SUPPORTING EUROPEAN AVIATION

Free Route Airspace (FRA)

"Giving users the freedom to plan a route in specified airspace"

Part 1 - Introduction of FRA

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21 - 25 OCT 2024

The Concept

Free Route Airspace

"A specified airspace within which users may freely plan a route between a defined entry point and a defined exit point, with the possibility to route via intermediate (published or unpublished) significant points, without reference to the ATS route network, subject to airspace availability. Within this airspace, flights remain subject to air traffic control."

Free Route Airspace: The Concept

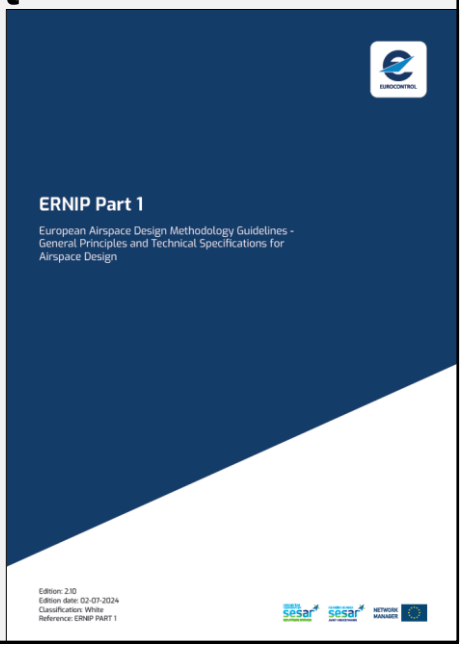
Since June 2012

European Route Network Improvement Plan - Part 1

Chapter 10 FREE ROUTE AIRSPACE
Section 1 - FRA Concept
Section 2 - FRA Design
Section 3 - FRA Implementation
Section 4 - FRA in Aeronautical Information Products

Note: FRA AIP publication requirements are included in ERNIP Part 1, Chapter 9.

https://www.eurocontrol.int/publication/european-route-network-improvement-plan-ernip-part-1



Free Route Airspace: The Concept
Scope

- The overall scope of the FRA Concept is to provide an enabling framework for the harmonised implementation of FRA whenever a State, a group of States decides to proceed with such implementation.
- The FRA Concept forms the basis for a common understanding for all ATM partners involved in FRA implementation.
- The FRA Concept encompasses various FRA implementation scenarios that will:
  - Meet the Safety Objectives;
  - Be compatible with existing operations;
  - Be sustainable through further development;
  - Be capable of expansion/connectivity to/with adjacent airspace;
  - Be capable of being exported to other regions.

Free Route Airspace: The Concept
Enablers

- Appropriate System Support - enhancement for the purposes of Flight Planning and ATFCM.
- Procedures - enhanced procedures where necessary for operations within FRA and at its interfaces.
- Adaptations to airspace structures.
- Adaptations to airspace management procedures.
- No additional equipment requirements or flight planning procedures changes are foreseen for aircraft operators. Nevertheless, modifications to flight planning systems may be required to ensure that full benefit of the FRA can be realised.

Free Route Airspace: The Concept
Main Principles

Free Route Airspace: The Concept
Content

- Airspace Classification (Class C).
- Flight Level Orientation Scheme (FLOS).
- Limited Applicability of FRA:
  - *Structurally Limited* - In complex airspace, the full implementation of FRA could potentially have a detrimental effect on capacity. In such airspace, States may decide to implement FRA on a structurally limited basis, for example by restricting the available FRA Horizontal entry/exit points for certain traffic flows, which could increase predictability and reduce the number of potential conflicts.
- Airspace Organisation.
- Maximising Efficiency of FRA.
- Access To/From Terminal Airspace.
- Publication of a Contingency ATS Route Network.
- Maintenance of a Fixed ATS Route Network within FRA.
- Airspace Limitations.
- Route Availability.
- Sectorisation.
- Sector and Traffic Volumes Capacities/Monitoring Values.
- ATS Delegation.
- Airspace Management.
- Letters of Agreement and Coordination Procedures.
- Flight Planning.
- Air Traffic Flow and Capacity Management.

Free Route Airspace: The Concept
Generic Terms

- **FRA area** is a generic term used to express the dimension of the established free route airspace.
- **FRA operation** is a generic term used to express the flight operation within the established free route airspace, in accordance with free route airspace procedures and without referencing to fixed ATS route network, if available.

