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Aviation



The Benefits and Lessons learnt in the implementation of Free Route Airspace (FRA) in the European Region

Part 1 - Concept, Design, Implementation, Publication

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NETWORK
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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between a defined entry point and a defined exit point, with the possibility to route via intermediate (published or unpublished) significant points, without reference to the ATS route network, subject to airspace availability.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

FRA Concept

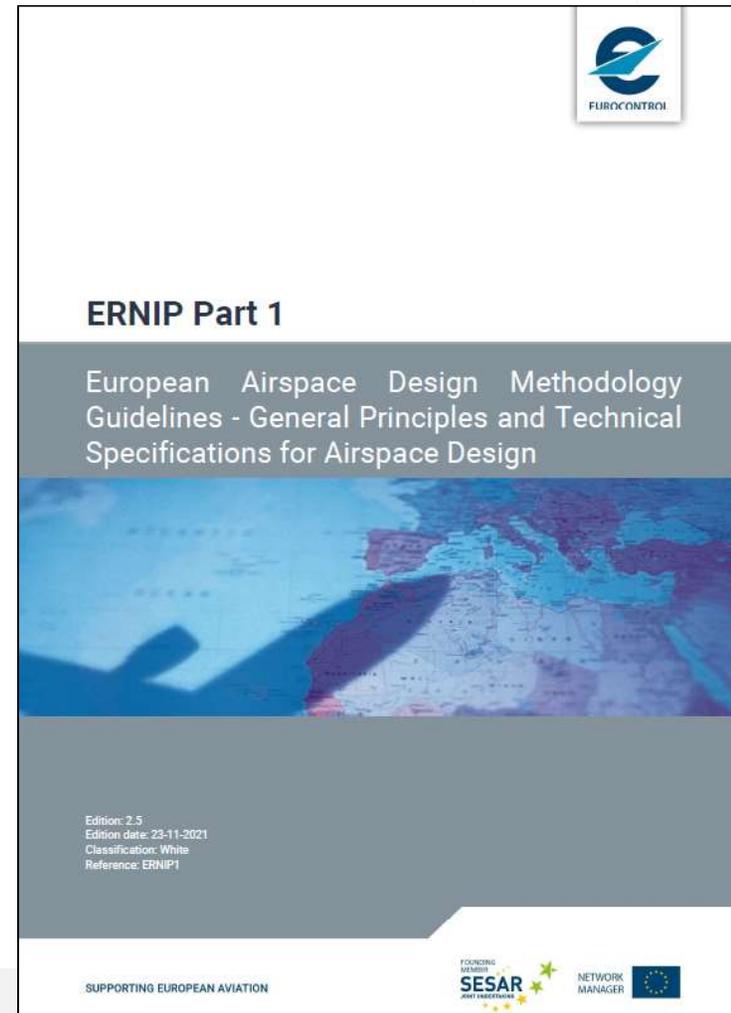
FRA Design

FRA Implementation

FRA in Aeronautical Information Products

Note: FRA AIP publication is included in Chapter 9.

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



Free Route Airspace: The Concept - Main Principles



FRA shall be **operationally** driven and produce tangible benefits for all airspace users

Military airspace requirements shall be satisfied

European Airspace Design Methodology will be respected

Common practice and methodology, used by EUROCONTROL/NM, will be applied

Free Route Airspace: The Concept - Scope

- The overall scope of the Free Route Airspace (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

