User Requirements for Air Traffic Services (URATS)

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FOREWORD

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Director Flight and Technical Operations
International Air Transport Association
800 Place Victoria
P.O. Box 113
Montreal, Quebec
CANADA H4Z 1M1

DOCUMENT CONTROL

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Contents

1. Introduction

This document provides international airline perspectives on **C**ommunications, **N**avigation, and **S**urveillance (CNS) technologies. In some instances, projects and applications that have evolved from specific CNS technologies are also mentioned, e.g., Europe's proposed IRIS communications system based on Viasat / Inmarsat SatCom, or Space-based ADS-B (SB ADS-B) with its foundation in terrestrial ADS-B OUT technology and protocols.

Readers are invited to contact IATA with respect to any aeronautical CNS technologies or applications not covered in this document. Inquiries may be directed to infrastructure@IATA.org

Be reminded that support for a technology doesn't automatically extend to specific usage of that technology. For example, support for ADS-C doesn't automatically imply that ADS-C based EPP is supported.

In most cases, introduction of new technological solutions must be based on a positive **airline** business case, follow the *pay per use* principal, and avoid airlines paying for superfluous systems and services, as determined by airline consensus.

Some airlines support the view that for aircraft to become active elements in a global ATM cloud-based domain, CNS technologies must be modernized, rationalized, and made more resilient to seamlessly support 4D trajectory-based operations (TBO).

Interference free access to relevant frequency spectrum is a key element of this vision of enhanced air/ground interaction, automation, flight predictability and reduction of environmental footprint.

In the "C" domain airlines seek to benefit from:

- Broadband communications including some non-traditional options.
- Technological resilience.
- Seamless operations.
  - For example, automated and transparent switching between networks, antennas, technologies and protocols.

In the "N" domain airlines seek:

- The enhanced safety and efficiency associated with 4D trajectories.
- Interoperability between regional implementations of core technologies.

In the "S" domain airlines wish to:

- Derive benefits from more efficient, automated, and precise surveillance, e.g., free route airspace.
- Gain enhanced operational predictability e.g., by avoidance of procedural control.
- See ATS cost reductions due to rationalization of overlapping, redundant surveillance systems (e.g., RADARs and ADS-B covering the same airspace).

Readers are encouraged to review URATS Volume 1 for more information.

In general, the positions reflected in this document seek to maximise existing aircraft capabilities and support implementation of new technologies when and where operationally justified.

Changes to CNS technology and related infrastructure should:

1) Have measurable safety and/or operational improvements as agreed by airlines.

2) Follow an inclusive airline consultation process prior to investments being made.

3) Be supported by cost-benefit analysis.

5) Follow ICAO user charges principles.

Appendix A is a checklist that ANSPs, States and international funding organizations should use when planning new CNS projects.

Appendix B is a glossary of acronyms.

Beyond Radio Frequency Interference

Use of non-traditional electronics and infrastructure

This edition of URATS Volume II contains references to non-traditional CNS technologies such as those used by Unmanned Aircraft System Traffic Management (UTM) and BVLOS (Beyond Visual Line of Sight) operation of Unmanned Aerial Vehicles (UAVs).

Designers and users of these unmanned aircraft systems (UAS) have successfully employed the capabilities of telecommunications infrastructure (such as LTE and 5G networks) to achieve the C, N and S performance they need to safely operate in designated airspace, including that shared with conventional manned aircraft.

Airlines have also embraced cost effective telecommunications infrastructure in parts of their operations such as MRO and Gate-Link.

This edition of URATS has been updated to include reference to these non-traditional C, N and S systems.

1.1. Communication

Airlines support migration to data link as the primary means of direct controller-pilot communication (DCPC) while retaining voice for tactical intervention and non-routine communications.

Currently, regional variations in data link standards, technologies and protocols result in airlines having to carry multiple systems (dual or triple stacking avionics), resulting in increased costs and operational complexity.

Over time, a more interoperable and adaptable ground infrastructure could accommodate a rationalization of airborne equipage by globally harmonizing the "C" domain around a reduced set of prioritized technologies and protocols.

System Wide Information Management (SWIM) will underpin modernisation of communication systems and protocols for the collaborative sharing of data in the ground-to-ground and air-to-ground domains. More details on IATA's position re SWIM can be found in User Requirements for Air Traffic Services (URATS), Air Traffic Management (ATM), **Volume I**.

1.2. Navigation

Airlines support implementation of GNSS as the primary means of navigation and the main enabler of PBN.

States and ANSPs are encouraged to consult with their customer airlines to implement coordinated transition strategies which include rationalization of NDBs, VORs and DMEs.

Minimum Operational Networks (MON)

In consultation with airlines, VOR and DME installations should be reduced with the goal of establishing a MON of operationally useful ground stations, including those justified as backup for GNSS.

All deactivated VOR and DME installations to be removed from ATM User Charges.

NDBs in service today are not required for airline operations and must be eliminated from the ATM cost base.

1.3. Surveillance

Cost-efficient surveillance using Minimum Operational Network (MON) principles must include limiting overlapping redundant coverage to that justified by safety and resiliency criteria, as agreed by airlines.

Airline user charges must exclude unjustified or over-dimensioned redundancy.

Automatic Dependent Surveillance (ADS) systems (ADS-B and ADS-C) are the preferred surveillance technologies, and where deployed, should result in RADAR rationalization.

