



Network Manager
nominated by
the European Commission



Free Route Airspace Design

Concept, Implementation, Application

AIRARD/TF/2

26th - 27th October 2017

Astana, Kazakhstan

Prepared and Presented by:

Mr. TIHOMIR TODOROV

Head of Section Airspace Design

Operations Planning Unit

Network Operations Management Division

Network Manager Directorate

EUROCONTROL



Network Manager
nominated by
the European Commission



European Route Network Improvement Plan (ERNIP)

<http://www.eurocontrol.int/operations-planning>



Network Manager
nominated by
the European Commission

ERNIP



Network Manager
nominated by
the European Commission



European Route Network Improvement Plan

Framework Document



European Network Operations Plan 2012 - 2014

Edition June 2012

PART 1 - The European Airspace Design Methodology Guidelines - General Principles and Technical Specification for Airspace Design

Chapter 6 **EN-ROUTE DESIGN METHODOLOGY:**

- ✓ **FREE ROUTE AIRSPACE DESIGN.**



- ❖ **6.5.1. FRA Concept**
Defines the FRA Concept.
- ❖ **6.5.2. FRA - AIP Publication**
Defines all requirements for AIP publication of FRA.
- ❖ **6.5.3. FRA - Charts Publication**
Defines the Chart types that can be affected by FRA implementation as well as relevant FRA Chart symbols to be used by the States.
- ❖ **6.5.4. FRA Glossary of Terms**
Includes the FRA definitions.
- ❖ **6.5.5. FRA AIP Publication Template**
Presents a template with fictitious example for AIP publication of FRA.
- ❖ **6.5.6. FRA Check List of Implementation Actions**
Defines all actions to be performed by States as FRA validation, coordination, publication and preparation for implementation.



Network Manager
nominated by
the European Commission



FRA Concept



“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between a defined entry point and a defined exit point, with the possibility to route via intermediate (published or unpublished) way points, without reference to the ATS route network, subject to airspace availability. Within this airspace, flights remain subject to air traffic control.”



Scope

The overall scope of the Free Route Airspace (FRA) Concept is to provide an enabling framework for the harmonised implementation of FRA in Europe whenever a State / FAB / ANSP, a group of States / FABs / ANSPs 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.

Enablers

The enablers are:

- 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.



- ❖ Airspace Classification.
- ❖ Flight Level Orientation.
- ❖ 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 / FABs / ANSPs 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.



- ❖ **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.

- ❖ **ICAO Doc 4444 PANS-ATM**

Appendix 2 Flight plan provisions state the following under ITEM 15: ROUTE

Flights along designated ATS routes

INSERT, [...]

OR, If the departure aerodrome is not on or not connected to the ATS route, the letters **DCT** followed by the point joining the first ATS route, followed by the designator of the ATS route.

[...]

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.



❖ **Route Availability Document (RAD)**

A common reference document containing the policies, procedures and description for route and traffic orientation. It also includes route network and free route airspace utilisation rules and availability (AURA).

❖ **Significant Point (ICAO Annex 11 Air Traffic Services)**

A specified geographical location used in defining an ATS route or the flight path of an aircraft and for other navigational and ATS purposes.

Note.- There are three categories of significant points: ground-based navigation aid, intersection and waypoint. In the context of this definition, intersection is a significant point expressed as radials, bearings and/or distances from ground based navigation aids.

❖ **Special areas (SA)**

“Airspace reservation” refers to airspace of defined dimensions for the exclusive use of specific users. These are special designed areas within which both civil and military activities could take place, including CBA, TRA, TSA, D, R, P and any specially activated areas.



FRA Definitions (3)



❖ 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)

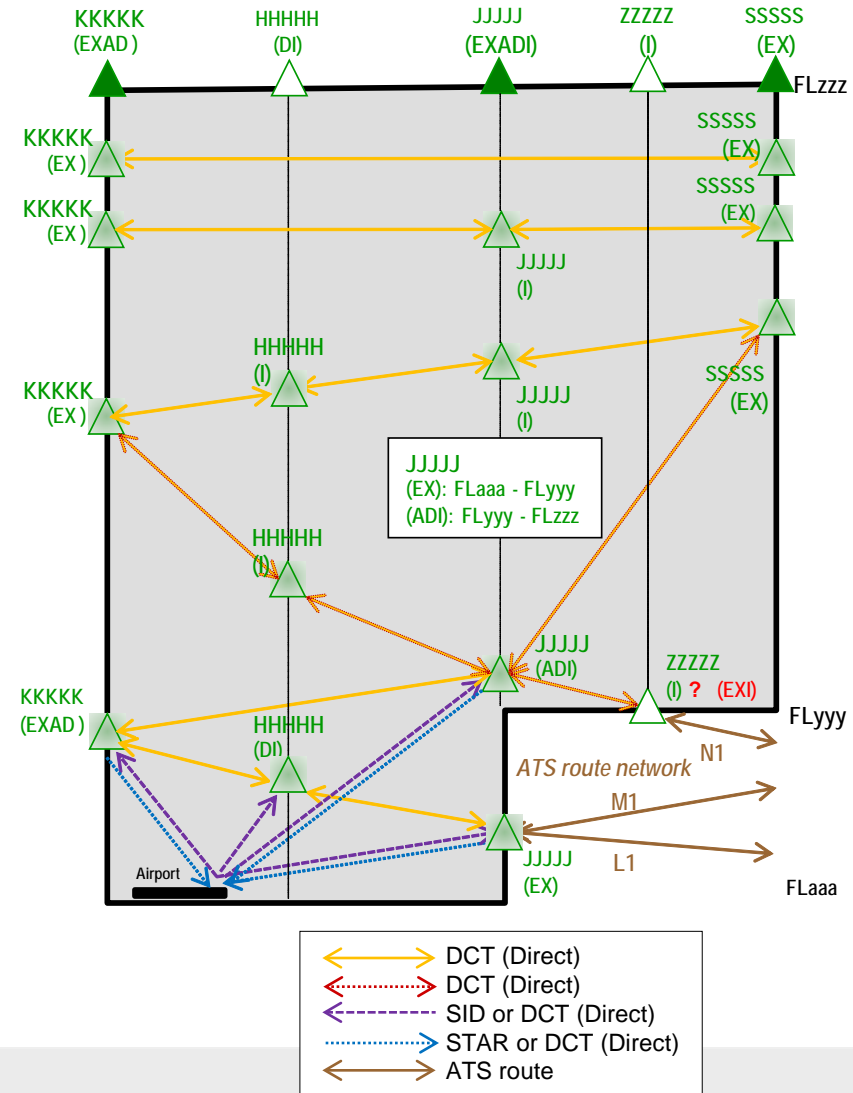
A published Significant Point or unpublished point, defined by geographical coordinates or by bearing and distance via which FRA operations are allowed.

❖ 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.