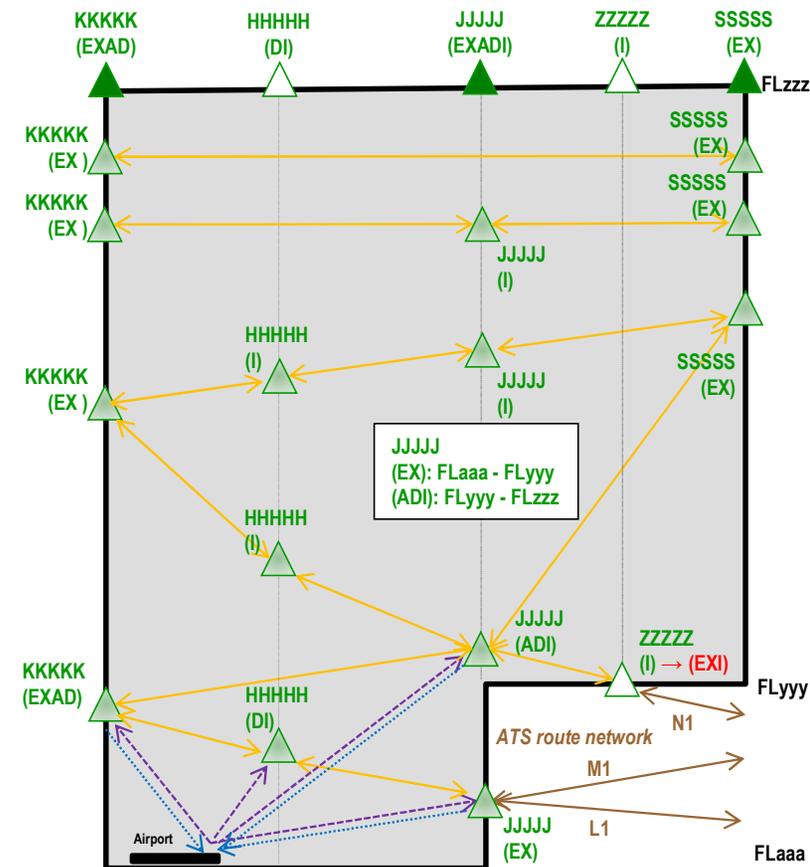
- Appropriate System Support - enhancement for the purposes of Flight Planning and ATFCM.
- Procedures - enhanced procedures where necessary for operations within FRA and at its interfaces.
- Adaptations to airspace structures.
- Adaptations to airspace management procedures.
- No additional equipment 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 - Content

- Airspace Classification (Class C).
- Flight Level Orientation Scheme.
- 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 Reservations.
- 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 - Points Structure

- FRA Horizontal Entry Point (E)**
 A published Significant Point on the horizontal boundary of the Free Route Airspace from which FRA operations are allowed.
- FRA Horizontal Exit Point (X)**
 A published Significant Point on the horizontal boundary of the Free Route Airspace to which FRA operations are allowed.
- FRA Intermediate Point (I)**
 A published Significant Point or unpublished point, defined by geographical coordinates or by bearing and distance via which FRA operations are allowed.
- FRA Arrival Connecting Point (A)**
 A published Significant Point to which FRA operations are allowed for arriving traffic to specific aerodromes.
- FRA Departure Connecting Point (D)**
 A published Significant Point from which FRA operations are allowed for departing traffic from specific aerodromes.