PSR justified for national security purposes should be excluded from airline user charges.

1.4. CNS Interdependencies

As avionics evolve, the interdependencies of C, N and S elements become more evident. For example, the link between GNSS and ADS-B and between SatCom and ADS-C (when considered as a surveillance source in oceanic and remote airspace), and the potential C, N and S (and ANPT) capabilities of a future LDACS with other on-board avionics.

Care must therefore be taken to ensure that the overall impact on flight operations is considered when determining the preferred mix of C, N and S infrastructure in specific airspace to avoid losing multiple capabilities with a single point of failure. An overarching consideration being current and projected aircraft equipage.

In terms of operational resiliency, backup modes must be considered whilst respecting MON principles and cost-efficiency criteria.

1.5. NEED FOR AVIONIC RATIONALIZATION:

Over preceding decades, aircraft avionic equipage has been mostly cumulative, with few occasions where CNS systems were de-activated and removed from civil aircraft. A few notable examples are LORAN, DOPPLER, and to a lesser degree ADF.

In the interval, C, N and S systems have evolved and new and novel technologies have been added to aircraft equipage, in some cases due to regionally divergent mandates. Lack of effective near-term harmonization across ATM development programs such as NextGen and SESAR has also compounded the airborne equipage issue.

The unfortunate and politically avoidable conflict between the telecommunications and aviation industries over 5G deployment signalled a breakpoint, and an opportunity, with the frequency spectrum being a significant driver for change.

Segments of the aviation ecosystem such as UAS / UTM / BVLOS are successfully employing telecommunications infrastructure and spectrum to enable new and novel avionics. The use of spectrum allocated to and paid for by the telecommunications industry is clearly an opportunity that deserves further evaluation by the aviation industry.

COTS hardware and software are also enabling newfound aviation applications.

Strengthening pressure on aviation's use of the frequency spectrum means that the coming decade will see increasing need to rationalize avionics in a drive towards incorporation of modern, spectrum efficient Radio Frequency (RF) technologies and protocols. **It's therefore critical to ensure that as these new avionic systems find their place on-board, older legacy systems are de-activated and removed.**

Regulators and avionic standards organizations are moving beyond the radio frequency interference (RFI) issues associated with 5G and express openness to rationalization concepts based around RF designs that make more efficient use of the frequency spectrum, use modern RF engineering, and shared multi-industry development costs.

In essence, airlines need to reliably communicate and navigate everywhere, using a common core of airborne equipage, free from RFI.

Time has evidently come for significant effort towards rationalizing airborne avionics with the added benefits of reducing aircraft weight and thereby improving the environmental impact of avionic carriage.

NOTE: Not all technologies listed in the following COMMUNICATIONS, NAVIGATION and SURVEILLANCE tables receive individual explanatory treatment in the body text of this document.

2. Explanation of Positions

Support: Support new deployments, when operationally justified.

Maintain: Existing installations continue to be supported but no new deployments should be considered.

Neutral: Some operational benefits are possible but require further assessment in consultation with airlines, prior to inclusion in user charges.

Do not support: The technology is not supported and should be removed from airline user charges.

2.1. Communications

Technology / Application	Support	Maintain	Neutral	Do not support
LTE/5G/6G	X See Note 3			
AeroMACS				X
AFTN		X		
AIDC	X			
AMHS		X		
ATN IPS	X			
CPDLC	X			
Digital-ATIS	X			
DCL	X			
HF Voice	X See Note 1			
HFDL		X See Note 2		
Inmarsat Global Xpress	X			
Iridium CERTUS			X	
IRIS			X	
LDACS	Supported by a limited number of airlines pending outcome of the certification process			
SATVOICE	X			
Space-based VHF Comm			X	
SWIM	X			
VDL Mode 0/ACARS		X		
VDL Mode 2		X		
VDL Mode 3				X
VDL Mode 4				X
VHF Voice	X			
VSAT	X			

Table 1 – Communications

Airline Comments: The high-level objective is to be able to communicate everywhere, reliably, quickly, securely, and cost effectively, from cockpit and cabin, with simple to use technology interfaces using automation to the maximum. Industry also needs to rationalize the technological mix as supporting different technologies across various regions is a significant and unnecessary cost and operational burden to airlines. Operators are also concerned at the slow resolution of issues regarding certain technologies such as LDACS. **Some airlines also see the need to demonstrate willingness to accelerate the transition to modern, more spectrum efficient avionic systems, whilst recognizing that this implies opportunity cost.**

Note 1: Oceanic and remote regions are anticipated to migrate from the use of HF Voice to SATCOM Voice and depending on it becoming a viable and cost-efficient alternative, Space-based VHF. IATA supports the development of a regulatory framework and separation standards allowing the use of SATVOICE as the LRCS of preference, accompanied by the optional removal of one or more on-board HF installations (control panel, transceiver, coupler/tuner, wiring and antenna). If at some point Space-based VHF is proven to be technically feasible, available for service and cost efficient, then it could also be considered as a LRCS of choice.

Note 2: IATA supports HFDL service **via the existing network**, for use in oceanic and remote areas and especially in polar regions, while recognizing that it may not meet RCP240/RSP180 requirements.

Note 3: LTE, 5G and 6G are supported understanding that radio frequency interference (RFI) issues with on-board avionics will be resolved. This may require airlines to evaluate changes to legacy avionics to gain the benefits of modern communications infrastructure, including that associated with more efficient spectrum usage.

