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UNITING AVIATION





Objective

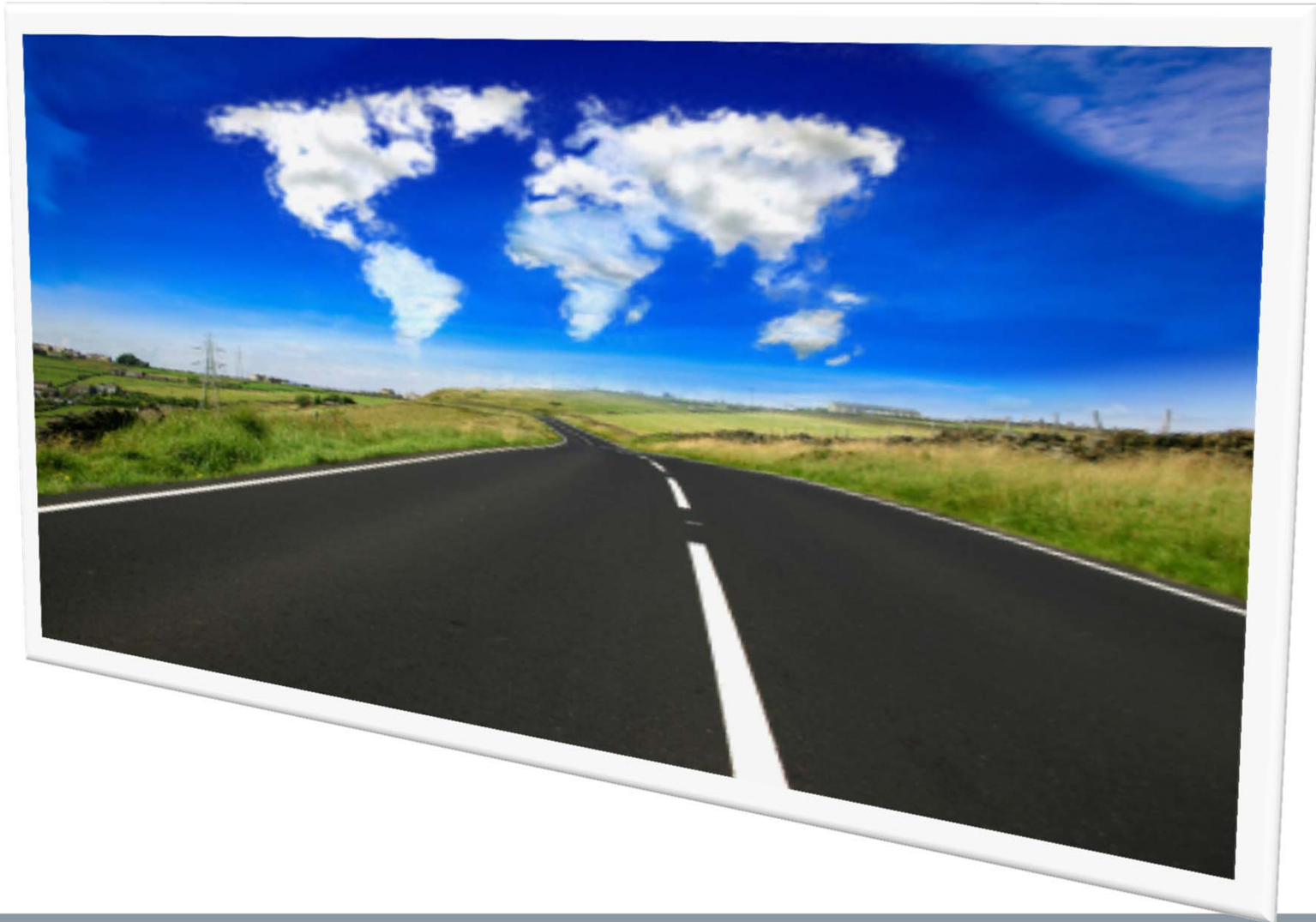
To **calculate your needs**, to **identify your optimum ASBU** Module element or group of elements **AVAILABLE** to address these needs and to **ensure implementation** maximising resource allocation and benefits.



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“Do we know where to go?”





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YES.