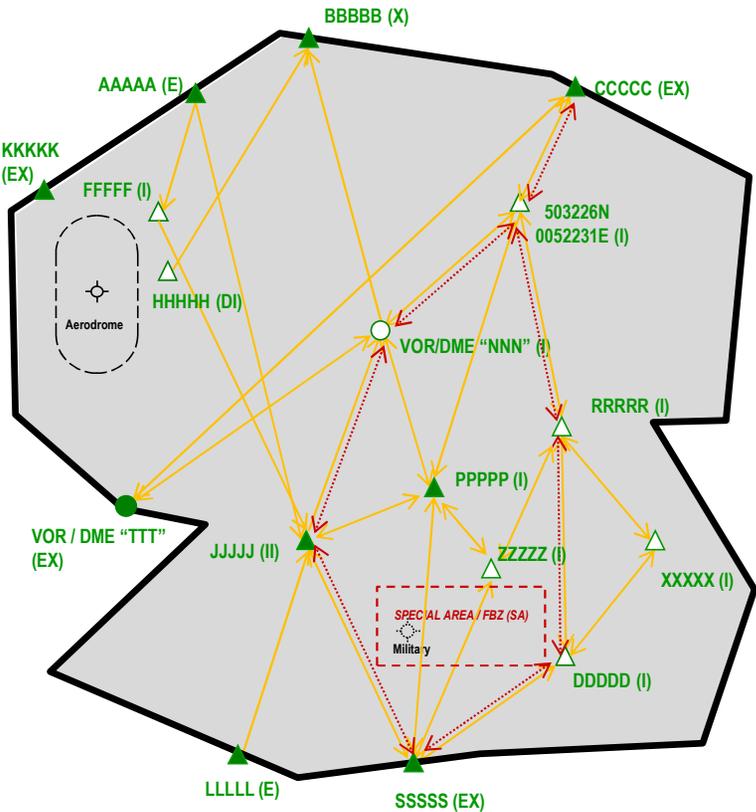


Free Route Airspace: The Concept - Flight Planning

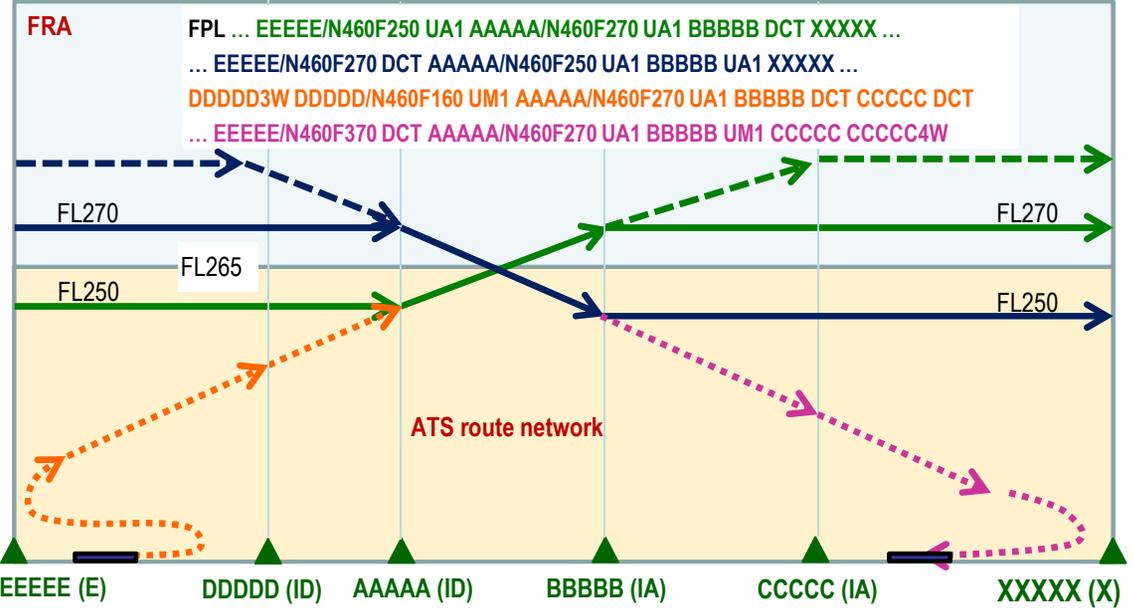
- **ICAO Doc 4444 PANS-ATM**, Appendix 2 Flight plan provisions state the following under ITEM 15: ROUTE
Flights along designated ATS routes
INSERT, [...]
OR by **DCT**, if the flight to the next point will be outside the designated route, unless both points are defined by geographical coordinates.

Flights outside designated ATS routes
INSERT points normally not more than 30 minutes flying time or 370 km (200 NM) apart, including each point at which a change of speed or level, or change of track, or a change of flight rules is planned.
[...]
INSERT **DCT** between successive points unless both points are defined by geographical coordinates or by bearing and distance.
- **DCT** (Doc 8400, ICAO Abbreviations and Codes (PANS-ABC)
Direct (*in relation to flight plan clearances and type of approach*)
Decoded abbreviation/indicator DCT (Direct) or Encoded abbreviation/indicator Direct (DCT) should be used only:
 - for flight planning purposes when submitting FPL;
 - when executing specified type of approach.
- **Free Route Airspace**
 - Segments between FRA Significant points are to be indicated by **DCT** in ITEM 15: ROUTE of the flight plan.
 - Example: [Entry Point] DCT [Intermediate point] DCT [Intermediate point] DCT [Exit Point].
 - There might not be any additional limitations on the DCT segments length.

Free Route Airspace: The Concept - Transition Horizontally and Vertically (theoretical expression)



FPL ... CCCCC DCT 5032N 00523E DCT PPPPP DCT SSSSS ...



Free Route Airspace: Design - FRA Points (1)

- A FRA (E) or FRA (X) or FRA (EX) point should be established exactly on the horizontal boundary of the relevant FRA area. In cross-border FRA, a FRA (E) or FRA (X) or FRA (EX) point, on the former internal FRA boundaries, should be changed to a FRA (I), where and when it is required depending on the nature of traffic flows.
- A FRA (A) or FRA (D) or FRA (AD) point, depending on the lower limit of the relevant FRA area is established for an aerodrome with or without designated SIDs/STARs.
- A FRA (I) point is located inside the FRA area and is used as a point:
 - For planning of user preferred trajectory.
 - For a change of speed or level, a change of track, or a change of flight rules is planned.
 - For Special Area avoidance.
 - For vertical transition to/from underlying fixed ATS route network or RAD DCT without specific reference to an aerodrome.
 - From/to which FRA operation is possible, if before/after a fixed ATS route network is used.
- Any unique combination of letters can be defined and published for particular FRA significant point depending on State decision.



