ASBU ELEMENTS

Aviation System Block Upgrade (ASBU)

✈ ICAO's ASBU methodology is a flexible, programmatic global approach that allows all Member States to enhance their air navigation capabilities according to their specific operational requirements.

ICAO

Aviation System Block Upgrade (ASBU)

✈ *The ASBU operates according to the following structure:*

    ✈ *ASBU thread: three different categories, operational, information and technology.*

    ✈ *ASBU Module: this is the set of elements of an ASBU thread that, according to the enabler roadmap, will be available for implementation within the defined timeframe established by the ASBU Block.*

    ✈ *ASBU Block: this implies that the element and all the enablers associated with it must be available for implementation within the ASBU Block year.*

    ✈ *ASBU Element: this module is the set of elements of a thread that, according to the enabler roadmap, will be available for implementation within the defined timeframe set by the ASBU Block.*

ICAO

ASBU THREADS

INFORMATION

✈ *AMET: Meteorological information*

✈ *DAIM: Digital Aeronautical Information Management*

✈ *FICE: Flight and Flow Information for a Collaborative Environment (FF-ICE)*

✈ *SWIM: System Wide Information Management*

TECHNOLOGY

✈ *ASUR: Surveillance systems*

✈ *COMI: Communication infrastructure*

✈ *COMS: ATS Communication service*

✈ *NAVS: Navigation systems*

OPERATIONAL

✈ *ACAS: Airborne Collision Avoidance System (ACAS)*

✈ *ACDM: Airport Collaborative Decision Making*

✈ *APTA: Improve arrival and departure operations*

✈ *CSEP: Cooperative Separation*

✈ *DATS: Digital Aerodrome Air Traffic Services*

✈ *FRTO: Improved operations through enhanced en-route trajectories*

✈ *GADS: Global Aeronautical Distress and Safety System (GADSS)*

✈ *NOPS: Network Operations*

✈ *OPFL: Improved traffic flow through runway sequencing*

✈ *RSEQ: Mejora del flujo de tráfico mediante la secuenciación de pistas*

✈ *SNET: Ground-based Safety Nets*

✈ *SURF: Surface operations*

✈ *TBO: Trajectory-based operations*

✈ *WAKE: Wake Turbulence Separation*

ICAO

ASBU ELEMENT

Each ASBU element contains information on its functional description, enablers, implementation applicability, and performance impact assessment. States should understand that ASBU elements are addressed to meet an operational need or resolve a deficiency, increase efficiency and safety.

✈ *Why: the main purpose, provides a summary of the essence of the element For operational elements provides information on the direct relationship of performance.*

✈ *the what: description of what stakeholders can do with this element that could not be done before. This section is not intended to describe performance improvement or benefits.*

✈ *the how: additional information to improve the understanding of the element*

ICAO

Aviation System Block Upgrade (ASBU)

✈ *The ASBU Elements have different levels of maturity:*

✈ *Ready for implementation: this maturity level focuses on the end of system development and initial worldwide operational capability.*

✈ *Standardization: this maturity level focuses on the definition of the necessary provisions for system interoperability and harmonization of procedures.*

✈ *Validation: this maturity level focuses on industrial research and validation and includes proof-of-concept validation, stand-alone prototype implementation and testing, testing and prototyping in a representative environment, and full engineering feasibility demonstration in real system application.*

✈ *Concept: This maturity level focuses on exploratory research and includes scientific investigation, investigation of basic principles observed and reported, and concept definition.*

ICAO

Elements ready for implementation

AMET (Advanced Meteorological Information)

AMET-B0/1 Meteorological observations products Information		
AMET-B0/2 Meteorological forecast and warning products Information	WAFS QMS METAR availability TAF availability METAR timeliness TAF timeliness SIGMET availability SIGMET format VAAC ONA WAFC	
AMET-B0/3 Climatological and historical meteorological products Information		
AMET-B0/4 Dissemination of meteorological products Information		