Doc 9854
AN/458



Global Air Traffic Management Operational Concept

Approved by the Secretary General
and published under his authority

First Edition — 2005

International Civil Aviation Organization



To achieve an interoperable global air traffic management system for all users during all phases of flight, that

- meets agreed levels of safety;**
- provides for optimum economic operations;**
- is environmentally sustainable; and**
- meets national security requirements.**



Establish Principles and Priorities



GANP Policy Principles

Aviation Safety is the Highest Priority

Cost Benefit and Financial issues

Aviation System Block Upgrades (ASBUs), Modules and Roadmaps



AIRPORT OPERATIONS

- **APTA** Optimized Airport Accessibility
- **WAKE** Wake Vortex Separation
- **RSEQ** Runway Sequencing
- **SURF** Surface Operations
- **ACDM** Airport Collaborative Decision Making
- **RATS** Remotely Operated Aerodrome Control



GLOBALLY INTEROPERABLE SYSTEMS AND DATA (SWIM)

- **FICE** Flight and Flow Information for a Collaborative Environment
- **DATM** Integration of Digital ATM Information
- **AMET** Integration of Meteorological information
- **SWIM** System Wide Information Management



OPTIMUM CAPACITY AND FLEXIBLE FLIGHTS (GLOBAL COLLABORATIVE ATM)

- **FRTO** Free Routing
- **NOPS** Network Operational Planning
- **ASUR** Initial Capability for Ground Surveillance
- **ASEP** Airborne Separation
- **OPFL** Optimum Flight Levels
- **ACAS** Airborne Collision Avoidance Systems
- **SNET** Safety Nets



EFFICIENT FLIGHT PATHS (TROUGH TRAJECTORY-BASED OPERATIONS)

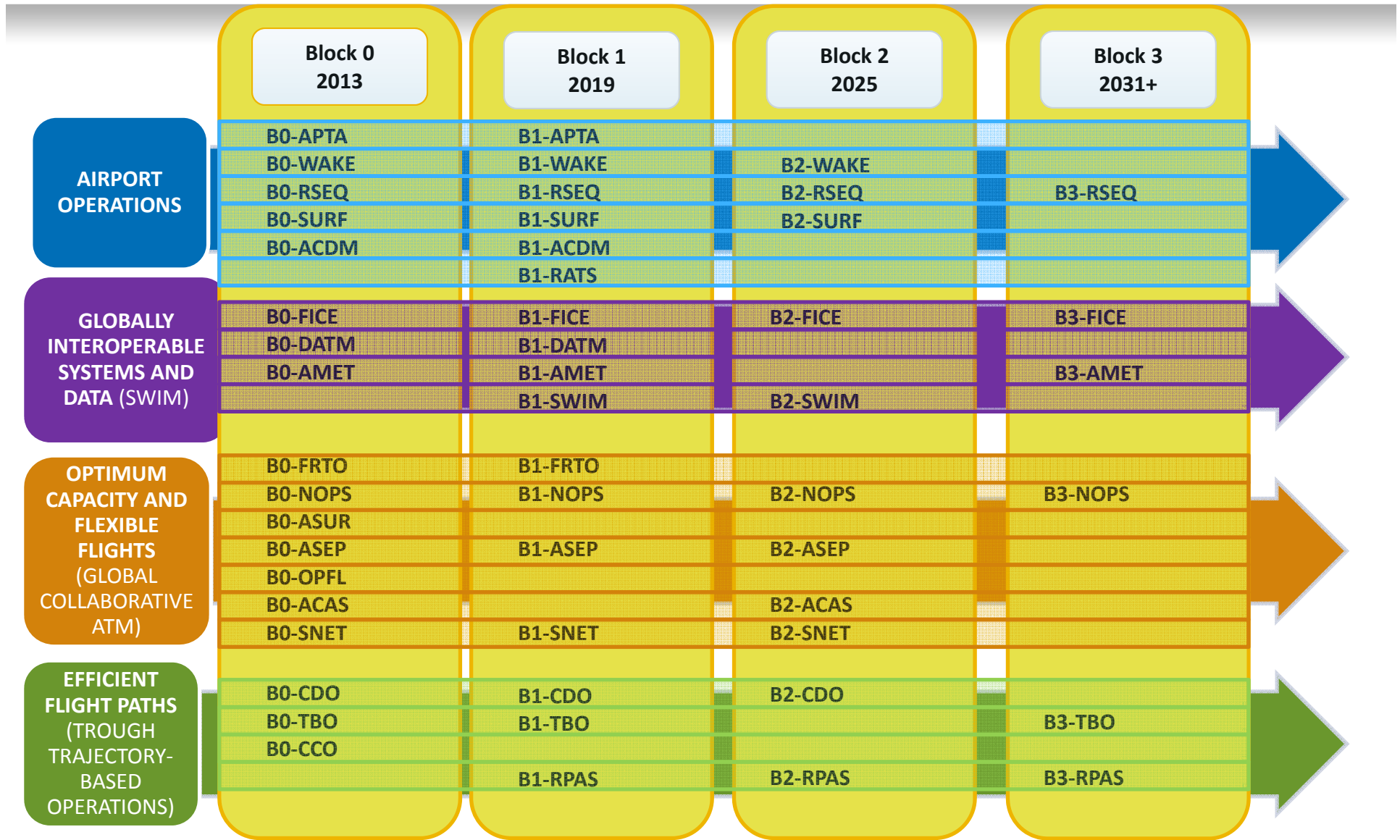
- **CDO** Continuous Descent Operations
- **TBO** Trajectory-based Operations
- **CCO** Continuous Climb Operations
- **RPAS** Integration of Remotely Piloted Aircraft