2.2. Navigation

Technology / Application	Support	Maintain	Neutral	Do not support
ABAS	X			
DFMC	X See Note 1			
DME		X See Note 2		
GBAS	X			
GNSS	X			
ILS	X			
MLS				X
NDB				X See Note 3
PBN	X			
SBAS	See Note 4			
TACAN				X
VOR		X See Note 2		
WGS-84	X			

Table 2 – Navigation

Note 1: DFMC

States should refrain from mandating sole use of own State constellation. Airlines must be permitted to use any and all available ICAO approved GNSS constellations, globally.

Note 2: Minimum Operational Networks (MON)

In consultation with airlines, DME and VOR installations should be reduced in number with the goal of establishing a MON of operationally useful ground stations. Airlines see less need for VORs in a future NAV infrastructure. All deactivated installations to be removed from ATM user charges.

Note 3: NDB

NDBs are not supported and should be removed from airline user charges.

Note 4: Airlines equipping with SBAS do so based on their operational requirements and specific business case. Some airlines, responding to mandates, safety concerns (e.g., operational barometric errors), and the need for more environmentally friendly operations, now believe that SBAS should be supported as a non-mandated technology.

General principles:

1. SBAS mandates are operationally unjustified.
2. Operational restrictions due to lack of SBAS equipage are unjustified; and
3. SBAS costs should not be imposed directly or indirectly on airlines that do not use the technology.

2.3. Surveillance

Technology / Application	Support	Maintain	Neutral	Do not support
5G/6G	X See Note 1			
ADS-B IN	X See Note 2			
ADS-B OUT	X			
ADS-C	X			
MLAT			X	
PAR				X
PSR				X See Note 3
Space-based ADS-B	X See Note 4			
SSR Mode A/C		X		
SSR Mode S	X			
TIS-B	X			

Table 3 – Surveillance

Note 1: 5G / 6G

Telecommunications infrastructure, and it's allocated and paid for frequency spectrum, provides new and novel opportunities for surveillance services, most immediately in the UAS / UTM / BVLOS domains. With the aviation industry now moving beyond the radio frequency interference (RFI) issues attributable to the flawed implementation of 5G infrastructure in some States, IATA is engaging with telecommunications organizations to seek opportunities for mutual benefit. Possibilities exist in C, N and S.

Note 2: ADS-B IN

Several IATA member airlines have invested in fleet equipage (out of factory and retrofit) and operational trials are in progress.

Note 3: RADAR (PSR / SSR / PAR)

Where States maintain RADAR for security / military purposes, these should be removed from airline user charges.

Recognizing its enhanced surveillance capabilities and lower costs, States and ANSPs are encouraged to accelerate transition to ADS and the rationalization of RADAR.

Where SSR and / or ADS-B provide the same or better coverage, do not support PSR for ATC surveillance services.

Note 4: Space-based ADS-B

Whilst supporting the technology where operationally justified, as determined by airlines, IATA opposes any monopolistic pricing behavior. Pricing must be subject to economic regulation and include, if appropriate, price capping.

3. Communications

3.1. Introduction

Currently, and for the foreseeable future, the safety and efficiency of civil aircraft operations is directly related to the availability and performance of aeronautical communications.

Airlines are exploring and, in some cases, implementing non-traditional means of communications such as deploying local area 5G and LTE networks in Maintenance, Repair and Overhaul operations (MRO) and for Gate-Link.

3.1.1 LTE / 5G / 6G

Several segments of the airline industry, e.g., Maintenance, Repair and Overhaul organizations (MRO) have established private telecommunications networks to facilitate enhanced internal communications and enable process control systems. For example, using 5G private networks to control and track drones used for maintenance and overhaul activity is no longer unusual.

As referenced in Note 3 appended to the Communications table above, LTE, 5G and 6G are supported on the understanding that any radio frequency interference (RFI) issues with respect to avionic systems will be resolved.

Some airlines are also deploying telecommunications "commercial off the shelf" (COTS) technology to facilitate services such as gate-link. In effect, the aviation industry is moving beyond the radio frequency interference (RFI) issues previously associated with 5G and, with suitable mitigation, are now embracing the advantages that telecommunications infrastructure and component availability brings to the electronic marketplace.

The use of commercial or private telecommunications networks is based on frequency spectrum licensed for such services and NOT on the use or sharing of aeronautical spectrum.

<u>Position on telecommunications infrastructure and certified off the shelf electronic components:</u>

The aviation industry recognizes the many advantages and opportunities that certified telecommunications infrastructure offers, with UAS / UAV / UTM / BVLOS being good examples of early adoption.

A noteworthy aspect is that the subject equipment and systems are certified by State telecommunications regulators.

In specific airline domains (such as MRO or ground ops), telecommunications infrastructure is proving to be a cost-effective technology of choice.

Potential use of such technology as a foundation for enhancement or replacement of legacy avionic systems is being enabled by rapid progress in the telecommunications domain, e.g., the launch and operation of 5G satellites capable of providing voice and data coverage in oceanic and remote airspace. Over time, continental airspace may also benefit from a transition to such services. IATA therefore supports the use of telecommunications industry spectrum, protocols, and infrastructure in use cases where airlines have received local telecommunications and aviation regulatory approvals for implementation.