ICAO

ASBU ELEMENTS

1. Its main purpose

2. Capability

3. Description of the element

4. Maturity level

5. Some element considerations

6. Planning levels (Potential benefits objectives...etc)

7. Operations Dependencies and relationships

8. Element enablers
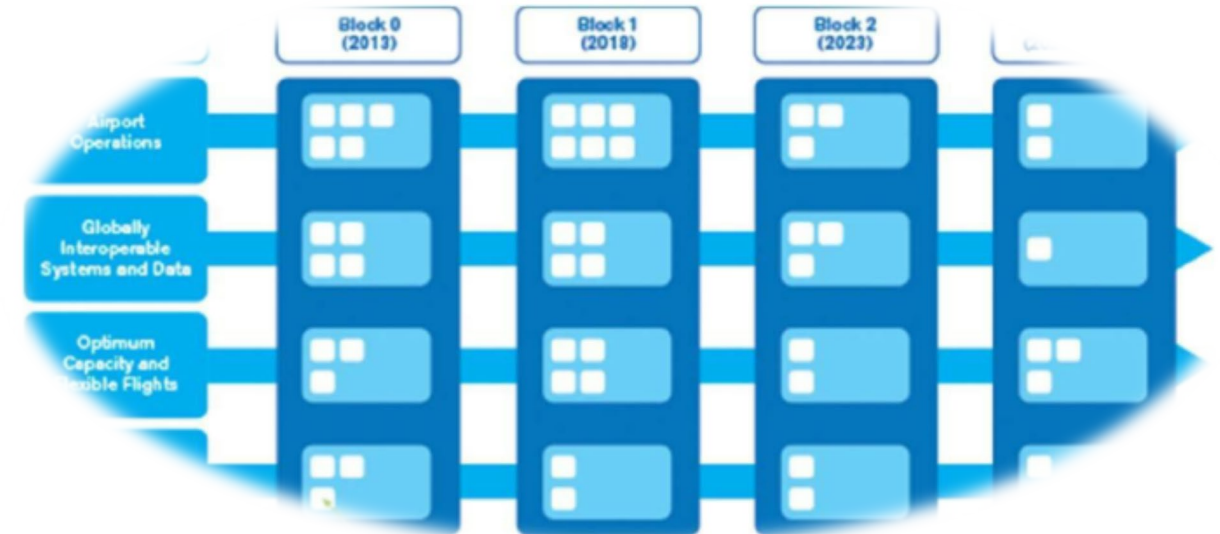
✈ *FICE-B0/1:* Automated basic inter facility data exchange (AIDC)

INFORMATION

✈ *AMET: Meteorological information*

✈ *DAIM: Digital Aeronautical Information Management*

✈ *FICE: Flight and Flow Information for a Collaborative Environment (FF-ICE)*

✈ *SWIM: System Wide Information Management*

FICE-B0/1	Automated basic inter facility data exchange (AIDC)	Information

☐ Sixth edition of the GANP ❓

Main Purpose ❓ To improve the efficiency of coordination and tranfer of control between ATS units.

New Capabilities ❓ Replacement of voice communication between ATS units by automatic message exchange.

Description ❓ This element represents a first automation step in the evolution of the coordination and transfer of control between neighbouring ATS units to guarantee that all related and necessary flight information will be available to the other unit as per agreement.

Maturity Level ❓ Ready for implementation

Human Factor Considerations
1. Does it imply a change in task by a user or affected others? No
2. Does it imply processing of new information by the user? Yes
3. Does it imply the use of new equipment? Yes
4. Does it imply a change to levels of automation? Yes

PLANNING LAYERS ❓
Tactical-Pre ops | Tactical-During ops

OPERATIONS ❓
Departure | En-route | Arrival

*FICE-B0/1: A*utomated basic inter facility data exchange (AIDC)

DEPENDENCIES AND RELATIONS ❓

Type of Dependencies	ASBU Element
Relation-technology benefit	COMI-B0/7 - ATS Message Handling System (AMHS)