Network Manager
nominated by
the European Commission

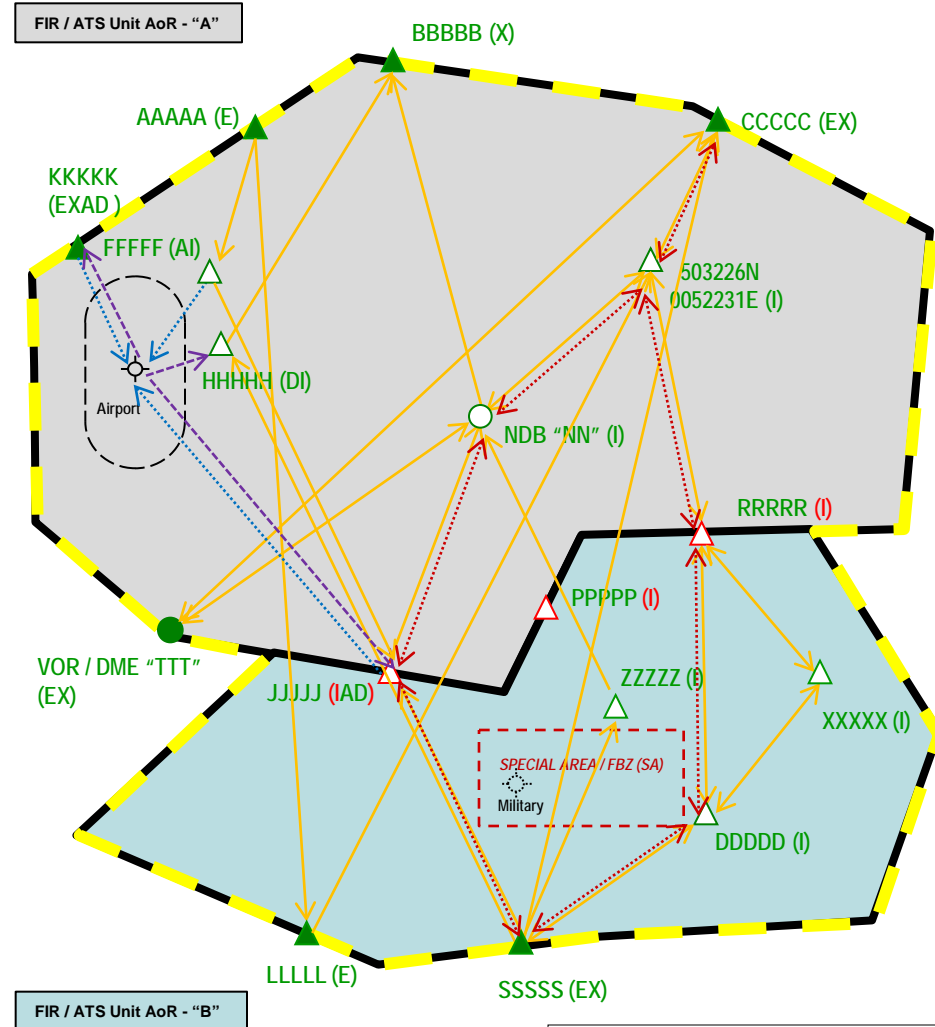
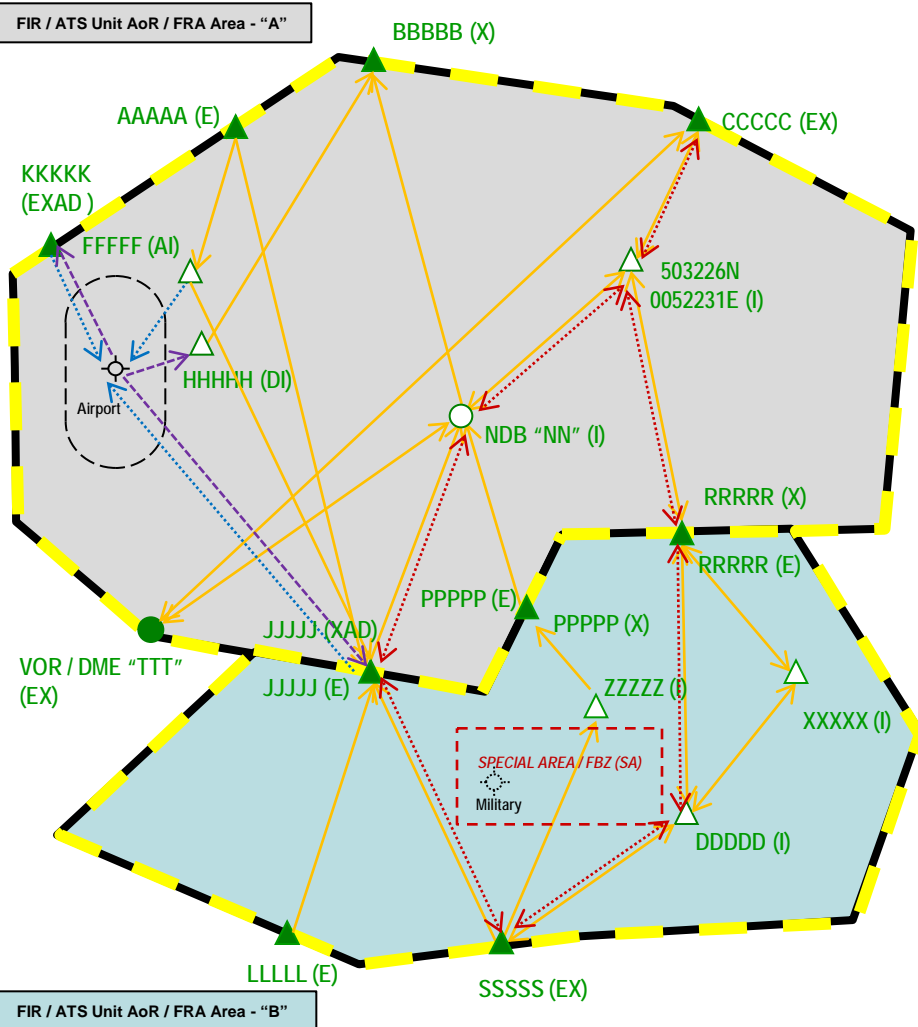
Free Route Airspace Fictitious Example



Separate Local FRA Areas - "A" and "B"



Common Cross-border FRA Area - "A" + "B"



- DCT (Direct)
- DCT (Direct)
- SID or DCT (Direct)
- STAR or DCT (Direct)



FRA Horizontal Entry (E) and Exit (X) points Rules

- ❖ Entry to and exit from FRA is done only over the significant points published and defined as FRA Horizontal Entry and FRA Horizontal Exit.
- ❖ These points retain their functions from ATS route network (e.g. points which are entry-only remain entry-only in FRA).

FRA Intermediate (I) points Rules

- ❖ Airspace users may file FRA Intermediate points between FRA Horizontal Entry and FRA Horizontal Exit points, circumnavigate a particular area, indicate a change in flight level or speed, or remain compliant with FRA boundaries rules.
- ❖ A FRA Intermediate point could be any published en-route radio navigation aid or 5LNC or unpublished significant point defined by geographical coordinates or by bearing and distance.
- ❖ There might be no limitations on the number of FRA Intermediate points used.
- ❖ The use of FRA Intermediate points in ITEM 15: ROUTE of the flight plan is defined by each State.

FRA Boundaries Rules

- ❖ Segments between FRA Horizontal Entry, FRA Intermediate and FRA Horizontal Exit points normally should remain fully contained in the published FRA boundaries.
- ❖ Flight plans with segments that partially violate the lateral limits of FRA area might not be accepted by the State. Whenever exceptions apply they need to be published in AIP or RAD.
- ❖ Flight plans containing segments that pass close to the FRA boundaries might be accepted, but tactical re-routing might be applied when required.

