



OACI

ORGANIZACIÓN DE AVIACIÓN CIVIL INTERNACIONAL

ORGANISMO ESPECIALIZADO
DE LA ONU





ELEMENTOS DE LAS MEJORAS POR BLOQUE DEL SISTEMA DE AVIACIÓN (ASBU)

MEJORAS POR BLOQUE DEL SISTEMA DE AVIACIÓN (ASBU)

- ✈ La metodología ASBU del GANP de la OACI es un enfoque mundial programático y flexible que permite a todos los Estados miembros mejorar sus capacidades de navegación aérea en función de sus requisitos operacionales específicos.



MEJORAS POR BLOQUE DEL SISTEMA DE AVIACIÓN (ASBU)

✈ *El ASBU funciona de acuerdo con la siguiente estructura:*

- ✈ *Hilo conductor ASBU: tres categorías diferentes, operativa, de información y tecnología.*
- ✈ *Módulo ASBU: es el conjunto de elementos de un hilo conductor que, de acuerdo con la hoja de ruta de los habilitadores, estará disponible para su implementación dentro del plazo definido establecido por el Bloque ASBU.*
- ✈ *Bloque ASBU: esto implica que el elemento y todos los habilitadores asociados a él deben estar disponibles para su implementación en el año del bloque ASBU.*
- ✈ *Elemento ASBU: este módulo es el conjunto de elementos de un hilo conductor que, de acuerdo con la hoja de ruta de los habilitadores, estará disponible para su implementación dentro del plazo definido establecido por el Bloque ASBU.*

INFORMACIÓN

- ✈ *AMET: Información meteorológica*
- ✈ *DAIM: Gestión digital de la información aeronáutica.*
- ✈ *FICE: Información de vuelo y flujo para un entorno colaborativo (FF-ICE).*
- ✈ *SWIM: Gestión de la información en todo el sistema*

TECNOLOGÍA

- ✈ *ASUR: Sistemas de vigilancia*
- ✈ *COMI: Infraestructura de comunicación*
- ✈ *COMS: Servicio de comunicación ats*
- ✈ *NAVS: Sistemas de navegación*

OPERACIONAL

- ✈ *ACAS: Sistema anticolidión de a bordo (ACAS)*
- ✈ *ACDM: Toma de decisiones en colaboración con el aeropuerto*
- ✈ *APTA: Mejorar las operaciones de llegada y salida*
- ✈ *CSEP: Separación cooperativa*
- ✈ *DATS: Servicios Digitales de Tráfico Aéreo de Aeródromo*
- ✈ *FRT0: Mejora de las operaciones mediante trayectorias en ruta mejoradas.*
- ✈ *GADS: Sistema Mundial de Socorro y Seguridad Aeronáuticos (GADSS)*
- ✈ *NOPS: Operaciones de red*
- ✈ *OPFL: Mejora del acceso a los niveles óptimos de vuelo en el espacio aéreo oceánico y remoto*
- ✈ *RSEQ: Mejora del flujo de tráfico mediante la secuenciación de pistas*
- ✈ *SNET: Redes de seguridad en tierra*
- ✈ *SURF: operaciones de superficie*
- ✈ *TBO: Operaciones basadas en la trayectoria*
- ✈ *WAKE: Separación por turbulencia en estela*

ELEMENTO ASBU

Cada elemento ASBU contiene información sobre su descripción funcional, habilitadores, aplicabilidad de implementación y evaluación de impacto en el desempeño. Los Estados deben entender que los elementos ASBU se abordan para satisfacer una necesidad operacional o resolver una deficiencia, aumentar la eficiencia y la seguridad.



✈ *¿Por qué?: el principal propósito, proporciona un resumen de la esencia del elemento Para los elementos operacionales proporciona información de la relación directa del desempeño.*

✈ *el qué: descripción de lo que las partes interesadas pueden hacer con este elemento que no se podía hacer antes. Esta sección no pretende describir la mejora del rendimiento o los beneficios*

✈ *el cómo: información adicional para mejorar la comprensión del elemento*

MEJORAS POR BLOQUE DEL SISTEMA DE AVIACIÓN (ASBU)

✈ *Los Elementos ASBU tienen diferentes niveles de madurez:*

✈ *Listo para implementación: este nivel de madurez se enfoca en el final del desarrollo del sistema y la capacidad operativa inicial a nivel mundial.*

✈ *Normalización: este nivel de madurez se centra en la definición de las disposiciones necesarias para la interoperabilidad del sistema y la armonización de los procedimientos.*

✈ *Validación: este nivel de madurez se centra en la investigación y validación industrial e incluye la validación de la prueba de concepto, la implementación y prueba de prototipos independientes, las pruebas y la creación de prototipos en un entorno representativo y la demostración de viabilidad de ingeniería completa en la aplicación del sistema real.*

✈ *Concepto: este nivel de madurez se centra en la investigación exploratoria e incluye la investigación científica, la investigación de los principios básicos observados e informados y la definición del concepto.*