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ASBUs METHODOLOGY





AIRPORT OPERATIONS

**AIRPORT
OPERATIONS**

**Block 0
2013**

**B0-APTA
B0-WAKE
B0-RSEQ
B0-SURF
B0-ACDM**



**Block 1
2019**

**B1-APTA
B1-WAKE
B1-RSEQ
B1-SURF
B1-ACDM
B1-RATS**

**Block 2
2025**

**B2-WAKE
B2-RSEQ
B2-SURF**

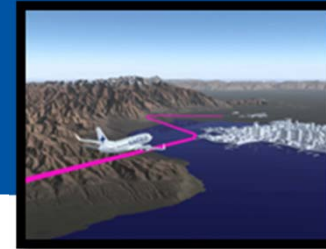
**Block 3
2031+**

B3-RSEQ



Block 0 and Block 1

APTA



B0-APTA

Optimization of Approach Procedures including vertical guidance

First step toward universal implementation of GNSS-based approaches.

- GNSS-based PBN approach procedures
 - GNSS + Baro VNAV
 - GNSS + SBAS
 - GNSS + GBAS

B1-APTA

Optimized Airport Accessibility

Next step in the universal implementation of GNSS-based approaches.

- Extension of GNSS-based approaches
 - GNSS + GBAS: CAT I capability to category CAT II/III
 - Potential integration of the PBN STARS directly
- ❖ Limited factor: emergence of multi-frequency/constellation GNSS



Block 0 and Block 1

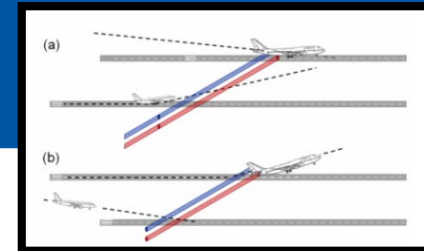
WAKE

B0-WAKE

Increased Runway Throughput through Optimized Wake Turbulence Separation

Revision of current ICAO wake vortex separation minima and procedures.

- RECAT
- DSA
- WIDAO/WDMT



B1-WAKE

Increased Runway Throughput through Dynamic Wake Turbulence Separation

Dynamic management of wake turbulence separation minima based on the real-time identification of wake turbulence hazards.

- Leader/follower pair-wise static matrix of aircraft type wake separation pairings
- Use of airport wind information (predicted and monitored)
- Wind prediction/monitoring



Block 0 and Block 1

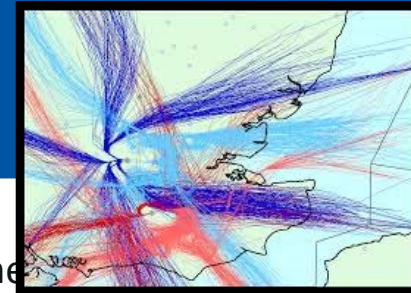
RSEQ

B0-RSEQ

Improved Traffic Flow through Runway Sequencing (AMAN/DMAN)

Time-based metering to sequence departing and arriving flights.

- AMAN and time
- DMAN or DFM
- Point Merge



B1-RSEQ

Improved Airport Operations through Departure, Surface and Arrival Management

Extension of arrival metering and, integration of surface management with departure sequencing.