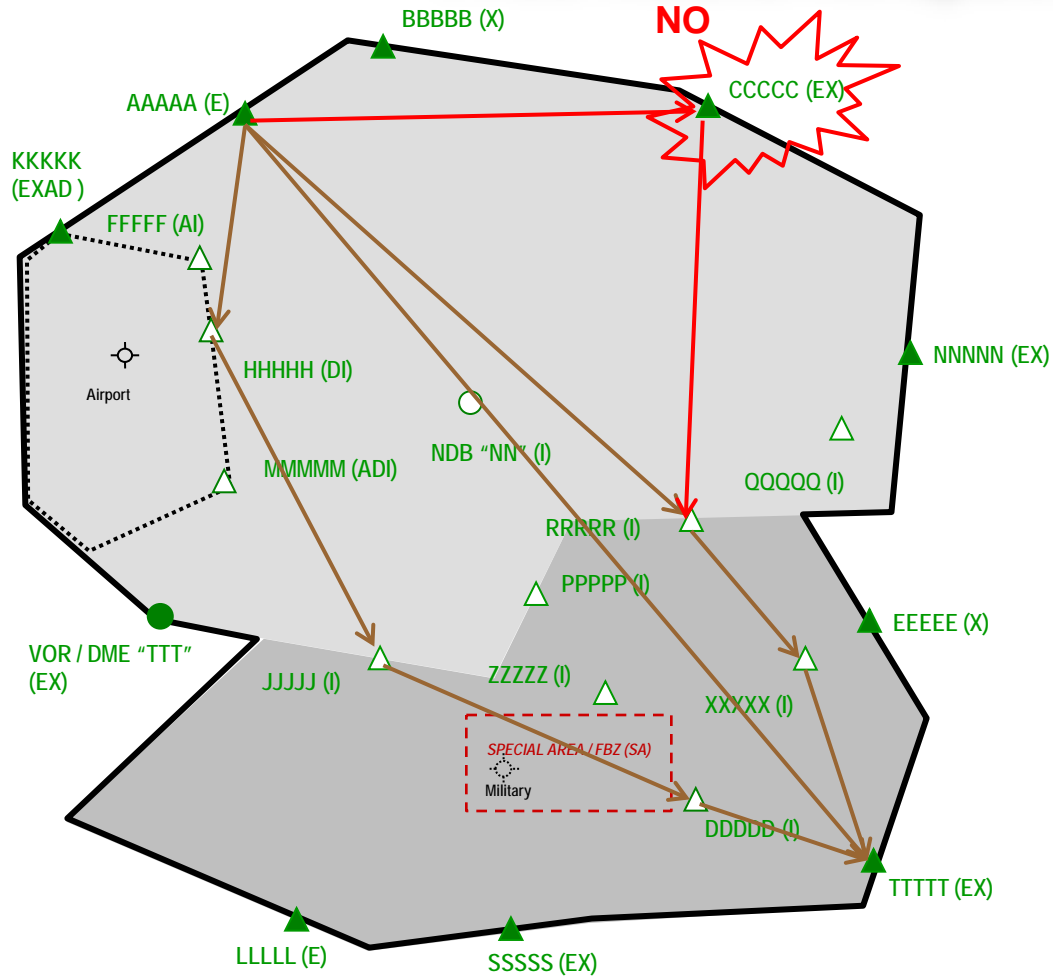
FPL ITEM 15: ROUTE Rules

- ❖ Segments between FRA Horizontal Entry, FRA Horizontal Exit and FRA Intermediate 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.