ENABLERS

Enabler Category	Enabler Type	Enabler Name	Description / References	Stakeholders	Year
Regulatory provisions	SMS	Apply SMS	Apply Safety Management System in accordance with the national requirements and guidance.	ANSP	2013
Ground system infrastructure	Flight and Flow information	HMI and FDPS	Upgrade the ground system to support the composition, exchange and processing of messages.	ANSP	2013
Operational procedures	Flight and flow information	Procedures for AIDC	Procedures for message composition and exchange. References: PANS-ATM ICAO Doc 4444 - Procedures for Air Navigation Services and regional interface co... read more	ANSP	2013
Ground system infrastructure	Flight and Flow information	Interconnectivity	Connectivity between ATSU systems through IP, AMHS, etc.	ANSP	2013
Training	Flight and Flow information	Training requirements for AIDC	Training for ATCO and CNS staff regarding AIDC.	ANSP	2013
Regulatory provisions	National regulatory framework	National regulatory framework amendment for the use of AIDC	If applicable, CAA may need to amend the national regulatory provisions on the use of AIDC. References: PANS-ATM (ICAO Doc 4444) and Regional Interfac... read more	CAA	2013

ICAO

FICE-B2/1: Planning Service

DEPENDENCIES AND RELATIONS ❓

Type of Dependencies	ASBU Element
Relation-benefit	AMET-B2/1 - Meteorological observations information
Relation-operational need	SWIM-B2/1 - Information service provision
Relation-operational need	SWIM-B2/2 - Information service consumption
Relation-operational need	SWIM-B2/3 - SWIM registry
Relation-information need	AMET-B2/2 - Meteorological forecast and warning information
Relation-benefit	AMET-B2/4 - Meteorological information service in SWIM
Relation-information benefit	DAIM-B1/1 - Provision of quality-assured aeronautical data and information
Relation-information need	DAIM-B1/2 - Provision of digital Aeronautical Information Publication (AIP) data sets
Relation-information need	DAIM-B1/3 - Provision of digital terrain data sets
Relation-information need	DAIM-B1/4 - Provision of digital obstacle data sets
Relation-information need	DAIM-B1/5 - Provision of digital aerodrome mapping data sets
Relation-information need	DAIM-B1/6 - Provision of digital instrument flight procedure data sets
Relation-information need	DAIM-B1/7 - NOTAM improvements
Relation-information need	DAIM-B2/1 - Dissemination of aeronautical information in a SWIM environment
Relation-information need	DAIM-B2/2 - Daily Airspace Management information to support flight and flow
Relation-information need	DAIM-B2/5 - NOTAM replacement

ICAO

TECHNOLOGY

✈*ASUR: Surveillance systems*

✈*COMI: Communication infrastructure*

✈*COMS: ATS Communication service*

✈*NAVS: Navigation systems*

ASUR-B0/1	Automatic Dependent Surveillance – Broadcast (ADS-B)	Technology

☐ Sixth edition of the GANP ❓

Main Purpose ❓ To support the provision of Air Traffic Services and operational applications at reduced cost and increased surveillance coverage.

New Capabilities ❓ ADS-B provides precise position/velocity information in all airspace (accuracy not range-dependent as with radar). It also provides aircraft call sign and precise position/velocity information to nearby aircraft with ADS-B-In receivers.

ADS-B can also support State aircraft airspace access, however it should, when possible, leverage benefits from dual-use of State aircraft capabilities to reduce cost and technical impact.

Description ❓ ADS-B provides an aircraft's identification, position, altitude, velocity, and other information to any receiver (airborne or ground) within range. The broadcasted aircraft position/velocity is normally based on the global navigation satellite system (GNSS) and transmitted at least once per second.

Maturity Level ❓ Ready for implementation

Human Factor Considerations

✈ **ASUR-B0/1:** Automatic Dependent Surveillance – Broadcast (ADS-B)