Free Route Airspace: Design - FRA Points (2)

- Any published significant point - 5LNC and NAVAID can be used as a FRA significant point.
- No mandatory requirement that only selected number of existing 5LNCs and NAVAIDs shall be used as FRA (I).
- No mandatory requirement that only “en-route” 5LNCs and NAVAIDs shall be used as FRA (I).
- No mandatory requirement that 5LNCs and/or NAVAIDs shall be inserted in the FPL at each 370 km (200 NM) flying distance.
- In some European States inside same FRA area, mandatory requirement is that at least one 5LNC or NAVAID in each FIR shall be inserted in the FPL. This is to avoid unnecessary storage of significant points in ATM systems.
- Any unpublished significant point defined by geographical coordinates or by bearing and distance is allowed in FRA by selected European States.

Free Route Airspace: Design - FRA Points (3)

- When required, FRA significant points have a specific information(s) as part of its FRA relevance definition.
 - Vertical FL band if different inside the FRA area from the general FRA vertical limits (e.g. a “balcony” in the FRA area definition).
 - FLOS over a relevant FRA significant point (see also slide 16).
 - Aerodrome(s) related to a FRA (A) or FRA (D) or FRA (AD) point.
 - FRA area name related to a FRA (A) or FRA (D) or FRA (AD) point located on a common boundary of two FRA areas.
 - Different FRA relevance on the same FRA significant point during defined time periods.



Free Route Airspace: Design - ATS route network

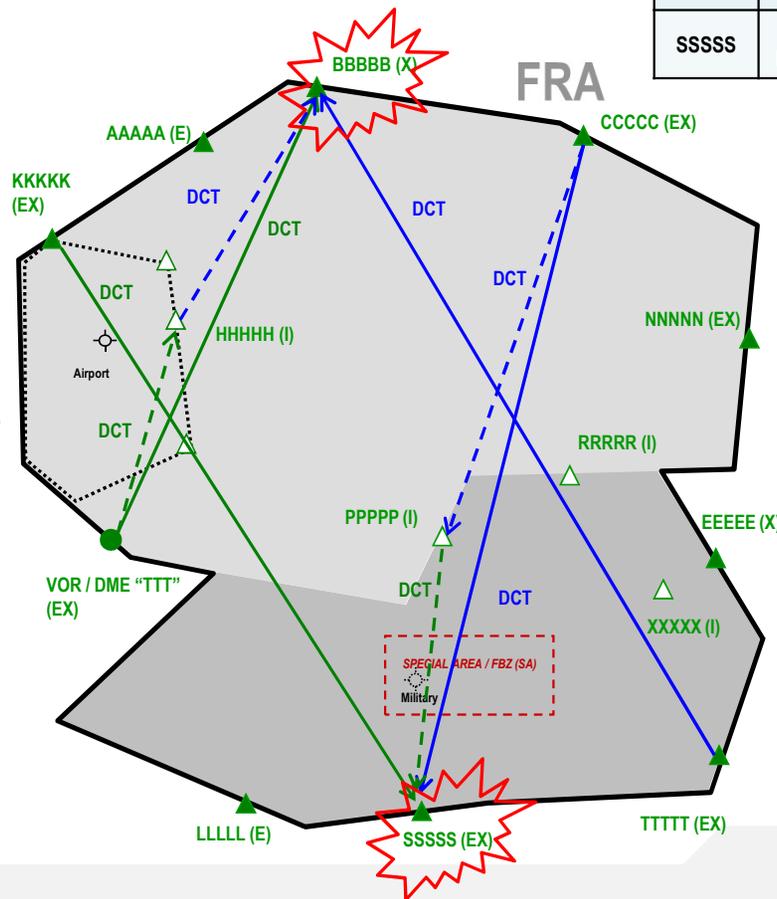
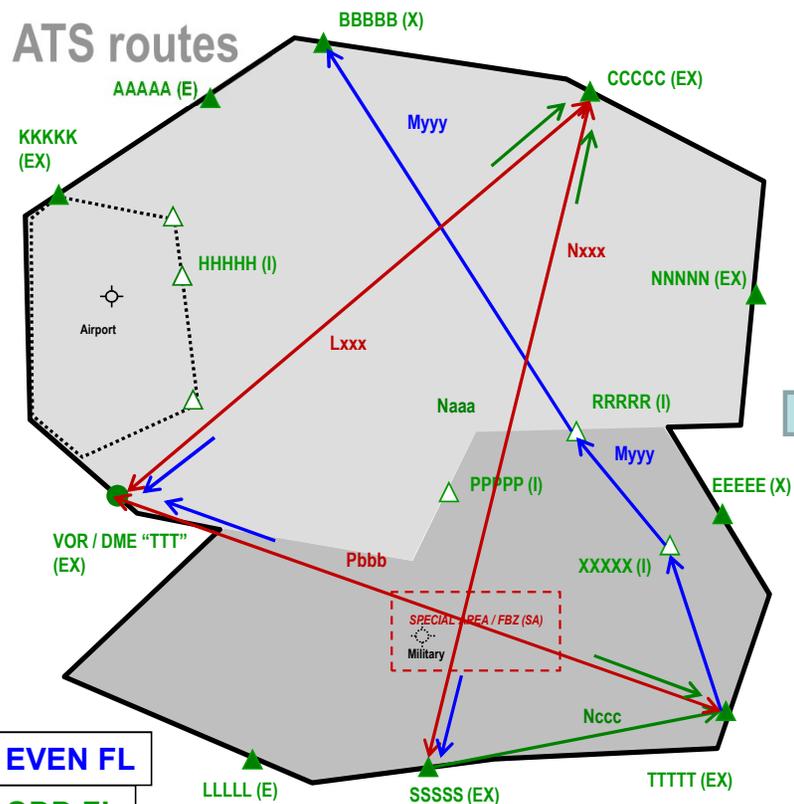
- Historically, ATS routes have been the preferred tools to allow the safe and efficient management of high density air traffic and to facilitate the early detection of possible conflicts and their resolution. Based on ICAO provisions, there is no particular requirement for ATS routes to co-exist in FRA where the air traffic services can be assured in a safe, efficient and sustainable manner.
- Each State shall decide to maintain or remove the fixed ATS route network during FRA operations and all details shall be provided in the national AIS publications.
- There is no mandatory requirement for the fixed ATS route network to be either maintained or removed when FRA is implemented.