Horizontal Transition - Overflights

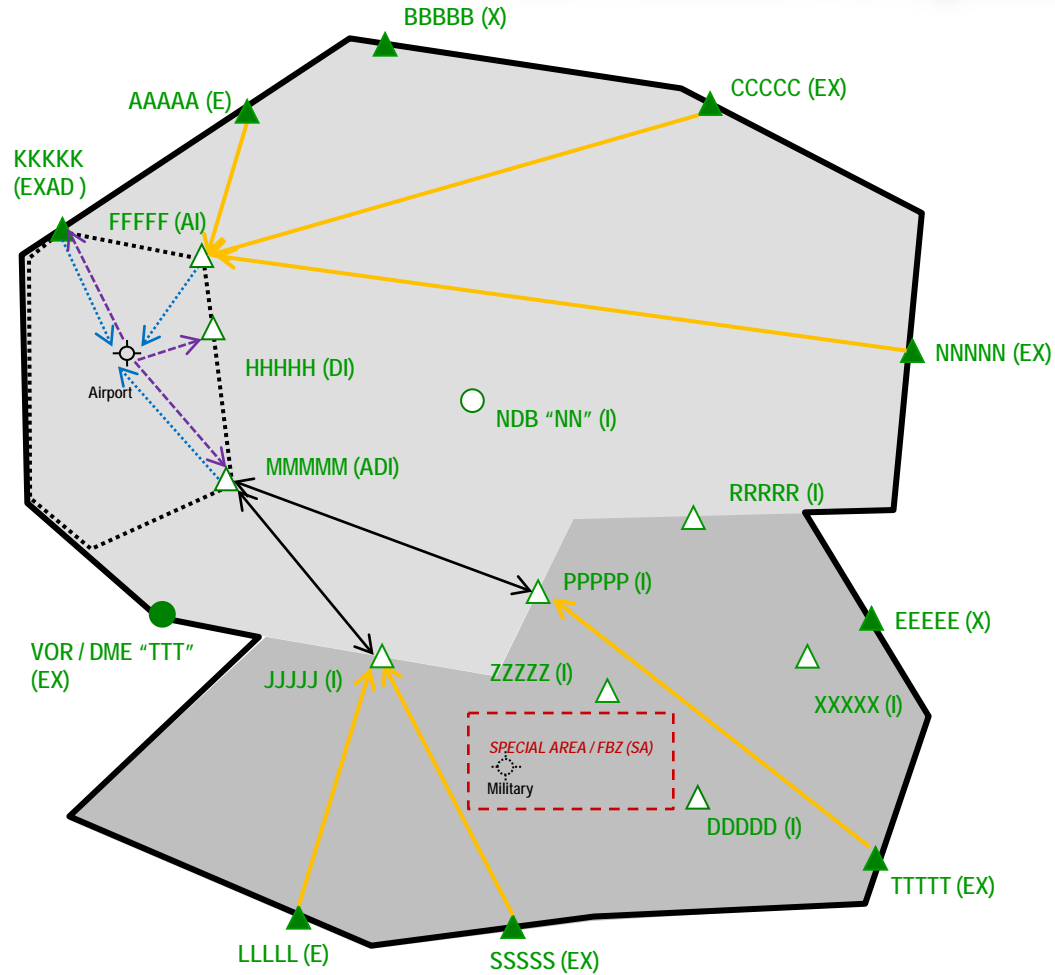
Free Route Airspace





Horizontal Transition - Arrivals

Free Route Airspace

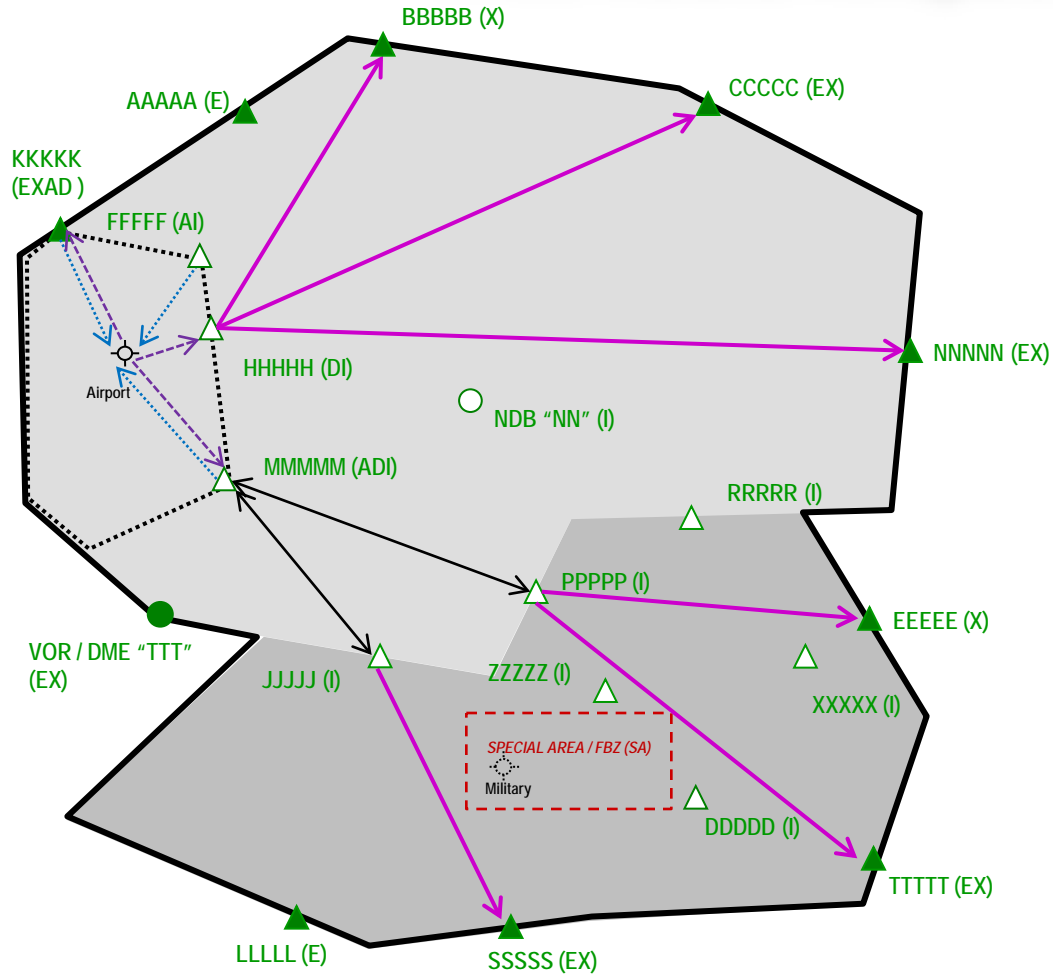




Horizontal Transition - Departures



Free Route Airspace

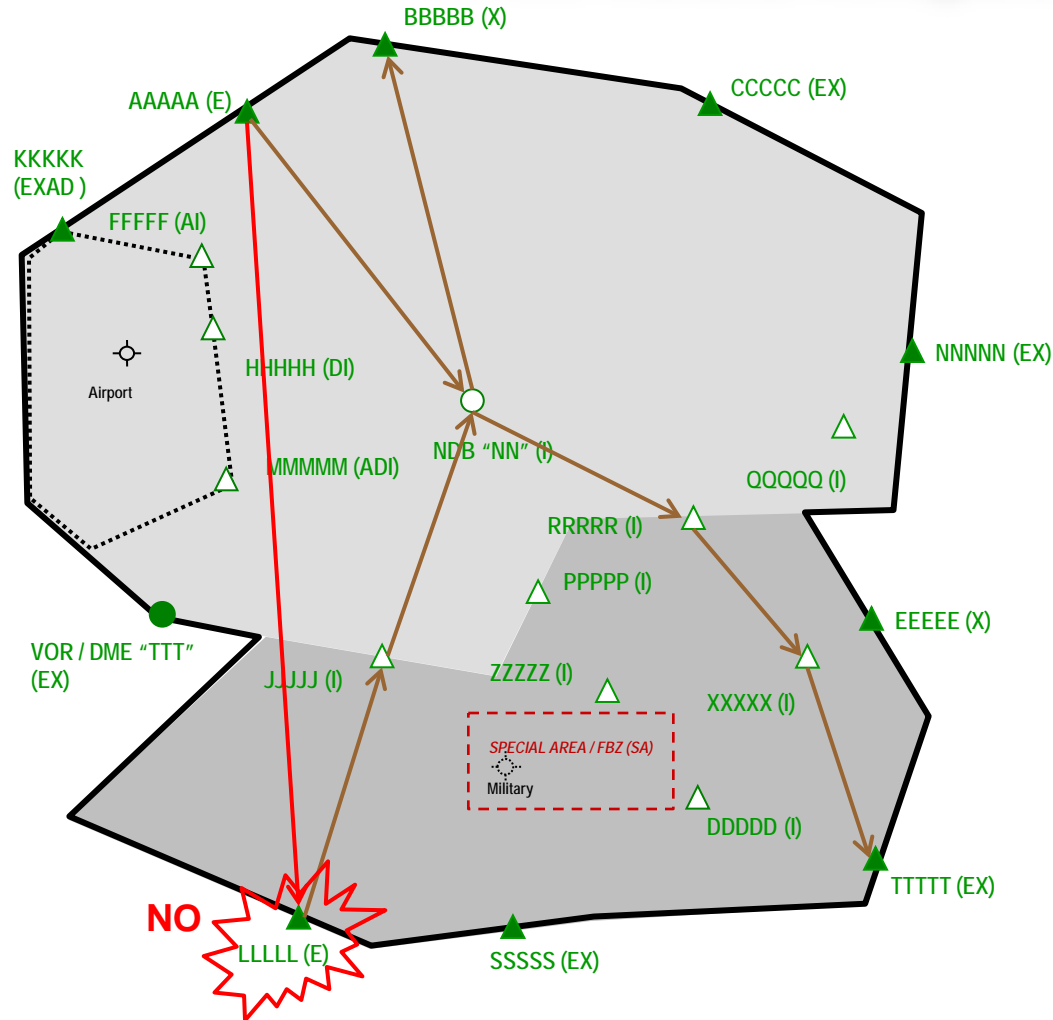




Horizontal Transition - Orientation Rules



Free Route Airspace

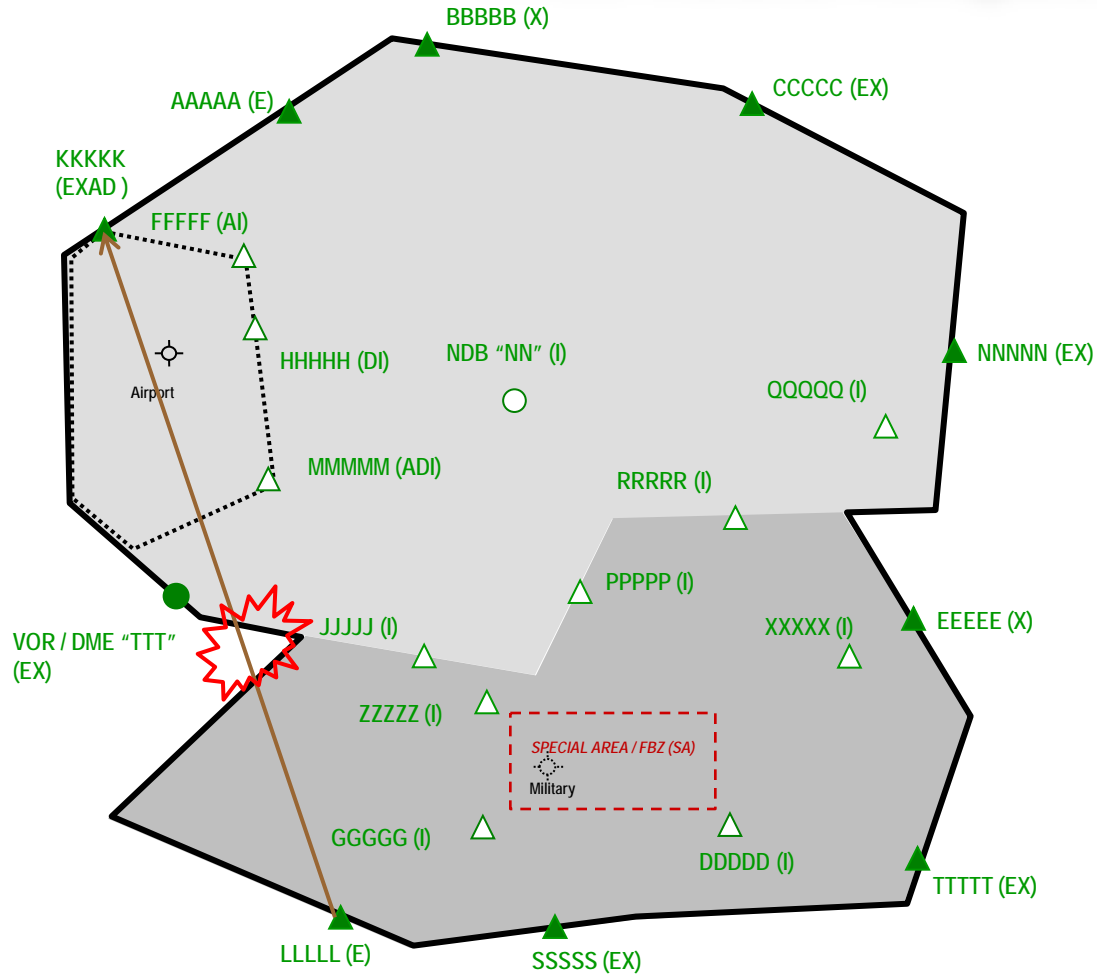




Horizontal Transition - Cross Border



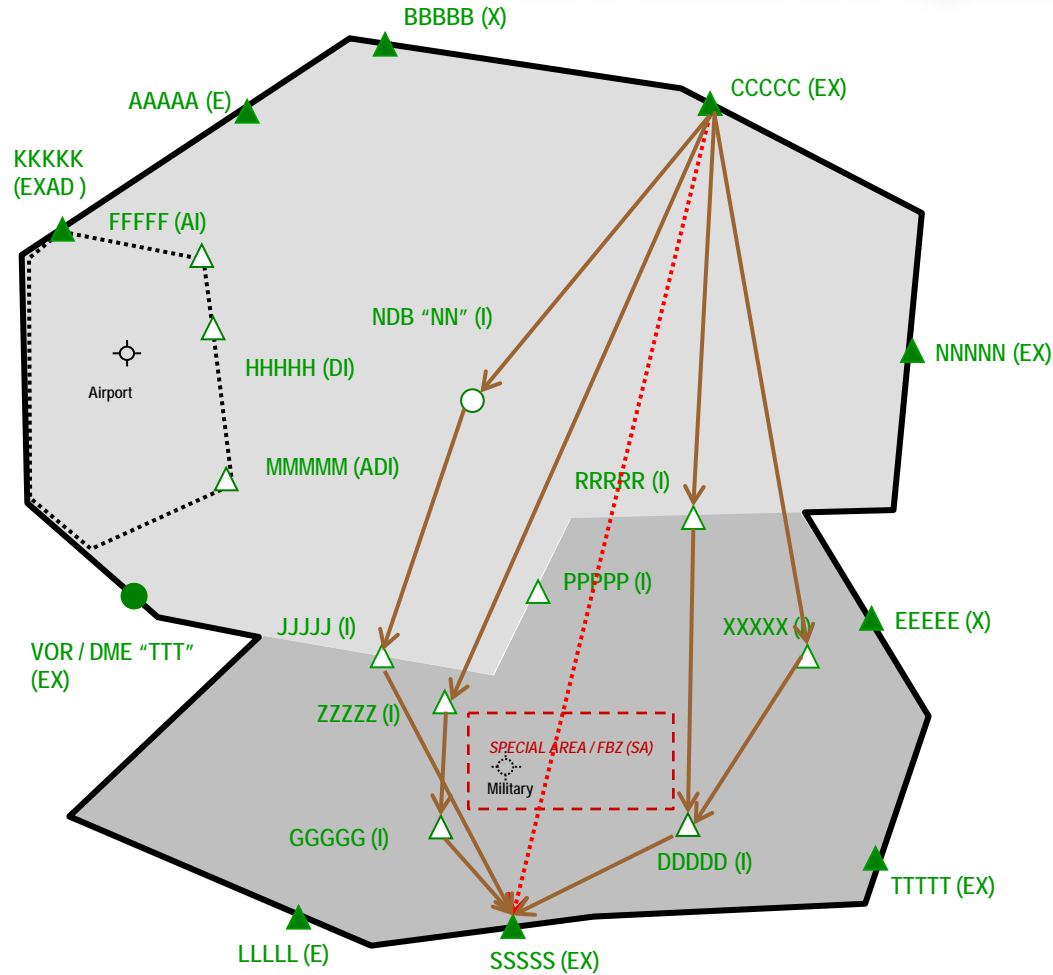
Free Route Airspace





Horizontal Transition - Special Area

Free Route Airspace





Possible FRA Vertical Rules (theoretical expression)



Vertical transition due change of cruising level

- ❖ Flights that make a change in cruising flight level resulting in a transition to/from FRA shall file the portion of the flight outside FRA along the standard ATS route network.