ENABLERS

Enabler Category	Enabler Type	Enabler Name	Description / References	Stakeholders	Year
Ground system infrastructure	Surveillance	ADS-B ground stations	ADS-B ground stations receive information from aircraft and transmit it to one or more Service Delivery Points Reference material: Technical standa... read more	ANSP	2008
Ground system infrastructure	Surveillance	*Service Delivery Point(s) for ADS-B information	Service Delivery Point(s) receive ADS-B information provides it to ATC automation for processing and display to controller Reference material: Guid... read more	ANSP	2008
Ground system infrastructure	Technical systems	HMI that supports controller awareness	Human Machine Interface (HMI) of the Air Traffic Controller Working Position (ATCo CWP) Reference: Guidance material: ICAO Doc. 9924 Aeronautical... read more	ANSP	2008
Airborne system capability	Surveillance	SSR Mode S transponder with extended squitter version 0, version 1 and version 2	Reference: Technical standards and guidance material: ICAO Annex 10 Volume IV Chapter 2,3 and 5 ICAO Doc. 9871 Technical Provisions for Mode S ... read more	Aircraft manufacturer Aircraft operator	2008
Training	-	Training requirements ADS-B implementation	Depending on the ANSP implementation, some controller training on new symbology may be required. If phraseology is changed by an ANSP, then controller... read more	ANSP	2008
Airborne system capability	Navigation	Basic Aviation GNSS receiver with RAIM	Position source. Basic Aviation GNSS receiver with RAIM. Such a receiver must comply with the technical performance requirements of either [E]TSO-C129... read more	Aircraft manufacturer Aircraft operator	2008

https://www.icao.int/NACC/Documents/Meetings/2023/ADSB/ADS-B-Imp-ImplementationActionPlan.pdf

ICAO

Module	Elements	Need Analysis				Implementation Status (if Element is needed)			
		Not Started	In Progress	Need	N/A	Planning	Developing	Partially Implemented	Implemented

Module	Elements	Not Started	In Progress	Need	N/A	Planning	Developing	Partially Implemented	Implemented
ASUR	1. ADS-B								√
	2. Multilateration (MLAT)				√				

ICAO

AMET-B0/1 Meteorological observations products Information

☐ Sixth edition of the GANP ❓

Main Purpose ❓ Meteorological observations in support of flexible airspace management, improved situational awareness, collaborative decision-making and dynamically optimized flight trajectory planning.

New Capabilities ❓ Provision of observations of additional meteorological parameters/elements. More automated observations. Higher temporal and spatial resolution for lightning, radar and satellite information.

Description ❓ This element represents the provision of meteorological observational products including:

- Automatic Weather Observation System (AWOS) information (including real-time exchange of wind and RVR data)
- Local reports (MET REPORT / SPECIAL)
- Aerodrome reports (METAR / SPECI)
- Lightning information
- Ground-based weather radar information
- Meteorological satellite imagery
- Aircraft meteorological report (ie. ADS-B, AIREP, AMDAR etc.)
- Vertical wind and temperature profiles
- Volcano Observatory Notice for Aviation (VONA)
- Wind shear alerts

Maturity Level ❓ Ready for implementation

Human Factor Considerations

1. Does it imply a change in task by a user or affected others? No

2. Does it imply processing of new information by the user? No

3. Does it imply the use of new equipment? Yes

4. Does it imply a change to levels of automation? Yes

Maturity Level ❓ Ready for implementation

Human Factor Considerations

1. Does it imply a change in task by a user or affected others? No

2. Does it imply processing of new information by the user? No

3. Does it imply the use of new equipment? Yes

4. Does it imply a change to levels of automation? Yes

PLANNING LAYERS ❓

Tactical-Pre ops Tactical-During ops

OPERATIONS ❓

Taxi-out Departure En-route Arrival Taxi-in Turn-around

DEPENDENCIES AND RELATIONS ❓

Type of Dependencies	ASBU Element
Relation-technology benefit	ASUR-B0/3 - Cooperative Surveillance Radar Downlink of Aircraft Parameters (SSR-DAPS)
Relation-technology benefit	COMS-B0/2 - ADS-C (FANS 1/A) for procedural airspace
Relation-technology need	COMI-B0/7 - ATS Message Handling System (AMHS)
Relation-technology benefit	COMI-B0/1 - Aircraft Communication Addressing and Reporting System (ACARS)

ICAO

ACDM-B0/1: Airport CDM Information Sharing

Main Purpose ❓ To generate common situational awareness, which will foster improved decision making within aerodromes, by sharing relevant surface operations data among the local stakeholders involved in aerodrome operations.