Free Route Airspace: Design - Flight Level Orientation Scheme (FLOS) (1)

- As FRA by definition has to be classified as Class C airspace, with certain agreed exemptions, a flight operating in level flight in such controlled airspace shall be flown at a cruising level, or, if authorized to employ cruise climb techniques, between two levels or above a level, selected from the tables of cruising levels in ICAO Annex 2, Appendix 3, a).
- Inside a FRA area, as there are no fixed ATS route network nor fixed allowed Directs (DCTs) between the FRA significant points, the direction of cruising levels to be used shall be in accordance with AIP ENR 1.7. Deviations from the published direction of cruising levels are necessary in several cases for operational reasons related to ATC Unit responsibility of the same FL (ODD FL or EVEN FL) over a FRA significant point.
- Any exemption or deviation from these rules shall be published in the national AIS publications and the relevant provisions shall be described in the LoAs, when necessary.

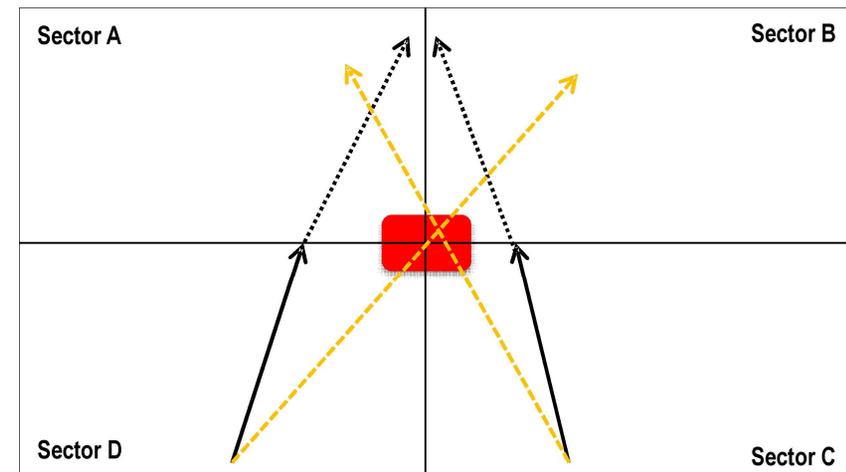
Free Route Airspace: Design - Flight Level Orientation Scheme (FLOS) (2)