3.1.2 Aeronautical Fixed Telecommunications Network (AFTN) and ATS Message Handling Services (AMHS)

The AFTN is a legacy messaging network used by ATS authorities, airlines, and meteorological offices.

The aviation industry adopted AMHS to replace the AFTN and is currently transitioning to SWIM.

ICAO has established standards to ensure interoperability between AFTN and AMHS.

SWIM is the technology of choice for upgrades or new implementations.

Position on AFTN and AMHS:

Support the transition from AFTN to AMHS.

Since ICAO SWIM standards become applicable in 2024, States that have not commenced the transition to AMHS should consider skipping that step and move directly to SWIM.

3.1.3 System Wide Information Management (SWIM)

System Wide Information Management (SWIM) is anticipated to underpin modernisation of communication systems and protocols for the collaborative sharing of data, ground-to-ground, and air-to-ground.

Refer to User Requirements for Air Traffic Services (URATS), Air Traffic Management (ATM), **Volume I** for additional information.

3.1.4 Very Small Aperture Terminal (VSAT)

VSATs are typically used for communications between ATC units in areas where landline connections are unreliable or uneconomical.

Position on VSAT:

Support deployment of VSAT terminals where operationally justified. However, a proliferation of new VSAT networks must be avoided where existing infrastructure, both national and international, can be expanded to serve new requirements.

3.1.5 Air Traffic Services Interfacility Data Communication (AIDC)

AIDC is an international data exchange standard designed for use via ground-ground circuit, including legacy AFTN.

AIDC greatly reduces the need for voice coordination between ATC facilities, resulting in fewer errors and reduced workload.

Position on AIDC:

Support AIDC deployment as the primary means of coordination between ATC facilities, while maintaining the capability for controllers to intervene via voice for non-routine communications.

3.2. Air–Ground Communications

Data Link should be, wherever practicable, the primary means of routine communication.

A good example is the successful FAA en-route data comm program currently utilizing FANS technology.

In Europe, where saturation of VDLM2 is a significant concern, the IRIS satcom system is being proposed along with a "multi-link" concept where several data link solutions compete at the commercial and technical levels.

Moving forward, airlines see the need for a technology agnostic approach. Commercial telecommunications infrastructure may also compete in a future multi-link environment.

Space-based VHF development is underway, and this technology may offer an additional option in a future communications mix.

Overall, service resiliency and pricing are significant airline considerations.

3.2.1 Aeronautical Mobile Airport Communications System (AeroMACS)

Position on AeroMACS:

Airline equipage decisions should be voluntary.

3.2.2 Very High Frequency (VHF) Voice

Currently based on double side-band amplitude modulation technology with channel spacing determined by region.

Position on VHF Voice:

Support 8.33 kHz channel spacing where operationally justified. Where implemented, carriage of 8.33 kHz-capable radios should be mandatory to ensure that safety and capacity benefits are realized.

Support evolution towards more spectrally efficient digital voice technology.

3.2.3 High Frequency (HF) Voice

Position on HF Voice:

HF voice should be retained as a backup to CPDLC until SATVOICE (or Space-based VHF) direct controller-pilot communications (DCPC) achieve widespread use in oceanic and remote airspace.

3.2.4 Voice Communication via Satellites (SATVOICE)

ICAO supports global, seamless, and interoperable SATVOICE.

<u>Position on SATVOICE:</u>

Support SATVOICE for DCPC in oceanic and remote airspace.

ANSPs should implement one-click dialling or similarly efficient call establishment methods to initiate and maintain communications without having to relay messages via an operator.

3.2.5 Controller Pilot Data Link Communications (CPDLC)

Controller Pilot Data Link Communications (CPDLC) should be, wherever practicable, the primary means of routine DCPC, understanding that urgency and some tactical situations warrant reversion to voice.

<u>Position on CPDLC:</u>

Support CPDLC as the primary means of communication in oceanic and remote airspace and in other airspace where operationally practicable.

3.2.6 Aircraft Communications Addressing and Reporting System (ACARS)

ACARS technical and operational requirements are defined in a set of Aeronautical Radio Incorporated (ARINC) documents.

<u>Position on ACARS:</u>

Support the use of legacy ACARS during transition to bit-oriented technology.

3.2.7 VHF Data Link Mode 2 (VDLM2)

While VDL Mode 2 has been accepted by the civil aviation industry as an upgrade to VDL Mode 0 (ACARS), airlines see an opportunity to transition to Future Communications Infrastructure (FCI) whilst maintaining sufficient POA / VDLM2 infrastructure to service a reducing number of legacy airframes.

<u>Position on VDL Mode 2:</u>

Support upgrade of existing ACARS networks based on aircraft equipage.

3.2.8 VHF Data Link Mode 3 (VDLM3)

VDL Mode 3 data link was not adopted by civil aviation.

<u>Position on VDL Mode 3:</u>

Do not support VDL Mode 3.

3.2.9 VHF Data Link Mode 4 (VDLM4)

VDL Mode 4 was a data link candidate for ADS-B. However, 1090 MHz Mode S Extended Squitter (ES) was chosen as the standard for international aviation.

Position VDL Mode 4:

Do not support VDL Mode 4.

3.2.10 High Frequency Data Link (HFDL)

HFDL does not reliably meet required communication performance (RCP) 240 or required surveillance performance (RSP) 180.