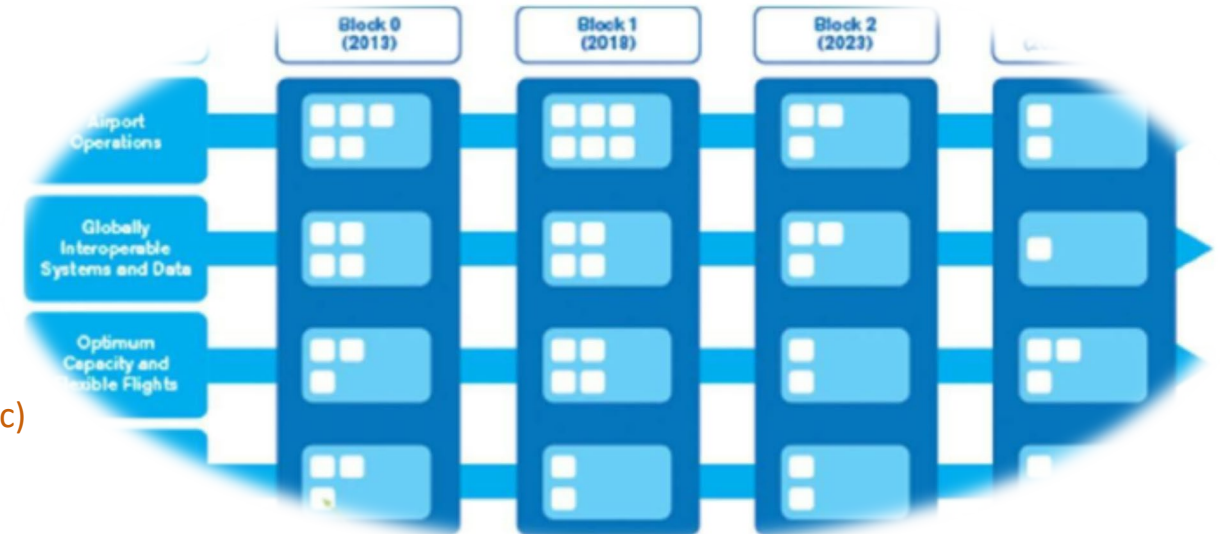
Elementos Listos para Implementarse

AMET (Advanced Meteorological Information)

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

Elemento ASBU

1. Su principal propósito
2. Capacidad
3. Descripción del elemento
4. Nivel de madures
5. Algunas consideraciones del elemento
6. Niveles de planificación (Posibles beneficios objetivos...etc)
7. Operaciones
8. Dependencias y relaciones
9. Habilitadores del elemento



INFORMACIÓN

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✈️ *SWIM: Gestión de la información en todo el sistema*

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

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 transfer 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

- Does it imply a change in task by a user or affected others? No
- Does it imply processing of new information by the user? Yes
- Does it imply the use of new equipment? Yes
- 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: Automated basic inter facility data exchange (AIDC)

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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



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FICE-B2/1: Planning Service

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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

TECNOLOGÍA

✈️ *ASUR: Sistemas de vigilancia*

✈️ *COMI: Infraestructura de comunicación*

✈️ *COMS: Servicio de comunicación ats*

✈️ *NAVS: Sistemas de navegación*

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

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		

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>

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

ASUR	1. ADS-B								√
	2. Multilateration (MLAT)				√				

☐ 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)

ACDM-B0/1: Airport CDM Information Sharing

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- 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



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CSEP-B1/1: Basic airborne situational awareness during flight operations (AIRB)

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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



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CSEP-B1/1: Basic airborne situational awareness during flight operations (AIRB)

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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

INFORMACIÓN

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OPERACIONAL

- ✈ **ACAS:** Sistema anticolisión de a bordo (ACAS)
- ✈ **APTA:** Mejorar las operaciones de llegada y salida
- ✈ **CSEP:** Separación cooperativa
- ✈ **FRTO:** Mejora de las operaciones mediante trayectorias en ruta mejoradas.
- ✈ **GADS:** Sistema Mundial de Socorro y Seguridad Aeronáuticos (GADSS)
- ✈ **NOPS:** Operaciones de red
- ✈ **OPFL:** Mejora del acceso a los niveles óptimos de vuelo en el espacio aéreo oceánico y remoto
- ✈ **SNET:** Redes de seguridad en tierra
- ✈ **TBO:** Operaciones basadas en la trayectoria
- ✈ **WAKE:** Separación por turbulencia en estela

- ✈ **ACDM:** Toma de decisiones en colaboración con el aeropuerto
- ✈ **DATS:** Servicios Digitales de Tráfico Aéreo de Aeródromo
- ✈ **RSEQ:** Mejora del flujo de tráfico mediante la secuenciación de pistas
- ✈ **SURF:** operaciones de superficie

**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)		
<i>"What cannot be measured cannot be improved"</i>		
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 runv
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		
	-	-
	-	-
	-	-



Gracias!