New Capabilities ❓ Stakeholders will be able to collaborate and take actions towards the achievement of a set of defined milestones by being aware of the status of an individual flight measured against known target times and milestones.

Description ❓ This element represents the first collaboration step among stakeholders involved in aerodrome operations. It consists in the definition of common specific milestones for several flight events taking place during surface operations. The stakeholders involved have to, based on accurate operational data, achieve the agreed milestones.

Maturity Level ❓ Ready for implementation

Human Factor Considerations
1. Does it imply a change in task by a user or affected others? No
2. Does it imply processing of new information by the user? Yes
3. Does it imply the use of new equipment? No
4. Does it imply a change to levels of automation? No

PLANNING LAYERS ❓

| Pre-tactical | Tactical-Pre ops | Tactical-During ops |

OPERATIONS ❓

| Taxi-out | Departure | Arrival | Taxi-in | Turn-around |

DEPENDENCIES AND RELATIONS ❓

Type of Dependencies	ASBU Element
Relation-information need	AMET-B0/1 - Meteorological observations products
Relation-information need	AMET-B0/2 - Meteorological forecast and warning products
Relation-operational benefit	SURF-B0/2 - Comprehensive situational awareness of surface operations

ICAO

Main Purpose ❓ To improve traffic situational awareness in all phases of flight.

New Capabilities ❓
- AIRB facilitates out-the-window visual acquisition of airborne traffic within visual range and traffic situational awareness for traffic beyond visual range.
- It enhances traffic situational awareness and quicker visual acquisition of targets through basic airborne situational awareness during flight operations enabled by the use of a cockpit display traffic information (CDTI).
- It supplements the flight crew's out the window scan and radio communications listening.
- It supports the flight crew in integrating information from these sources into a comprehensive and accurate traffic picture including long traffic detection range.
- It also enables communication with surrounding aircraft on common/local frequency (e.g. turbulence reports, uncontrolled airfield operations).

Description ❓ The use of cockpit displays to provide the flight crew with a graphical depiction of traffic using relative range and bearing, supplemented by altitude, flight ID and other information. This element represents the use of the cockpit display traffic information (CDTI) with appropriate ADS-B data filtered for traffic situational awareness. The CDTI is capable of merging data with TCAS. It is recommended to use the display where ACAS information is already provided (if ACAS-equipped)

Maturity Level ❓ Ready for implementation

Human Factor Considerations

1. Does it imply a change in task by a user or affected others? **No**

2. Does it imply processing of new information by the user? **Yes**

3. Does it imply the use of new equipment? **Yes**

4. Does it imply a change to levels of automation? **No**

DEPENDENCIES AND RELATIONS ❓

Type of Dependencies	ASBU Element
Relation-technology need	ASUR-B0/1 - Automatic Dependent Surveillance – Broadcast (ADS-B)
Relation-technology benefit	ACAS-B1/1 - ACAS Improvements

ICAO

ENABLERS

Enabler Category	Enabler Type	Enabler Name	Description / References	Stakeholders	Year
Regulatory provisions	Certification	Certification of CDTI for airborne situational awareness	References: ICAO Annex 10 Volume IV basic technical requirements ICAO Doc 9994 ADS-B IN equipment/function compliant with DO-317B/ED194A (2015)	CAA Aircraft manufacturer Aircraft operator	2015
Operational procedures	Operations	SOPs for the use of CDTI for AIRB	References: PANS-OPS (Doc 8168) operation of ADS-B IN traffic display (2016) Standard Operating Procedures	Aircraft operator	2013
Airborne system capability	Surveillance	ADS-B IN equipment/function	ADS-B IN equipment/function compliant with DO-317B/ED194A (2015)	Airspace user Aircraft manufacturer	2015
Airborne system capability	Aircraft system	CDTI	Cockpit Display of Traffic Information (CDTI). The CDTI may be shared with ACAS information traffic display but we should not assume this capability i... read more	Aircraft manufacturer Aircraft operator	2013
Training	-	Training requirements for AIRB	The appropriate use of the traffic display could be evaluated during recurrent training on ACAS. The equipage of AIRB capability is unknown to ATC. Th... read more	Aircraft operator	2013