Point	FLOS
BBBBB	EVEN FLs - for all exiting ACFT
SSSSS	ODD FLs - for all exiting ACFT EVEN FLs - for all entering ACFT



Free Route Airspace: Design - No Planning Zone (NPZ)

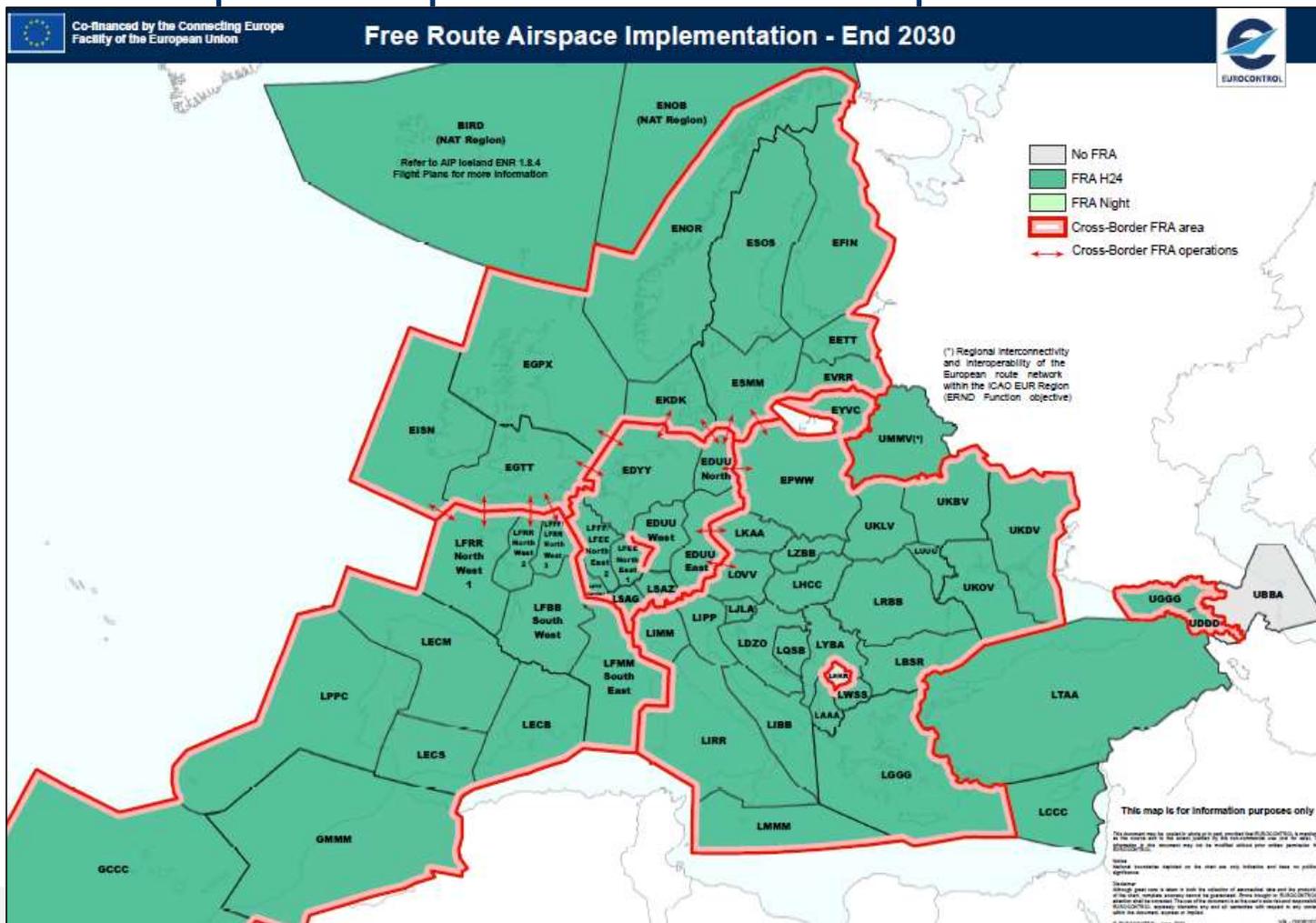
- Occasions where two flights are transferred by two different control sectors to two different downstream control sectors is difficult to manage and such alignment of sector boundaries has to be avoided by coordinated airspace design.
- If such coordinated airspace design approach is difficult or not practical, the application of a “No Planning Zone” (NPZ) (red shaded area) is considered.
- Such NPZs is established when necessary and is published together with relevant flight planning instructions in State AIP.