- Surface Management
- Departure and surface integration
- Extended arrival metering
- Utilization of RNAV/RNP routes



Block 0 and Block 1

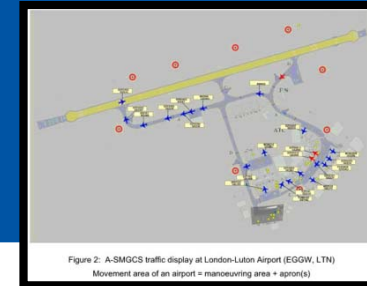
SURF

B0-SURF

Safety and Efficiency of Surface Operations (A-SMGCS Level 1-2) and Enhanced Vision System (EVS)

Airport surface surveillance for ANSP.

- Element 1 – A-SMGCS Level 1-2 (Surveillance & alerting)
- Element 2- Enhanced vision systems for taxi operations (e.g. infrared cameras, millimeter wave radar,...)



B1-SURF

Enhanced Safety and Efficiency of Surface Operations- SURF

Airport surface surveillance for ANSP and flight crews, cockpit moving map displays and visual systems for taxi operations.

- Element 1: Basic surface situational awareness (SURF)
- ADS-B In or TIS-B
- Cockpit electronic maps



Block 0 and Block 1

A-CDM

B0-ACDM

Improved Airport Operations through Airport-CDM

Airport operational improvements through the way operational partners at

airports work together.



B1-ACDM Optimized Airport Operations through A-CDM Total Airport Management

Airport and ATM operational improvements through the way operational partners at airports work together.

- Airport Operations Planning (AOP)
- Airport Operations Centre (APOC)



NEW!!

Block 0 and Block 1

RATS



B1-RATS

Remotely Operated Aerodrome Control

Remote provision of ATS to aerodromes or remotely operated aerodrome control tower contingency and through visualization systems and tools.

- Element 1: Remote provision of ATS for single aerodromes
- Element 2: Remote provision of ATS for multiple aerodromes
- Element 3: Remote provision of ATS for contingency situations



GLOBALLY INTEROPERABLE SYSTEMS AND DATA (SWIM)

GLOBALLY
INTEROPERABLE
SYSTEMS
AND DATA
(SWIM)

Block 0
2013

B0-FICE
B0-DATM
B0-AMET



Block 1
2019

B1-FICE
B1-DATM
B1-AMET
B1-SWIM

Block 2
2025

B2-FICE

B2-SWIM

Block 3
2031+

B3-FICE

B3-AMET



Block 0 and Block 1

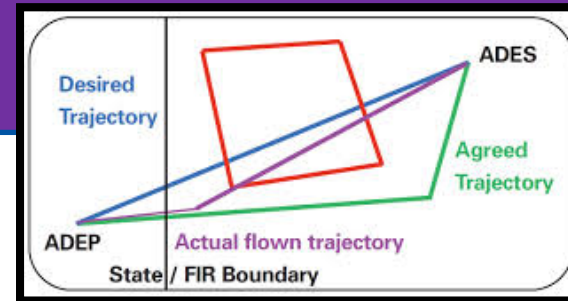
FICE

B0-FICE

Increased Interoperability, Efficiency and Capacity through Ground-Ground Integration

Supports the coordination of ground-ground data communication between

ATSUs, based on ATS Inter-facility Data Communication (AIDC).



B1-FICE

Increased Interoperability, Efficiency and Capacity through FF-ICE, Step 1 application before Departure

Introduction of FF-ICE step 1, to implement ground-ground exchanges before departure using common flight

information reference model, FIXM, XML and the flight object used.

- New Flight Information Mechanism



Block 0 and Block 1

DATM

B0-DATM

Service Improvement through Digital Aeronautical Information Management

Initial introduction of digital processing and management of information, by the

implementation of AIS/AIM making use of AIXM, moving to electronic AIP and better quality and availability of data.

B1-DATM

Service Improvement through Integration of all Digital ATM Information

Increase in information integration and support on a new concept of ATM information exchange fostering access via internet-protocol-based tools Exchange

models such as AIXM, FIXM, WXXM and others relate their concepts to the AIRM fostering convergence, re-use, and collaborative alignment.





Block 0 and Block 1

AMET



B0-AMET

Meteorological information supporting enhanced operational efficiency and safety

Meteorological information provided in support of flexible airspace management.