- ❖ The portion of the flight inside FRA may be filed according FRA rules or via the ATS route network, subject to airspace availability, according to operator's preferences.
- ❖ The transition point between FRA and ATS route network shall be any published significant point which is available for FRA operations and shall be defined in ITEM 15: ROUTE of the flight plan.

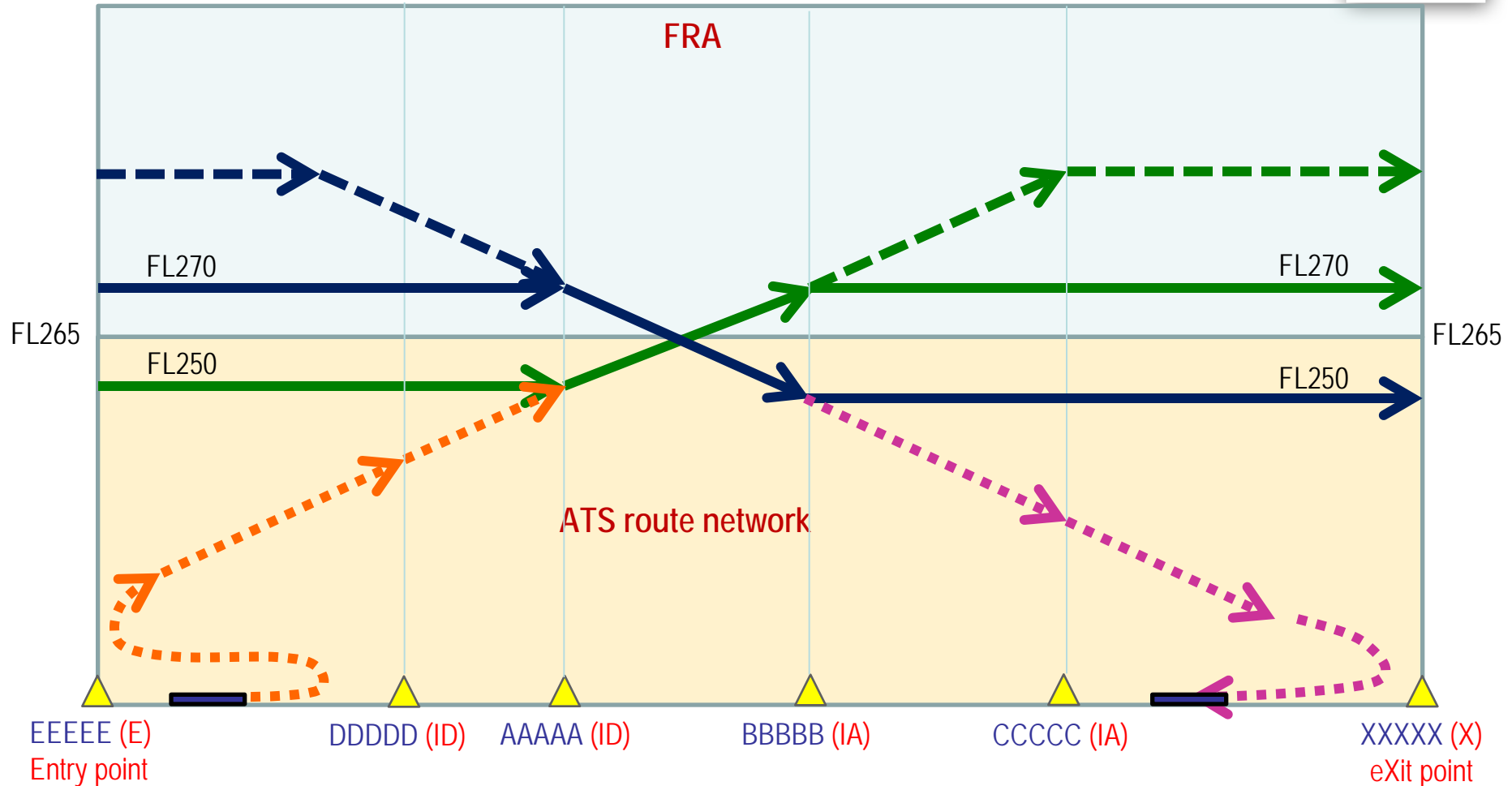
Vertical transition to / from airports

- ❖ Flights arriving to or departing from airports (local or located outside but close to the boundaries of FRA area) may file a flight plan in accordance with FRA rules even if a portion of their flight is below the lower limit of FRA.
- ❖ In these cases operators may file a "free route" from/to a published FRA Horizontal Entry / Exit point to/from a published FRA Arrival / Departure Connecting point or from a published FRA Horizontal Entry point to a published FRA Horizontal Exit point.