FRA in Europe

Free Route Airspace: Implementation
The Beginning

- FRA implementation started on **07th May 2009** by Portugal within the airspace of Lisboa FIR.

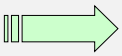
Free Route Airspace: Implementation
Summary

- FRA is currently implemented within the airspaces of almost **40 States** in Europe either only inside the State or as cross-border between States.
- ATS route network inside FRA still exists only in around **10 States**.
- Large cross-border FRA areas are also implemented.

https://www.eurocontrol.int/concept/free-route-airspace

Free Route Airspace: Implementation

Ways



- Horizontally:
  - Flights allowed to flight plan within “specified airspace” between officially published **E**ntry/e**X**it points or via **I**ntermediate points.
  - “Specified airspace” usually represents the:
    - FIR/UIR. or
    - Area of responsibility for relevant air traffic control (ATC) unit (CTA/UTA → ACC/UAC).

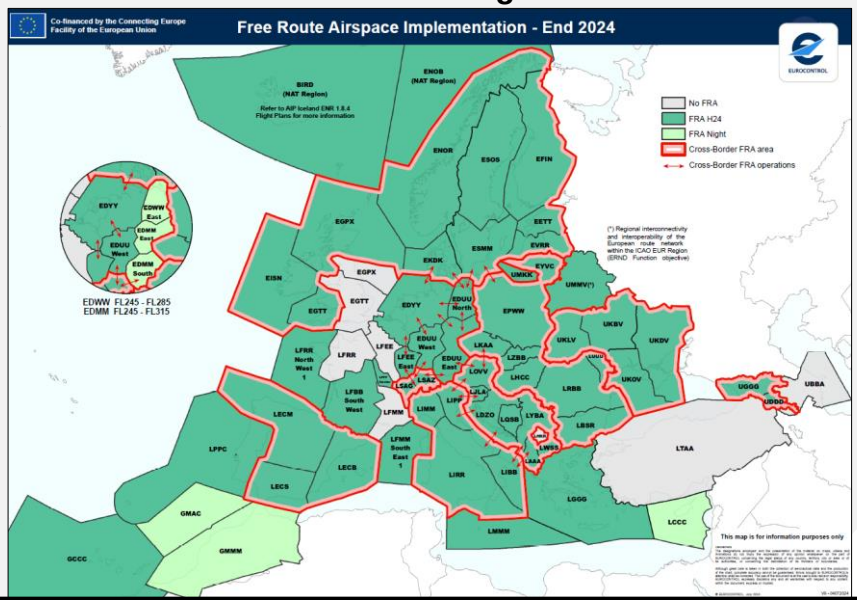
- Vertically:
  - Above FL305, FL285, FL245, …, FL095, LAL (Lower Available Level).

- Timely:
  - Core night (e.g. as 22:00 - 04:00 Summer time).
  - Near night (extended night).
  - Weekend.
  - Extended Weekend.
  - Seasonal.
  - H24.

Free Route Airspace: Implementation

ICAO EUR Region - EUROCONTROL Network Manager AoR* Status

* This visualisation also includes the FRA implementations in Belarus and the Russian Federation (Kaliningrad FIR).