- Element 1: WAFS
- Element 2: IAVW
- Element 3: Tropical cyclone watch
- Element 4: Aerodrome warnings
- Element 5: Wind shear warnings and alerts
- Element 6: SIGMET and other operational meteorological (OPMET) information

B1-AMET

Enhanced Operational Decisions through Integrated Meteorological Information (Planning and Near-term Service)

Meteorological information supporting automated decision process or aids, involving.

- Element 1: Meteorological information
- Element 2: Meteorological information translation
- Element 3: ATM impact conversion
- Element 4: Meteorological information integrated decision support



NEW!!

SWIM

Block 0 and Block 1



B1-SWIM

Performance Improvement through the application of System-Wide Information Management (SWIM)

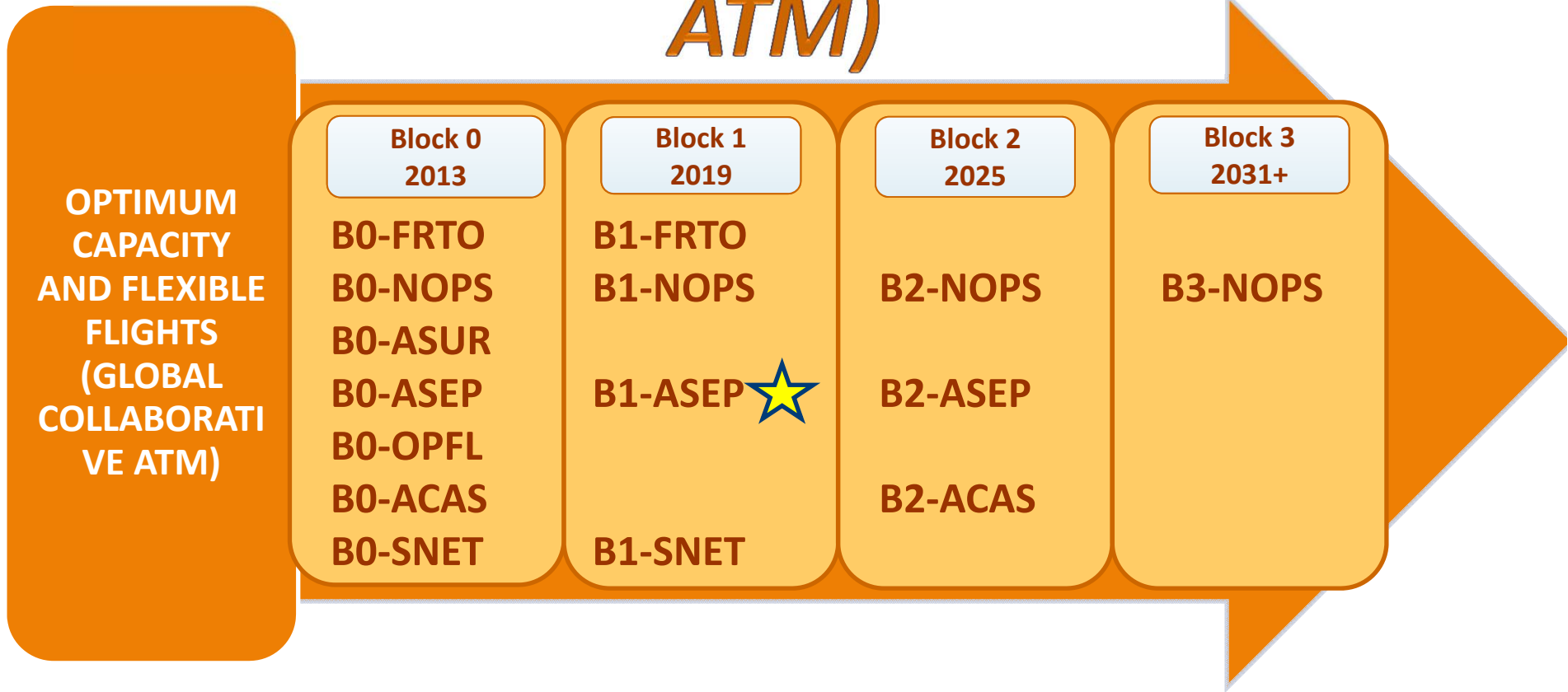
Implementation of SWIM services

(applications and infrastructure) creating the aviation intranet based on standard data models, and internet-based protocols to maximize interoperability.