Position on HFDL:

Support maintenance of the existing HFDL network for backup use in oceanic, remote, and polar airspace while recognizing that it may not meet RCP240/RSP180 requirements.

3.2.11 L-Band Digital Aeronautical Communications System (LDACS)

LDACS is intended for air / ground communications in continental airspace.

It is designed to support data and voice.

LDACS must coexist with other aeronautical L-band systems (e.g., DME, JTIDS / MIDS, UAT, GNSS, and SSR), as well as with systems using nearby frequency spectrum (e.g., GSM / UMTS).

LDACS provisions are currently being developed by ICAO.

In addition to communications, LDACS can also be used for ranging. This capability may provide input to an Alternative Position, Navigation and Timing (A-PNT) solution.

Some airlines seek to accelerate interference studies and complete the certification process at the earliest opportunity.

Position on LDACS:

As one of the possible technologies addressing air-ground communication congestion, LDACS offers an option for regional implementation provided its deployment does not require modification of airborne systems currently operating in or near aeronautical L-Band spectrum.

3.2.12 Aeronautical Telecommunication Network over Internet Protocol Suite (ATN IPS)

The ICAO Global Air Navigation Plan (GANP) calls for a transition from FANS 1/A and OSI ATN to ATN IPS.

Position on ATN IP:

Support the transition from FANS and ATN/ATS B1/B2 to ATN IPS.

3.2.13 Space-based VHF

If proven technically and commercially viable, this technology has potential to significantly enhance oceanic and remote airspace operations and act as a backup for continental airspace communications.

Position on Space-based VHF:

Further evaluation is required. At the time of writing, technical and spectrum studies are underway.

3.3. Other Data Link Services

3.3.1 Digital Automatic Terminal Information Service (D-ATIS)

Position on D-ATIS:

Support D-ATIS deployment at airports while providing dual-stack support during the transition from ATIS to D-ATIS.

3.3.2 Departure Clearance (DCL)

ATC departure clearance via data link facilitates significant operational benefits.

The underlying DCL data link technology varies by region, e.g., ACARS / ARINC 623 / ATN, resulting in a lack of global harmonization.

Position on DCL:

At airports where airline consultation determines that operational benefits justify costs, support deployment and usage of DCL.

4. Navigation

4.1. Performance-Based Navigation (PBN)

The PBN concept encompasses two types of navigation specifications:

- **RNAV Specification –** Navigation specification based on area navigation that does not include the requirement for on-board performance monitoring and alerting, e.g., RNAV 5, RNAV 2 and RNAV 1.

- **RNP Specification –** Navigation specification based on area navigation that requires on-board performance monitoring and alerting, e.g., RNP 4, RNP 2 and RNP APCH.

Readers are reminded that having an approval such as RNP 2 does not automatically imply approval for what might be perceived as a less stringent approval e.g., RNP 4.

Given the number of such approvals that might be required by an international airline, regulators are encouraged to establish time and cost-efficient approval procedures and whenever feasible, issue multiple approvals based on a single airline submission. It is accepted that RNP-AR will continue to be a stand-alone approval process.

Position on PBN:

Support the implementation of ICAO PBN for all phases of flight in airspace where operationally and financially justified.

4.2. World Geodetic System-84 (WGS-84)

Incorrect WGS-84 coordinates can adversely impact safety of flight.

Position on WGS-84:

Implementation and maintenance of WGS-84 continues to be a civil aviation priority.

4.3. Conventional Ground-Based Navigation Aids

An airline agreed Minimum Operational Network (MON) of ground-based navigation aids should remain as a back-up to GNSS.

4.3.1 Non-Directional Beacon (NDB)

NDBs in service today are not required for airline operations.

Position on NDB:

Support immediate decommissioning of NDBs and removal from airline user charges. For airports with only NDB non-precision approach, the ADF procedure should be replaced by a GNSS-based RNP APCH with vertical guidance. NDBs used for en-route operations should be replaced by PBN waypoints.

4.3.2 Distance Measuring Equipment (DME)

DME can serve as a contingency navigation aid supplementing GNSS and as part of the navigation infrastructure that supports PBN operations. Some airlines see a future LDACS system as another option.

Position on DME:

In consultation with airlines, maintain a MON of DMEs as contingency navigation aids.

4.3.3 VHF Omnidirectional Range (VOR)

In consultation with airlines, ANSPs should define and maintain a VOR MON.

Position on VOR:

Support minimum reliance on VOR.

4.3.4 Tactical Air Navigation (TACAN)

TACAN is a military navigation aid.

Position on TACAN:

Do not support civil implementations of TACAN.

4.3.5 Instrument Landing System (ILS)

ILS is a proven technology that meets user requirements where precision approaches are required. When considering replacement of ILS Category I by RNP APCH, coordination with and endorsement by relevant airlines is essential to account for required airport and network performance and accessibility criteria. Some airlines see ILS being included in a MON as SBAS / GBAS becomes more common and more aircraft are equipped to benefit from the newer technologies.

Position on ILS:

Where coordinated and agreed with airlines, support continued use of ILS as part of a MON.

4.3.6 Microwave Landing System (MLS)

Position on MLS:

Do not support further implementations of MLS.

4.4. Global Navigation Satellite System (GNSS)

GNSS is the preferred navigation infrastructure to enable the full benefits of PBN, especially RNP.