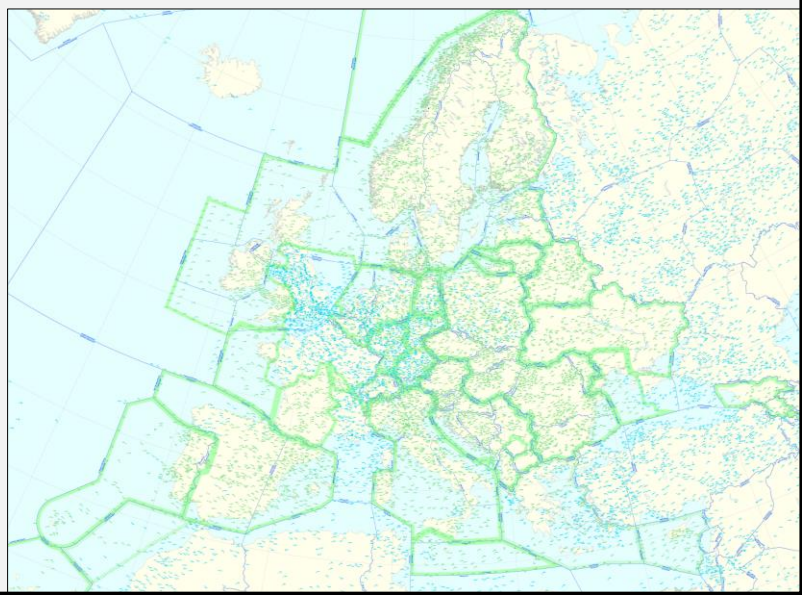


Free Route Airspace: Implementation

ICAO EUR Region - EUROCONTROL Network Manager AoR* Visualisation

* The snapshot from the EUROCONTROL produced route network chart (ERN) also includes the FRA implementations in Belarus and the Russian Federation (Kaliningrad FIR).

https://www.eurocontrol.int/service/cartography



Free Route Airspace: Implementation

EUROCONTROL Network Manager Design Support Tools

- **SAAM** (**S**ystem for traffic **A**ssignment and **A**nalysis at a **M**acroscopic level) - An integrated system for network-wide or local design, evaluation, analysis and display of air traffic, civil/military airspace and TMA scenarios.
  https://www.eurocontrol.int/database/system-traffic-assignment-and-analysis-macroscopic-level
- **NEST** (**NE**twork **S**trategic **T**ool) - A simulation software for network capacity planning and airspace design.
  https://www.eurocontrol.int/model/network-strategic-modelling-tool
- **CAPAN** (**CAP**acity **AN**alysis methodology) - Developed and used by EUROCONTROL to support the development, validation and implementation of proposals for airspace and capacity improvement.
  https://www.eurocontrol.int/methodology/capacity-analysis-methodology
- **RTS** (**R**eal **T**ime **S**imulation) - EUROCONTROL simulation capabilities and platform for experimentation ESCAPE is a scalable EUROCONTROL ATM real-time simulation platform supporting small- and large-scale simulations in the following areas: Airspace design for both en-route and TMA.
  https://www.eurocontrol.int/simulator/escape

Free Route Airspace - Benefits
General View

- FRA is a way of overcoming the aviation sector's efficiency, capacity and environmental problems by helping to reduce fuel consumption and emissions, while improving flight efficiency. At the same time, it paves the way for further enhanced airspace design and ATM operational concepts.
- With FRA projects now in place across more than three quarters of European airspace, the region's flight efficiency targets are within grasp. Route extension - the difference between the flight flown and the corresponding portion of the great circle distance - due to airspace design went down **from 3.58% in December 2007 to 1.59% in August 2024**, thanks in part to initiatives like free route airspace and despite significant disruption in the network.
- FRA is a key landmark in achieving free routeing across European airspace on the road to SESAR's business trajectories and 4D profiles. It will make it possible to meet the demands of future airspace users over the next 50 years, including civil and military unmanned aircraft systems (UASs), supersonic and hypersonic transport, spaceplane operations to sub-orbit and orbit, high altitude pseudo satellite (HAPS) platforms, plus balloons and airships.

Free Route Airspace - Benefits
Airspace Users

- The move from routes to free route airspace availability offers significant opportunities to airspace users.
- Once fully implemented at European level, these improvements should allow the following savings, compared with the current situation:
  - **1 billion** nautical miles.
  - **6 million** tonnes of fuel.
  - **20 million** fewer CO_2 tonnes.
  - **€ 5 billion** in fuel costs savings.

Free Route Airspace - Benefits
ANSPs

- Operating an FRA environment offers improved traffic predictability due to more stable trajectories. At the same time, it enhances the use of conflict detection tools. The FRA concept leads to a better spread of conflicts compared with the concentration of conflicts generated by the former fixed ATS route network.
- EUROCONTROL studies also show a slight decrease in ATCOs workload as a result of FRA implementation, mainly coming from a decrease in radio transmissions, monitoring and coordination tasks.
- ATCOs working with FRA environment are adamant that they do not want to go back to a fixed ATS route network. Before FRA, aircraft received tactical directs from ATCOs to shorten their route, but there was no logical correlation between the fixed ATS route network and how the aircraft actually flew. FRA offers airspace users the ability to fly directly according to their filed flight plan route while ensuring efficiencies in fuel planning, consumption and costs.