- Applications of SWIM on the ground
- Air ground data exchanges will remain based on point-to-point communication



OPTIMUM CAPACITY AND FLEXIBLE FLIGHTS (GLOBAL COLLABORATIVE ATM)





Block 0 and Block 1

OPFL, ACAS, ASUR

B0-OPFL

Improved access to Optimum Flight Levels through Climb/Descent Procedures using ADS-B

This module enables an aircraft to reach a more satisfactory flight level for flight efficiency or to avoid turbulence for safety.

- In-trail procedure (ITP)

B0-ASUR

Initial Capability for Ground Surveillance

Ground surveillance supported by ADS-B OUT and/or wide area multilateration systems. This capability will be expressed in various ATM services, e.g., traffic information, search and rescue and separation provision.

- Element 1: ADS-B
- Element 2: Multilateration (MLAT)

B0-ACAS

ACAS Improvements

To provide short term improvements to existing airborne collision avoidance systems (ACAS) to reduce nuisance alerts while maintaining existing levels of safety.



Block 0 and Block 1

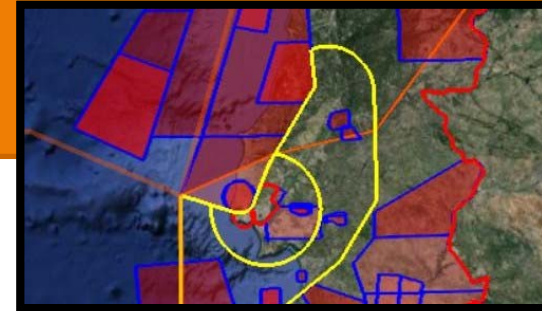
FRTO

B0-FRTO

Improved Operations through Enhanced En-Route Trajectories

To allow the use of airspace which would otherwise be segregated (i.e., special use airspace) along with flexible routing

- Element 1: Airspace planning
- Element 2: Flexible use of airspace (FUA)
- Element 3: Flexible routing



B1-FRTO

Improved Operations through Optimized ATS Routing

Introduction of free routing in defined airspace, where the flight plan is not defined as segments of a published route network or track system to facilitate adherence to the user-preferred profile.

- Element 1: Free routing
- Element 2: Reduced route spacing
- Element 3: Dynamic sectorization



Block 0 and Block 1

NOPS

B0-NOPS

Improved Flow Performance through Planning based on a Network-Wide view

Collaborative ATFM measure to regulate peak flows involving departure slots, managed rate of entry into a given piece of airspace for traffic along a certain axis, requested time at a way-point or and

FIR/sector boundary along the flight, use of miles-in-trail to smooth flows along a certain traffic axis and re-routing of traffic to avoid saturated areas.



B1-NOPS

Enhanced Flow Performance through Network Operational Planning

ATFM techniques that integrate the management of airspace, traffic flows including initial user driven prioritization processes for collaboratively defining

ATFM solutions based on commercial/operational priorities.

- Element 1: Improved ATFM and ATFM-AOM integration
- Element 2: Synchronization
- Element 3: Initial user driven prioritization process (UDPP)
- Element 4: Full flexible use of airspace (FUA)
- Element 5: Complexity management



Block 0 and Block 1

ASEP

B0-ASEP

Air Traffic Situational Awareness (ATSA)

Two ATSA applications which will enhance safety and efficiency by providing pilots with the means to enhance traffic situational awareness and

achieve quicker visual acquisition of targets.

- Element 1: ATSA-AIRB
- Element 2: ATSA-VSA



B1-ASEP

Increased Capacity and Efficiency through Interval Management

Interval Management (IM) improves the management of traffic flows and aircraft spacing. Precise management of intervals between aircraft with common or merging trajectories maximizes airspace throughput while reducing ATC workload along with more efficient aircraft fuel burn.



Block 0 and Block 1

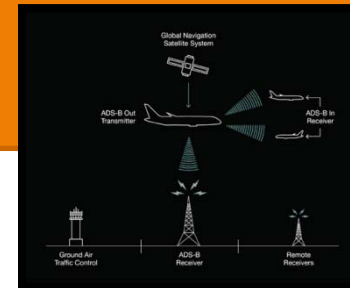
SNET

B0-SNET

Increased Effectiveness of Ground-based Safety Nets

This module monitors flights while airborne to provide timely alerts to air traffic controllers of potential risks to flight safety.