Network Manager
nominated by
the European Commission

Possible FRA Vertical Transition (theoretical view)



FPL:

```

... EEEEE/N460F250 UA1 AAAAA/N460F270 UA1 BBBBB DCT XXXXX ...
... EEEEE/N460F270 DCT AAAAA/N460F250 UA1 BBBBB UA1 XXXXX ...
... SID ... DDDDD/N460F160 UM1 AAAAA/N460F270 UA1 BBBBB DCT CCCCC DCT
... EEEEE/N460F370 DCT AAAAA/N460F270 UA1 BBBBB UM1 CCCCC ... STAR ...
  
```

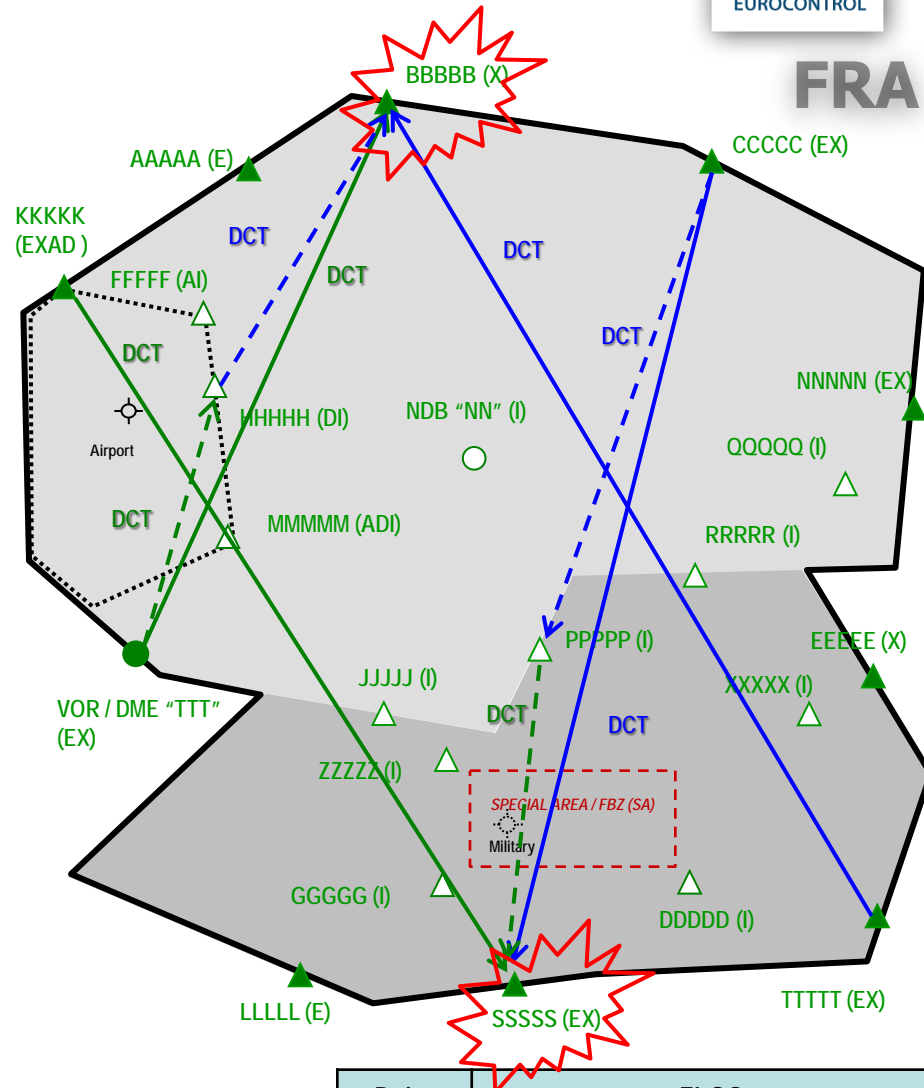
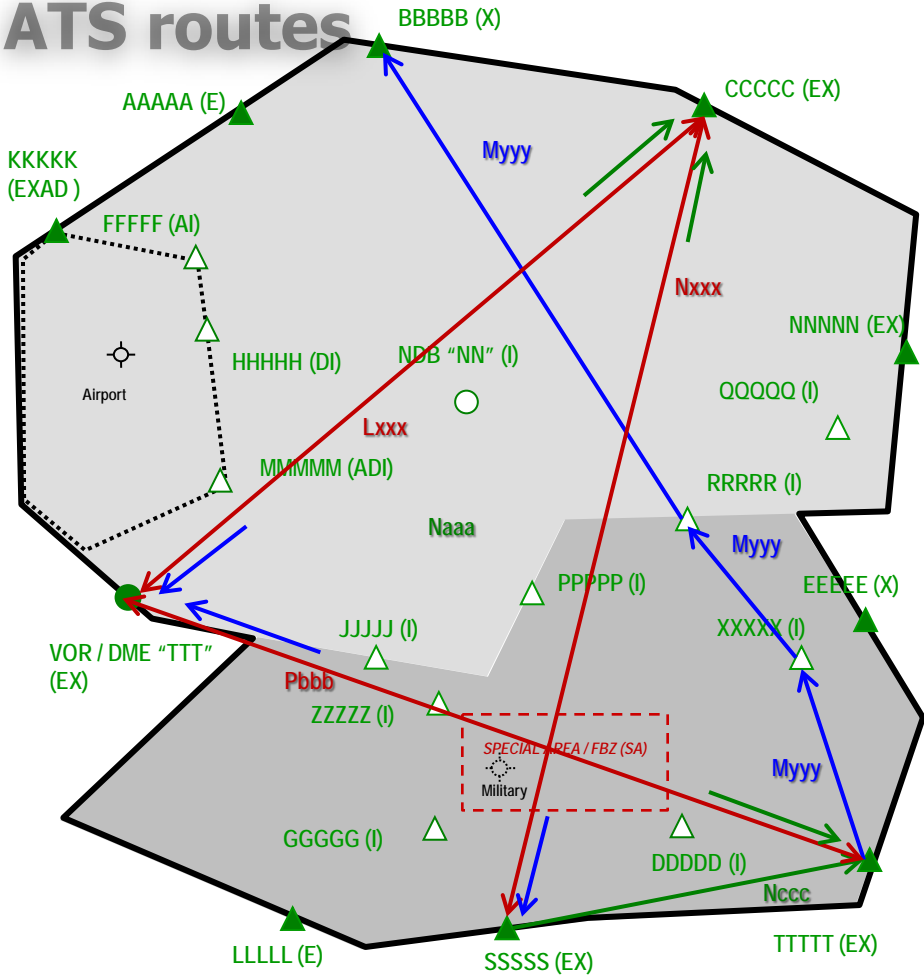


FRA FLOS



FRA

ATS routes



EVEN FL
ODD FL

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



Network Manager
nominated by
the European Commission



Cross-border FRA Enablers

(SEEN FRA Project - Bulgaria / Hungary / Romania)



Cross-border FRA Enabler Procedures



Area of Common Interest (AoCI)

- ❖ In a fixed ATS route network environment traffic is transferred between relevant ACCs at predefined Change-over Point (COP) and silent transfer of control conditions are specified with reference to these points (e.g. 10NM longitudinal separation).
- ❖ In a cross-border FRA environment predefined COPs do not exist and transfer of control would not be possible without the need for excessive coordination.
- ❖ In order to reduce the required coordination and reduce the risks associated with the transition from one controlled airspace to another, an AoCI might be defined in the context of cross-border FRA.
- ❖ The AoCI is considered a portion of the airspace located in the immediate vicinity of the common boundary (CTA/UTA or FRA area). The exact size and shape of the AoCI can be described in the LoAs.
- ❖ The AoCI is an airspace characterized by enhanced cooperation, intensive information exchange and extended automated system support. The procedures and activities within the AoCI might be included in relevant FRA CONOPs.
- ❖ Responsibility for ATS in the AoCI - The Definition of AoCI does not change responsibility for ATS provision, including provision of separation. Each ATS unit remains responsible for ATS provision (and air traffic control in particular) within its own AoR (CTA).

FRA Concept: FRA enabler Procedures - enhanced procedures where necessary for operations within FRA and at its interfaces.