Position on GNSS:

Support use of GNSS as the primary radio navigation service for all phases of flight and as the primary enabler of PBN and RNP.

4.5. GNSS Augmentations

4.5.1 Aircraft-Based Augmentation System (ABAS)

The most common form of ABAS is Receiver Autonomous Integrity Monitoring (RAIM).

Position on ABAS:

Support ABAS as preferred augmentation.

4.5.2 Ground-Based Augmentation System (GBAS)

GBAS facilitates precision approach to multiple runways from a single base station.

Some operators view more flexible GBAS CAT III approaches as the logical and longer-term replacement for ILS CAT III operations.

Position on GBAS:

Short to mid-term: Support GBAS as a supplement to ILS for precision approach.

Longer term: Support GBAS to replace ILS while keeping an ILS MON for back up purposes.

4.5.3 Satellite-Based Augmentation System (SBAS)

ICAO SARPs supporting the use of SBAS are mature.

Some regional PBN implementation rules may impose operational restrictions if operating without SBAS.

Position on SBAS:

Airlines equipping with SBAS do so based upon their individual operational requirements and business case.

4.6. Dual-Frequency Multi-Constellation (DFMC) GNSS

DFMC reduces ionospheric error and increases service availability, reliability, and resilience.

Position on DFMC GNSS:

Operational and technical requirements for use of DFMC GNSS should be performance-based. States should refrain from issuing avionic mandates to equip with avionics for any specific GNSS constellation or augmentation.

Discourage attempts to discriminate against the use of any GNSS constellation(s) that meet ICAO requirements.

Providing that required navigation performance can be met, airlines should be allowed to navigate using all available on-board capability, rather than be limited to any GNSS constellation or augmentation system.

5. Surveillance

5.1. Introduction

ATS surveillance systems can be classified as follows:

Independent Non-Cooperative Surveillance: The aircraft position is derived from measurement not requiring the cooperation of the aircraft. An example is Primary Surveillance Radar (PSR).

Independent Cooperative Surveillance: Position is derived from measurements performed using cooperative aircraft transmissions. Secondary Surveillance Radar (SSR) is an example.

Dependent Cooperative Surveillance: Derives aircraft position using on-board avionics, which is then provided to ground surveillance infrastructure, possibly along with additional data. Automatic Dependent Surveillance – Broadcast (ADS-B) is an example of this category.

Surveillance used for ATS requires complementary communications capability that meets the appropriate Required Communications Performance (RCP).

5.2. Primary Surveillance Radar (PSR)

While PSR remains the system of choice for the identification of unlawful airspace intrusions, there are some regions, e.g., Europe, where enhanced ATS usage of PSR is being considered.

(EUROCAE WG-103 is researching improvements in PSR resolution to enable further reduction in separation within TMAs.)

Position on PSR:

Where SSR provides the same or better coverage, do not support PSR for ATC surveillance services.

Airline PSR user charges should reflect sole usage of PSR for separation services.

When civil PSR installations are being utilized on a shared basis with military users, financing (user charges) should also be shared.

5.3. Secondary Surveillance Radar (SSR)

Some regions operate an abundance of overlapping SSRs resulting in over interrogation with minimal if any cross-border sharing of surveillance data.

Position on SSR:

ANSPs should make full use of available Mode S capabilities, including information provided by downlinked aircraft parameters (DAPs). Cross-border sharing of relevant surveillance data is encouraged.

5.4. Multilateration (MLAT)

MLAT global separation standards of 5 NM and 3 NM have been promulgated as being equivalent to radar.

Some ANSPs have deployed MLAT as a Precision Runway Monitor (PRM) and for surveillance of airport ground movements. Additional MLAT / WAM applications include ADS-B backup and RVSM height monitoring.

Position on MLAT:

Support MLAT when operationally necessary such as to provide coverage enhancements or act as a gap-filler for SSR, or when used in support of airport ground operations.

5.5. Precision Approach Radar (PAR)

Airlines derive no benefit from this technology.

Position on PAR:

Do not support PAR for civil aviation.

Any airline user charges associated with PAR installations should be eliminated.

5.6. Dependent Cooperative Surveillance

5.6.1 Automatic Dependent Surveillance Contract (ADS-C)

ADS-C is transitioning from being exclusively used in oceanic and remote airspace to also being deployed in continental airspace. An example is the European EPP forward fit mandate initially proposed for the 2027 timeframe, provided the preceding industrialization maturity gate is passed. ADS-C is also an enabler for certain trajectory-based operations and itself has a dependence on data link / multi-link communications.

Airlines have expressed concerns regarding ownership and confidentiality of ADS-C data based on experience with ADS-B data usage and sale by 3rd party commercial entities. A regulatory framework protecting airline's data and usage rights may be required.

Position on ADS-C:

Support ADS-C for use in oceanic and remote airspace and in continental airspace where there are airline agreed benefits.

ADS-C reporting periods must be limited to what is required to deliver the separation minimum or other airline agreed service benefits.

5.6.2 Automatic Dependent Surveillance Broadcast OUT (ADS-B OUT)

When considering performance requirements for ADS-B, States and ANSPs are encouraged to follow the guidance in ICAO Circular 326 and relevant ICAO provisions. Differences in avionic performance requirements across various ADS-B mandates is problematic, given that airlines operate globally.