ICAO

ASBU THREADS

INFORMATION

✈ *AMET: Meteorological information*

✈ *DAIM: Digital Aeronautical Information Management*

✈ *FICE: Flight and Flow Information for a Collaborative Environment (FF-ICE)*

✈ *SWIM: System Wide Information Management*

TECHNOLOGY

✈ *ASUR: Surveillance systems*

✈ *COMI: Communication infrastructure*

✈ *COMS: ATS Communication service*

✈ *NAVS: Navigation systems*

OPERATIONAL

✈ *ACAS: Airborne Collision Avoidance System (ACAS)*

✈ *APTA: Improve arrival and departure operations*

✈ *CSEP: Cooperative Separation*

✈ *FRTO: Improved operations through enhanced en-route trajectories*

✈ *GADS: Global Aeronautical Distress and Safety System (GADSS)*

✈ *NOPS: Network Operations*

✈ *RSEQ: Mejora del flujo de tráfico mediante la secuenciación de pistas*

✈ *SNET: Ground-based Safety Nets*

✈ *SURF: Surface operations*

✈ *TBO: Trajectory-based operations*

✈ *WAKE: Wake Turbulence Separation*

✈ *ACDM: Airport Collaborative Decision Making*

✈ *DATS: Digital Aerodrome Air Traffic Services*

✈ *OPFL: Improved traffic flow through runway sequencing*

✈ *OPFL: Improved traffic flow through runway sequencing*

ICAO

ASBU ELEMENT:
PROJECT PLAN DEVELOPMENT

ADS-B IMPLEMENTATION		
Why? the main purpose is that it provides a summary of the essence of the element for the operational elements, and information of the direct relationship of the performance.	**What?** description of what stakeholders can do with this element that could not be done before. This section is not intended to describe performance enhancement or benefits	**How?** additional information to improve the understanding of the element.
- Define Objective	- Define stakeholders - Integrate all stakeholders in the project - Define action plan - Define benefits	- Case study - Technical evaluation - Risk analysis - Cost benefit analysis - Business and safety case - Schedule - Implementation Strategy - Others

Relationship of the performance (Key performance indicators)

"What cannot be measured cannot be improved"

KPI01 **Departure punctuality**	KPI09 Airport peak capacity	KPI17 Level-off during climb
KPI02 **Taxi-out additional time**	KPI10 Airport peak throughput	KPI18 Level capping d…
KPI03 **ATFM slot adherence**	KPI11 Airport throughput efficiency	KPI19 Level-off during
KPI04 **Filed flight plan en-route extension.**	KPI12 Airport/Terminal ATFM delay	KPI20 Number of aircr
KPI05 **Actual en-route extension**	KPI13 Taxi-in additional time	KPI21 Number of runw
KPI06 **En-route airspace capacity**	KPI14 Arrival punctuality	KPI22 Number of runway excursions
KPI07 **En-route ATFM delay**	KPI15 Flight time variability	KPI23 Number of airprox/TCAS alert/loss of separation/near midair collisions/midair collisions (MAC)
KPI08 **Additional time in terminal airspace**	KPI16 Additional fuel burn	

https://www4.icao.int/ganpportal/ASBU/KPI

1. Enable 1		
Describe		
Element	**Technical Needs**	**Standards and technical information to incorporate in the analysis**
	-	-
	-	-
	-	-
2. Enable 2		
	-	-
	-	-
	-	-

ICAO
Headquarters
Montréal

European and
North Atlantic
(EUR/NAT) Office
Paris

Asia and Pacific
(APAC) Sub-office
Beijing

Middle East
(MID) Office
Cairo

Western and
Central African
(WACAF) Office
Dakar

North American
Central American
and Caribbean
(NACC) Office
Mexico City

Asia and Pacific
(APAC) Office
Bangkok

South American
(SAM) Office
Lima

Eastern and
Southern African
(ESAF) Office
Nairobi

ICAO

Thank You!