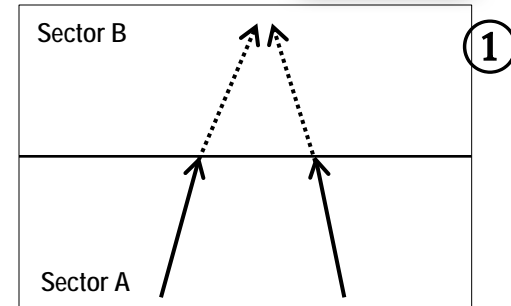
Cross-border FRA Enabler Procedures



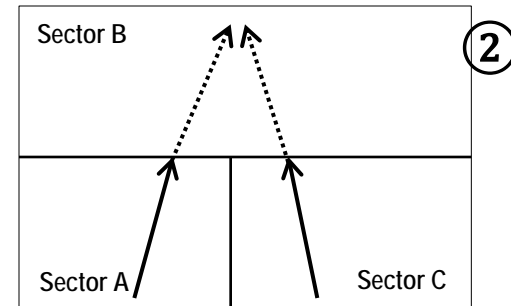
Separation provision during transfer of control

- ❖ (1) Control sectors from the transferring ATC unit shall monitor the AoCI and shall propose such sector exit conditions, that ensure that traffic exiting the same control sector remains separated within the downstream control sector at least within the AoCI. This requires ATCOs to be aware of planned flight trajectories outside the AoR and therefore correct representation of planned flight legs, at least within the AoCI is a must for cross-border FRA operations. The purpose of such proposal is to reduce the required coordination and does not imply any responsibility for provision of separation by the transferring control sector within the airspace of the downstream control sector. It is up to the receiving control sector to accept these conditions or counter-propose new conditions based on the traffic situation within its own AoR.
- ❖ (2) The above control sector exit conditions however may not be proposed if the two flights originate from different sectors. In these cases it is up to the receiving control sector to coordinate proper sector entry conditions. Appropriate sector design between CTAs will maintain such instances to minimum and SYSCO will facilitate coordination when it is required. ATCO awareness of sector boundaries and active sector configuration on the other side of the common border will help mitigate the associated risks.
- ❖ (3) 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 closure of a small critical part of the airspace around the sector boundaries (red shaded area) has to be considered.

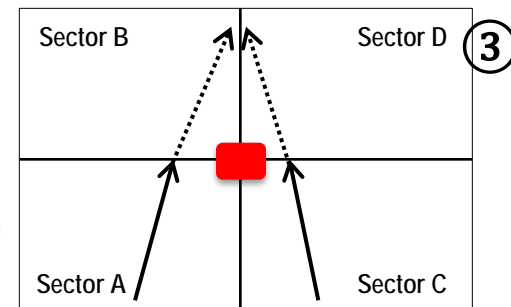
FRA Concept: FRA enabler Procedures - enhanced procedures where necessary for operations within FRA and at its interfaces.



Proper sector exit conditions proposed by Sector A to Sector B



Proper sector exit conditions may not be proposed. Receiving sector must initiate coordination.



Such alignment of sector boundaries is inappropriate in FRA and has to be avoided.



Cross-border FRA Enabler Procedures



Avoidance of airspace reservations in AoCI

- ❖ Usually in FRA flight planning through special areas shall not be allowed and AOs are expected to plan their flights around the areas using FRA Intermediate points. Nevertheless in exceptional circumstances flight trajectories may cross an activated special area (e.g. anti-hail danger area whose activation cannot be planned in advance, or due change in trajectory after tactical intervention or weather avoidance).
- ❖ The relevant ATC units are expected to share information on actual and planned activation of special area within the AoCI. Such special areas might be graphically displayed on radar maps and relevant medium and short term warnings to support ATCOs with the prevention of their penetration. Planned and actual activation of special areas in the AoCI might be included in ATCOs briefings.
- ❖ When such special areas are located in the immediate vicinity of the common border (CTA/UTA or FRA area), transferring ATCOs are expected to propose sector exit conditions which ensure proper deviation around the areas. Receiving sectors are ultimately responsible to accept these conditions or counter-propose new ones according to current traffic situation or prevailing conditions.
- ❖ The application of all above requires accurate and active exchange of information concerning planned and actual activation of special areas within the AoCI.
- ❖ The establishment of AMC LoAs is required before application of these procedures.

FRA Concept: FRA enabler Procedures - enhanced procedures where necessary for operations within FRA and at its interfaces.



Cross-border FRA Enabler ATC System Support (1)



Based on existing States ATC systems capabilities appropriate ATM system support and tools might be introduced in order to facilitate ATCOs tasks in FRA environment and maintain high sector throughput. The following possible ATC system upgrades might be envisaged within the scope of FRA operations:

Conflict Management (Medium-Term Conflict Detection (MTCD))

- ❖ MTCD might be improved in order to increase reliability and HMI;
- ❖ MTCD might be complemented by a “probe” function in the horizontal and vertical plane;
- ❖ The area within which MTCD is available might be extended to encompass the AoCI in order to support separation provision during transfer of control;
- ❖ A new tactical conflict resolution tool might be introduced in order to ease conflict assessment and resolution. The tactical tool is based on current radar tracks and speeds.

Sector Sequence Management

- ❖ In a FRA environment sector shapes may be only partially optimized according traffic flows and sector sequence may not always be optimal;
- ❖ It is expected that in FRA a larger number of sector “clips” might be generated. Therefore where exists the “skip” function might be improved in order to allow for early sector sequence coordination between ATCOs.

SYSCO (System Supported Co-ordination Concept)

- ❖ It is expected that the lack of predefined entry and exit points will lead to a significant increase in telephone coordination between the ACCs;
- ❖ SYSCO is expected to reduce the time needed for coordination of flights and maintain high sector capacities;
- ❖ Additional OLDI messages and functions might be implemented in order to speed up telephone coordination, when such is required (Point Message (PNT)).

FRA Concept: FRA enabler Appropriate System Support - enhancement for the purposes of Flight Planning and ATFCM.



Cross-border FRA Enabler ATC System Support (2)



Based on existing States ATC systems capabilities appropriate ATM system support and tools might be introduced in order to facilitate ATCOs tasks in FRA environment and maintain high sector throughput. The following possible ATC system upgrades might be envisaged within the scope of FRA operations:

Datalink

- ❖ Datalink is not considered a direct enabler for FRA; however it indirectly supports FRA operations by alleviating ATCOs from routine radiotelephone workload and providing additional capacity;
- ❖ Effective use of datalink would allow executive ATCOs to concentrate on more complex traffic management in a FRA environment.

Automated Civil-Military Coordination

- ❖ Once special areas are established in the appropriate States airspaces, adequate system support would be required in order to minimize related coordination workload. This support is expected to be provided by messages XIN (Crossing Intention Notification Message) and XRQ (Crossing Clearance Request Message), which shall be available in automated ATM systems. However the exchange of these messages require similarly capable military automated ATM systems and therefore the introduction of these message exchanges will remain outside the scope of FRA implementations.

Information exchange

- ❖ Introduction of cross-border FRA operations impose requirements for increased awareness of traffic situation within close vicinity of common ATC units border. Therefore it will be required to automatically exchange flight plan information and tactical updates for all flights within the AoCI, regardless of the fact that these may not cross the common border. Such information exchange is possible to be made using the Basic Flight Data Message - BFD and Change Flight Data Message - CFD. However system upgrades might be required in order to properly manage these messages.

Mode S

- ❖ Information provided by mode S contributes to ATCO increased situational awareness and therefore could be considered as a FRA enabler.

FRA Concept: FRA enabler Appropriate System Support - enhancement for the purposes of Flight Planning and ATFCM.