Over-interrogation of aircraft transponders when ADS-B is used in parallel with SSR is discouraged. In saturated 1090 MHz areas airlines have experienced temporary loss of ANSP surveillance services for individual aircraft. ANSPs are therefore encouraged to action required technical solutions as part of ADS-B implementation.

Position on ADS-B-OUT:

Support implementation of ADS-B OUT based on Mode S Extended Squitter (1090ES) data link.

ADS-B should not be implemented as a redundant surveillance capability. Provided there is a positive business case, it should replace radar, or be used in non-radar airspace to improve ATS surveillance. Transition timelines need to be determined in consultation with airspace users.

Once ADS-B ground stations become operational, ANSPs should, in consultation with airlines, establish a timeline to decommission other surveillance infrastructure.

Performance requirements for ADS-B OUT should be consistent with ICAO Circular 326. Requiring unnecessarily high performance, without appropriate safety and / or cost benefit justification, cannot be supported.

5.6.3 Space-Based Automatic Dependent Surveillance Broadcast (Space-Based ADS-B)

ANSPs who have invested in Space-Based ADS-B need to implement airspace user benefits in parallel with any related user charges. Benefits include enhanced air traffic flow management, enhanced air traffic separation provision, flexible routings (e.g., User Preferred Routings - UPR), enhanced trajectory management, improved ATS contingencies and airline agreed infrastructure cost efficiency.

Position on Space-based ADS-B:

Support in cases where airline benefits are measurable and agreed. IATA opposes any monopolistic pricing behaviour. Pricing must be subject to economic regulation and include, if appropriate, price capping.

5.6.4 Automatic Dependent Surveillance Broadcast (ADS-B) IN

Several IATA member airlines have retrofitted a sub-set of their fleets with this technology and in some cases, new airframes are being procured with ADS-B IN as standard equipage.

Position on ADS-B IN:

Support - in use cases where airlines have established positive safety and operational benefits.

5.6.5 Traffic Information Service - Broadcast (TIS-B)

TIS-B increases pilot situational awareness by providing data to enable a Cockpit Display of Traffic Information (CDTI).

Position on TIS-B:

Support – when sustained by a positive airline safety, operational or business case.

6. Frequency Spectrum for Civil Aviation

Frequency spectrum allocations are agreed by the International Telecommunications Union (ITU) at World Radiocommunication Conferences (WRCs), which meet every 3-4 years. The resolutions resulting from these meetings become radio regulations and once signed by States, have the status of international treaties.

In preparation for each WRC, IATA actively cooperates with ICAO and other concerned entities, e.g., ASRI[1], in the development of a common aviation position to ensure that airlines' requirements and opinions are considered.

Position:

In coordination with ICAO and other relevant organizations, support a common aviation position for ITU WRCs. Encourage States, ANSPs, airlines and aviation stakeholders to support the position.

Advance the protection of aeronautical spectrum from harmful radio interference by intentional and unintentional sources.

State telecommunications regulators must ensure that revised allocations are comprehensively proven not to adversely impact the aeronautical use of spectrum.

Encourage airlines and aviation stakeholders to report cases of harmful radio interference to national spectrum and aviation authorities, in addition to ICAO and IATA.

[1] **Aviation Spectrum Resources Inc.**

7. Conclusions

IATA encourages ANSPs and States to adopt only those technologies which have airline agreed safety, business, and operational justification.

7.1. Communications

Airlines support a coordinated migration to data link as the primary means of controller-pilot communication while continuing the provision of voice communications for tactical intervention and non-routine communications.

7.2. Navigation

Airlines support implementation of GNSS as the primary means of navigation and the main enabler of PBN. States and ANSPs are encouraged to consult with airlines and airspace users to rationalize navigation infrastructure and remove unnecessary NDBs and VORs.

7.3. Surveillance

Changes to surveillance technology and related infrastructure should be agreed collaboratively between ANSPs and relevant airlines prior to implementation. Unnecessary overlapping of surveillance coverage is discouraged. Particularly, any ADS-B implementation should be accompanied by removal of radars and elimination of applicable user charges.

7.4. CNS Mandates

IATA does not support mandates for specific CNS equipage. Justified performance-based requirements are preferred.

Inquiries regarding this document may be directed to infrastructure@IATA.org

8. Appendix A: Planning Checklist

IMPLEMENTATION OF CNS/ATM IMPROVEMENTS

Effective consultation helps to:

1) Prioritize investments to ensure that capacity and services match airspace user needs.

2) Support an efficient and effective aviation value chain.

3) Enhance understanding of capital expenditure (CAPEX) and operational expenditure (OPEX) to ensure only cost effective and operationally valid projects are adopted.

4) Ensure alignment with ICAO GANP / ASBUs.

Questions when planning CNS / ATM improvements:

1) What are the current and forecast requirements of airlines?

2) What are the airline benefits of this change in terms of safety cost, and operational efficiency?

3) What is the coordinated timeline for realization of airline benefits?

4) What is the life cycle of current technology and what is the appropriate replacement strategy to ensure benefits appropriate to costs.

5) What are the infrastructure requirements, policies, and procedures necessary to achieve projected airline benefits?

6) What is the projected cost to airlines in terms of increased air navigation and communication fees, on-board equipment, aircraft down time, training, maintenance, etc.?

7) When do projected benefits recover the associated costs?