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FRA in ICAO

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Global Air Navigation Plan - ASBU

Improved operations through enhanced en-route trajectories

Aviation System Block Upgrade (ASBU) Operational Threads:

- FRTO (Free-route operations):
  - 2019+
    - FRTO-B1/1 - **Free Route Airspace (FRA)**.
    - FRTO-B1/2 - Required Navigation Performance (RNP) routes.
    - FRTO-B1/3 - Advanced Flexible Use of Airspace (FUA) and management of real time airspace data.
    - FRTO-B1/4 - Dynamic sectorization.
  - 2025+
    - FRTO-B2/1 - Local components of integrated ATFM and ATC Planning function (INAP).
    - FRTO-B2/2 - Local components of Dynamic Airspace Configurations (DAC).
    - FRTO-B2/3 - Large Scale Cross. Border Free Route Airspace (FRA).

- TBO (Trajectory-based operations):
  - 2031 onward
    - TBO-B3/1 Network based on-demand synchronization of **trajectory-based operations**.

ICAO 14th Air Navigation Conference (26 AUG - 6 SEP 2024)

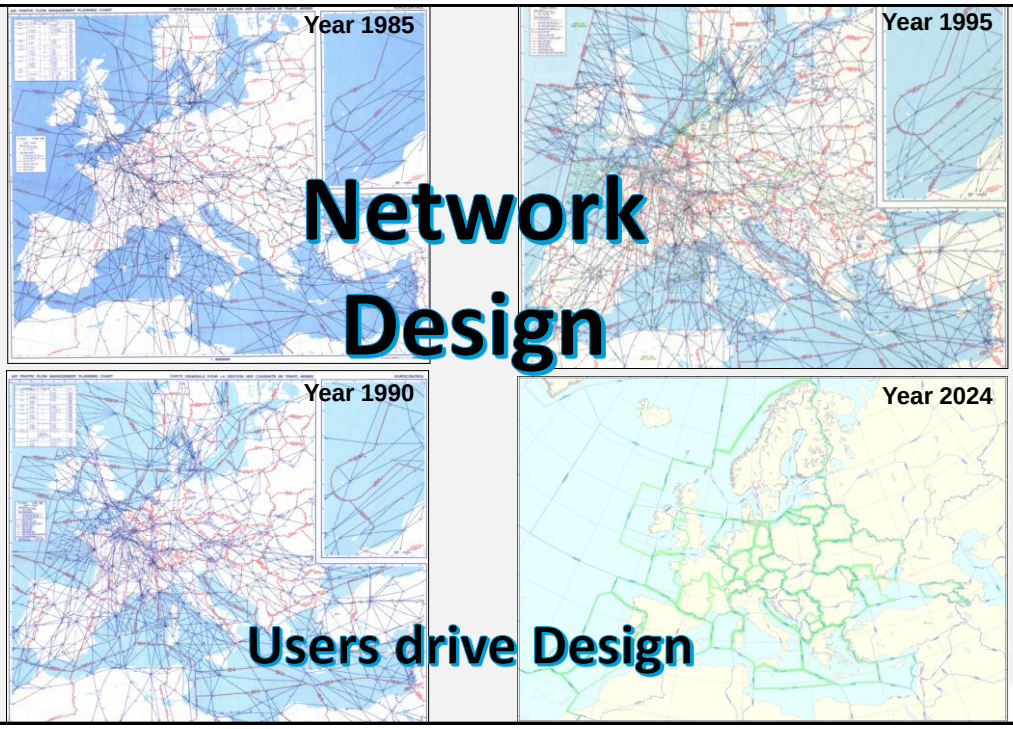
Report on the Committee on Agenda Item 3

Air navigation system performance improvement

Recommendation 3.1/4 - Free route airspace

That **States**:
a) **actively collaborate** with neighbouring States to implement free route airspace;

that **ICAO**:
b) **develop provisions** and **guidance material** to support harmonised implementation of free route airspace, including implementation across airspace boundaries and regions.



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SUPPORTING EUROPEAN AVIATION

Thank you!

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FOUNDING MEMBER sesar JOINT UNDERTAKING
NETWORK MANAGER

AFI FRA PMT5 and UPR WORKSHOP, OCTOBER 2024, NAIROBI

21 to 25 October 2024, NAIROBI, KENYA

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