Free Route Airspace: Implementation - Actions

- The checklist of implementation actions is established in Europe and applies to the new FRA projects and other major airspace changes.
- FRA Project - START:
Local FRA CONOPS discussed with EUROCONTROL to ensure harmonised network FRA implementation
T0 - (24 - 30) months BEFORE implementation, depending on the expected impact of the change
- FRA Project - END (possible):
Post implementation analyses and Fine-tuning of implementation
T0 + (1 - 6) AIRAC cycles

Free Route Airspace: Implementation - Europe end 2030



Free Route Airspace: Publication

- The detailed requirements for FRA data origination and publication in AIP and via AIP Data Set, including references to the data quality requirements contained in the ICAO Doc 10066 PANS-AIM are in accordance with Chapter 9 - Guidelines for data provision of Airspace Objects in Aeronautical Information Products.
- When the AIP data set is provided in accordance with ICAO Doc 10066 PANS-AIM, the AIP sections marked with (#) above may be omitted or left blank and reference to the data set availability is provided.

FRA Data	AIP section
FRA terminology and relevant terms or abbreviations for FRA operations	GEN 2.2
FRA General Procedures, including: <ul style="list-style-type: none"> FRA Arrival/Departure Connecting Routes (If not described in ENR 3.3 or AD 2.22) FRA FLOS Provisions 	ENR 1.3
FRA general information on CDR and Special Areas	ENR 1.9
FRA Flight Planning procedures	ENR 1.10
FRA Area definition (lateral limits, vertical limits, time applicability, etc.) If applicable, a name and description for the cross-border FRA that this FRA is part of	ENR 2.2
FRA Arrival/Departure Connecting Routes (If not described in ENR 1.3 or AD 2.22)	ENR 3.3#
1. FRA relevance of NAVAIDs designated as FRA Significant Points: <ul style="list-style-type: none"> (E), for "FRA Horizontal Entry Point"; (X), for "FRA Horizontal Exit Point"; (I), for "FRA Intermediate Point"; (A), for "FRA Arrival Connecting Point"; (D), for "FRA Departure Connecting Point". 2. FRA specific information of NAVAIDs: <ul style="list-style-type: none"> Vertical FL band, if different inside the FRA area; FLOS over relevant NAVAID, if applicable; Aerodrome(s) related to a FRA (A) or FRA (D) or FRA (AD) point; FRA area name related to a FRA (A) or FRA (D) or FRA (AD) point; Different FRA relevance on the same NAVAID during defined periods. 	ENR 4.1#
1. FRA relevance of 5LNCs designated as FRA Significant Points: <ul style="list-style-type: none"> (E), for "FRA Horizontal Entry Point"; (X), for "FRA Horizontal Exit Point"; (I), for "FRA Intermediate Point"; (A), for "FRA Arrival Connecting Point"; (D), for "FRA Departure Connecting Point". 2. FRA specific information of 5LNCs: <ul style="list-style-type: none"> Vertical FL band, if different inside the FRA area; FLOS over relevant 5LNC; Aerodrome(s) related to a FRA (A) or FRA (D) or FRA (AD) point; FRA area name related to a FRA (A) or FRA (D) or FRA (AD) point; Different FRA relevance on the same 5LNC during defined periods. 	ENR 4.4#
Special Area(s) FRA reconfiguration	ENR 5.1#
Special Area(s) FRA reconfiguration	ENR 5.2#
FRA Arrival/Departure Connecting Routes (If not described in ENR 1.3 or ENR 3.3)	**** AD 2.22
Full FRA description	En-route Charts
1. SIDs/STARs extension in FRA. 2. FRA Arrival/Departure Connecting Routes (If not described part of en-route Chart).	Aerodrome Charts

Free Route Airspace



“Giving users the freedom to plan a route in Europe's airspace”



QUESTIONS