8) Does the technology meet existing international standards? If new standards are required, will they be ready within an appropriate timeframe?

9) Is the investment consistent with international harmonization, and does it contribute to seamlessness regional and global airline operations?

10) Does the technology represent the most effective use of resources?

11) Is the change consistent with an incremental approach to technology deployment? Is an incremental approach the best solution?

12) Are adjacent ANSPs and States prepared to collaborate to reduce costs and promote seamless operations?

9. Appendix B: GLOSSARY

ABAS	Aircraft Based Augmentation System
ACARS	Aircraft Communications Addressing and Reporting System
ACAS	Airborne Collision Avoidance System
ADS	Automatic Dependent Surveillance
ADS-B	Automatic Dependent Surveillance – Broadcast
ADS-C	Automatic Dependent Surveillance – Contract
AeroMACS	Aeronautical Mobile Airport Communications System
AIDC	Air Traffic Services Inter-facility Data Communication
ANC	ICAO Air Navigation Conference
ANSP	Air Navigation Service Provider
AOC	Aeronautical Operational Control Communications
APNT	Alternative Position Navigation and Timing
APV	Approach with Vertical Guidance
ARINC	Aeronautical Radio Incorporated
ASP	Aeronautical Surveillance Panel
ATC	Air Traffic Control
ATIS	Automatic Terminal Information Service
ATM	Air Traffic Management
ATN	Aeronautical Telecommunications Network
ATS	Air Traffic Services
AWOS	Automated Weather Observing System
BDSBAS	BeiDou Satellite-Based Augmentation System (China)
Baro-VNAV	Barometric Vertical Navigation
CANSO	Civil Air Navigation Services Organization
CDTI	Cockpit Display of Traffic Information
CNS/ATM	Communications Navigation Surveillance/Air Traffic Management
COTS	Commercial Off The Shelf
CPDLC	Controller Pilot Data Link Communications
CSMA	Carrier Sense Multiple Access

D-ATIS	Digital - Automated Terminal Information Service
DL	Data Link
DME	Distance Measuring Equipment
EGNOS	European Geostationary Navigation Overlay Service (Europe)
EPP	Extended Projected Profile
ES	Extended Squitter
EUROCAE	European Organization for Civil Aviation Equipment
EUROCONTROL	European Organization for the Safety of Air Navigation
FAA	Federal Aviation Administration (USA)
FANS	Future Air Navigation Systems (FANS)
FIR	Flight Information Region
FMS	Flight Management System
FSMP	Frequency Spectrum Management Panel (ICAO)
GAGAN	GPS Aided Geo Augmented Navigation (India)
GBAS	Ground Based Augmentation Service
GEO	Geosynchronous Orbit
GLS	GNSS/GBAS Landing System
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
HF	High Frequency
HFDL	High Frequency Data Link
IATA	International Air Transport Association
ICAO	International Civil Aviation Organization
IEEE	Institute of Electrical and Electronics Engineers
ILS	Instrument Landing System
ISO	International Organization for Standardization
IPS	Internet Protocol Suites
IT	Information Technology
ITU	International Telecommunications Union (ITU)
KASS	Korea Augmentation Satellite System (Republic of Korea)

LCS	Light Cockpit SatCom
LDACS	L-band Digital Aeronautical Communications System
LTE	Long Term Evaluation
LPV	Localizer Performance with Vertical Guidance
MLS	Microwave Landing System
MOPS	Minimal Operational Performance Standard (RTCA, EUROCAE)
MRO	Maintenance Repair and Overhaul (organization)
MSAS	MTSAT Satellite Based Augmentation System (Japan)
MTSAT	Multi-functional Transport Satellites (Japan)
NextGen	Next Generation Air Transportation System
NDB	Non-Directional Beacon
NSP	Navigation Systems Panel (ICAO)
OSI	Open Systems Interconnection
PAR	Precision Approach Radar
PBN	Performance Based Navigation
PDC	Pre-Departure Clearance
PRM	Precision Runway Monitor
PSR	Primary Surveillance Radar
RAIM	Receiver Autonomous Integrity Monitoring
RCP	Required Communication Performance
RF	Radio Frequency
RNAV	Area Navigation
RNP	Required Navigation Performance
RNP APCH	Required Navigation Performance Approach
RNP AR	Required Navigation Performance Authorization Required
RVSM	Reduced Vertical Separation Minimum
RSP	Required Surveillance Performance
RTCA	Radio Technical Commission for Aeronautics
SARPs	Standards and Recommended Practices
SASP	Separation and Airspace Safety Panel (ICAO)

SBAS	Satellite Based Augmentation System
SESAR	Single European Sky ATM Research
SSR	Secondary Surveillance Radar
STDMA	Self-Organizing Time Division Multiple Access
SWIM	System Wide Information Management
TCAS	Traffic Collision Avoidance System
TDMA	Time Division Multiple Access
TDOA	Time Difference of Arrival
TIS-B	Traffic Information Service Broadcast
TMA	Terminal Area
UAT	Universal Access Transceiver
VDL	VHF Digital Link
VHF	Very High Frequency
VNAV	Vertical Navigation
VoIP	Voice over IP
VOR	VHF Omni-directional Range
WAM	Wide Area Multilateration
WAAS	Wide Area Augmentation System (USA)
WGS-84	World Geodetic System –1984
WIMAX	Worldwide Interoperability for Microwave Access