- Element 1: Short-term conflict alert (STCA)
- Element 2: Area proximity warning (APW)
- Element 3: Minimum safe altitude warning (MSAW)



B1-SNET

Ground-based Safety Nets on Approach

To enhance safety by reducing the risk of controlled flight into terrain accidents on final approach through the use of approach path Monitor (APM). APM

warns the controller of increased risk of controlled flight into terrain during final approach.



EFFICIENT FLIGHT PATHS (TRAJECTORY-BASED OPERATIONS)

**EFFICIENT
FLIGHT PATHS
(TROUGH
TRAJECTORY-
BASED
OPERATIONS)**

**Block 0
2013**

**B0-CDO
B0-TBO 
B0-CCO**

**Block 1
2019**

**B1-CDO
B1-TBO

B1-RPAS**

**Block 2
2025**

**B2-CDO

B2-RPAS**

**Block 3
2031+**

**B3-TBO

B3-RPAS**

Block 0 and Block 1

CDO

B0-CDO

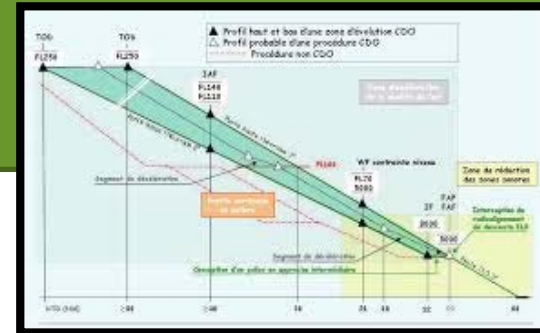
Improved Flexibility and Efficiency in Descent Profiles (CDO)

Deployment of performance-based airspace and arrival procedures that allow an aircraft to fly its optimum aircraft profile taking account of airspace

B1-CDO

Improved Flexibility and Efficiency in Descent Profiles (CDOs) using VNAV

To enhance vertical flight path precision during descent, arrival, and enables aircraft to fly an arrival procedure not



and traffic complexity with continuous descent operations (CDOs)

- Element 1: Continuous descent operations
- Element 2: Performance-based navigation

reliant on ground based equipment for vertical guidance.



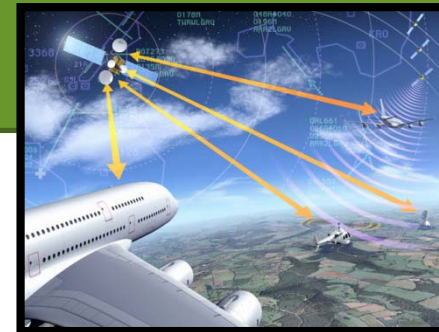
Block 0 and Block 1

TBO

B0-TBO

Improved Safety and Efficiency through the initial application of data link and SATVOICE En-Route

Implementation of an initial set of data link applications for supporting surveillance and communications in air



traffic services.

- Element 1: ADS-C over Oceanic and remote areas
- Element 2: Performance-based navigation

B1-TBO

Improved Traffic Synchronization and Initial Trajectory-Based Operation.

Improve traffic flows synchronization at en-route merging points and optimize approach sequence through the use of

4DTRAD capability and airport applications (RTA).

- Element 1: Initial 4D operations (4D TRAD)
- Element 2: Data link operational terminal information service (D-OTIS)
- Element 3: Departure clearance (DCL)
- Element 4: Data link TAXI (DTAXI)



Block 0 and Block 1

CCO

B0-CCO

Improved Flexibility and Efficiency in Departure Profiles - Continuous Climb Operations (CCO)

Deployment of departure procedures that allow an aircraft to fly its optimum aircraft profile taking account of airspace and traffic complexity with continuous climb operations (CCOs).





NEW!!

Block 0 and Block 1

RPAS



B1-RPAS

Initial Integration of Remotely Piloted Aircraft (RPA) into non-segregated airspace

Implementation of basic procedures for operating RPA in non-segregated airspace.

- Streamline process to access non-segregated airspace
- Defining airworthiness certification for RPA
- Define operator certification
- Define remote pilot licensing requirements
- Define detect and avoid technology performance requirements



Objective

To **calculate your needs**, to **identify your optimum ASBU** Module element or group of elements **AVAILABLE** to address these needs and to **ensure implementation** maximising resource allocation and benefits.



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***Thank you for your
attention***

Questions?
