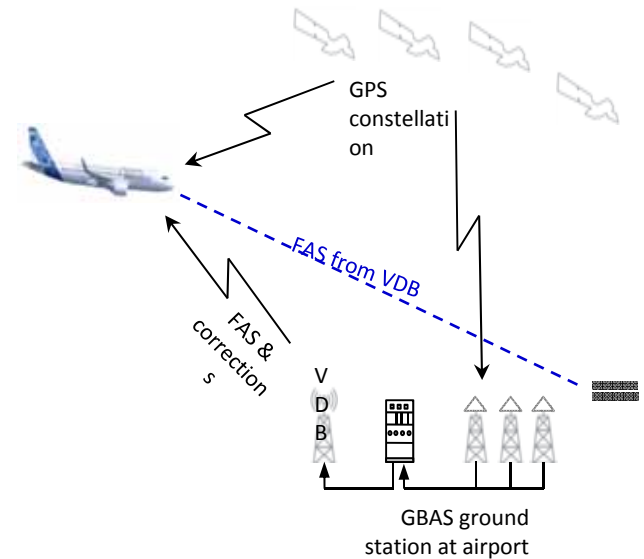
SURF – IA (Indication & Alert)

- Runway incursions remains a major hazard with around 2 occurrences a day in Europe
- Business case for Safety solutions still challenging
- A SURF-IA simplified concept (without CDTI) aimed at increasing affordability has been validated in SESAR1
- SESAR 2020 VLD (PJ 28) will complete validation on the field



GBAS CAT 3

- GBAS CAT 3 standards validated
- GBAS well supported by the R&D community
 - Increased runway bandwidth when LVP are in force
 - Enabler for more flexible approach operations (Increased G/S, Displaced Threshold, curved approach)
- But still no perspectives for large deployment
- How to create the momentum ?



CONCLUSION

- AIRBUS Avionics roadmap highlight a mix of “launched” and “to be launched” - pending Business Cases consolidation covering operational and safety improvements, and infrastructure transition
- SESAR JU and SESAR Deployment Manager pivotal role for streamlining deployment initiatives in Europe
- SESAR solutions worldwide interoperability and broader deployment perspective should facilitate Business Cases
- BEBS incentives have some support (e.g. ICAO recommendation 6/2) but still missing practical implementation in new concepts operations





**Thank you
for your attention**

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