Network Manager
nominated by
the European Commission



FRA Concept Implementation in Europe



FRA 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



FRA Check List of Implementation Actions (1)



Ref	Topic	Description	Rationale	Responsible/ Involved	Deadline
1	Local FRA CONOPS discussed with NM to ensure harmonised network FRA implementation	<ul style="list-style-type: none"> • General scope • 4D description of the FRA volume • Cross-Border impacts • Enablers and constraints • Impact on ATM (ATS/ASM/ATFCM) Procedures • Impact on flight planning procedures • Impact on Publication • Impact on local/AOs/CFSPs/NM systems • Identification of benefits 	To ensure network harmonised FRA implementation	ANSP(s) / NM	T0-(24-30) months depending on the expected impact of the change; input concerning the implementation plan from ERNIP Part 2.
2	Airspace Design	<ul style="list-style-type: none"> • Establish the airspace volume (horizontal and vertical limits) • Horizontal connectivity E/X points • Vertical connectivity A/D points • Connecting routes • RAD restrictions • Use of geographical coordinates as Intermediate (I) points • Usage of Intermediate (I) points • Airspace reservations • Flight Plan Buffer Zones (FBZs) • ATS delegation • Sector design 	To ensure interconnectivity and interoperability with adjacent horizontal and vertical airspace	ANSP(s) / NM / Military	T0 -- 12 months
3	Airspace Management Process	<ul style="list-style-type: none"> • Priority Rules • CDM requirements • Utilisation of AUP/UUP • Information Sharing • Rerouting • OAT Handling 	To ensure seamless network application of ASM/FUA procedures	ANSP(s) / NM / Military	T0 -- 12 months
4	ATC Procedures and Letters of Agreement	<ul style="list-style-type: none"> • Definition of all required procedures internally and with neighbouring ATC units 	To ensure appropriate interconnectivity	ANSPs	T0 -- 6 months
5	Air traffic flow and capacity management	<ul style="list-style-type: none"> • Sector Configuration Management • Sector and Traffic Volumes (Capacities / Monitoring Values) • Re-routing Proposals • ATFCM Procedures 	To ensure seamless network application of ATFCM procedures	ANSP(s) / NM	T0 -- 6 months

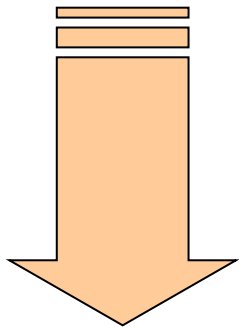


FRA Check List of Implementation Actions (2)

Ref	Topic	Description	Rationale	Responsible/ Involved	Deadline
6	CAA/NSA Involvement	<ul style="list-style-type: none"> • Consultation with CAA/NSA/Military • Safety case • Mitigating actions (if required) 	To ensure safe implementation and fulfilment of all regulatory requirements	ANSPs/CAA/NSAs/Military	T0 -- 9 months
		<ul style="list-style-type: none"> • Prepare and send to ICAO PfA if implementation over High Seas • Approval by CAA/NSA 		ANSPs/CAA/NSAs/ICAO	T0 -- 6 months
7	Awareness and consultation	<ul style="list-style-type: none"> • CONOPS 	To ensure network harmonised FRA implementation	ANSPs/NM through the NM CDM process to all operational stakeholders, including NSAs	T0 -- 24 months
		<ul style="list-style-type: none"> • Airspace design and airspace management 	To ensure network harmonised FRA implementation		T0 - (12 - 18) months
		<ul style="list-style-type: none"> • ATC Procedures and Letters of Agreement 	To ensure network harmonised FRA implementation		T0 - (6 - 12) months
		<ul style="list-style-type: none"> • Air traffic flow and capacity management 	To ensure network harmonised FRA implementation		T0 - (6 - 12) months
8	AIS/RAD Publication	<ul style="list-style-type: none"> • AIC Publication • AIP Publication • RAD 	To ensure network harmonised FRA implementation	ANSPs/NM through the NOP Portal	T0 - (6 - 12) months
				ANSPs	T0 - 2 AIRAC cycles (min)
				ANSPs/NM	T0 - 2 AIRAC cycles
9	NM Integration/ Pre-validation Check	As described in ERNIP Part 1, 6.5.6.1	To ensure network harmonised FRA implementation	ANSPs/NM/AOs/CFSPs	T0 - 6 months
10	Implementation	<ul style="list-style-type: none"> • FRA Project Implementation 		ANSPs/NM/AOs/CFSPs/Military	T0
11	POST implementation	<ul style="list-style-type: none"> • Lessons Learnt 	To ensure network harmonised FRA implementation	ANSPs/NM/AOs/CFSPs/Military	T0 + (1 - 2) AIRAC cycles
12	Fine-tuning of implementation	<ul style="list-style-type: none"> • Implementation of further changes depending on lessons learnt 	To ensure network harmonised FRA implementation	ANSPs/NM/AOs/CFSPs/Military	T0 (1 - 6) AIRAC cycles



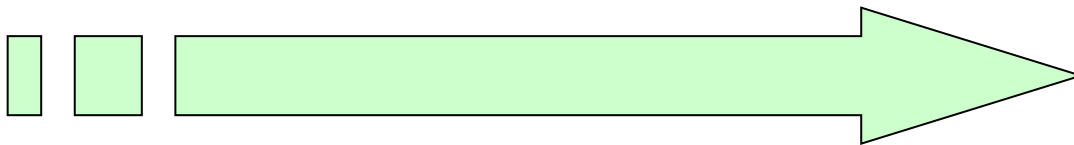
❖ Horizontally:



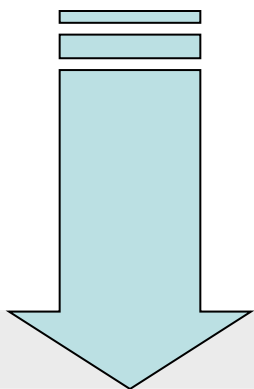
- ✓ Flights allowed to flight plan within “specified airspace” between officially published **Entry/eXit** points or via **Intermediate** points.
- ✓ “Specified airspace” usually represents the area of responsibility for relevant air traffic control (ATC) unit (CTA/UTA → ACC/UAC).

❖ Vertically:

- ✓ Above FL335; FL285; FL245; FL095, etc.



❖ Timely:



- ✓ Core night (e.g. as 22:00 - 04:00 Summer time);
- ✓ Near night (extended night);
- ✓ + Weekend;
- ✓ H24.



Network Manager
nominated by
the European Commission

FRA Implementation Projects

ERNIP Data Base



- ❖ European Route Network Improvement Plan (ERNIP) Database developed by EUROCONTROL which can be accessed by registered users via the EUROCONTROL on-line portal: https://extranet.eurocontrol.int/ernip_database/Index.action.
- ❖ Central, interactive database accessible via a standard web browser, integrating short, medium and long-term improvement projects planned for implementation or under development to improve the European ATS route network and airspace structure.
- ❖ Project initiatives come from the States / FABs / ANSPs, airspace users and EUROCONTROL in form of requirements or concrete proposals for airspace changes or adaptations.
- ❖ Improvements quoted under Project Category “Free Route Airspace”. 150 FRA improvements recorded - 99 implemented / 51 planned/proposed.

Proposal ID :	71.086a	Impl. Status:	Planned 25 MAY 2017	States & Org.:	ALB	Comments:	<ul style="list-style-type: none"> Night period - 21:00 - 05:00 (20:00 - 04:00). ATS route network will be suspended during FRA hours. Phase 1 is planned to continue till 7 DEC 2017 and will be extended to H24. 'Double AIRAC procedure' for AIRAC AIP AMDT publication required for implementation (ICAO Annex 15 refers). 	Modify... <input type="button" value="v"/>
Project Name:	FRALB - Free Route Airspace Albania - Phase 1	Project Group:	RFG SE	Originator(s):	ALB FAB BLUE MED	Related proposals:	<ul style="list-style-type: none"> 71.085a 71.086b 71.087 71.089b 	View Docs... <input type="button" value="v"/>
Description:	To implement NIGHT Free Route Airspace within Tirana CTA / UTA, FL195 and above.	Project Category:	Free Route Airspace					SAAM Status: SAAM inserted
Objective:	To align the airspace structure with real operations and to make operational DCT's flight planable.							History: Stefan Gerris 04 FEB 2011 View history
								Contact:
								All Contacts <input checked="" type="checkbox"/>
								Internal
								DENIS ODIC <input checked="" type="checkbox"/>
								TIHOMIR TODOROV <input checked="" type="checkbox"/>
								External
								Ilir ZUNA <input checked="" type="checkbox"/>



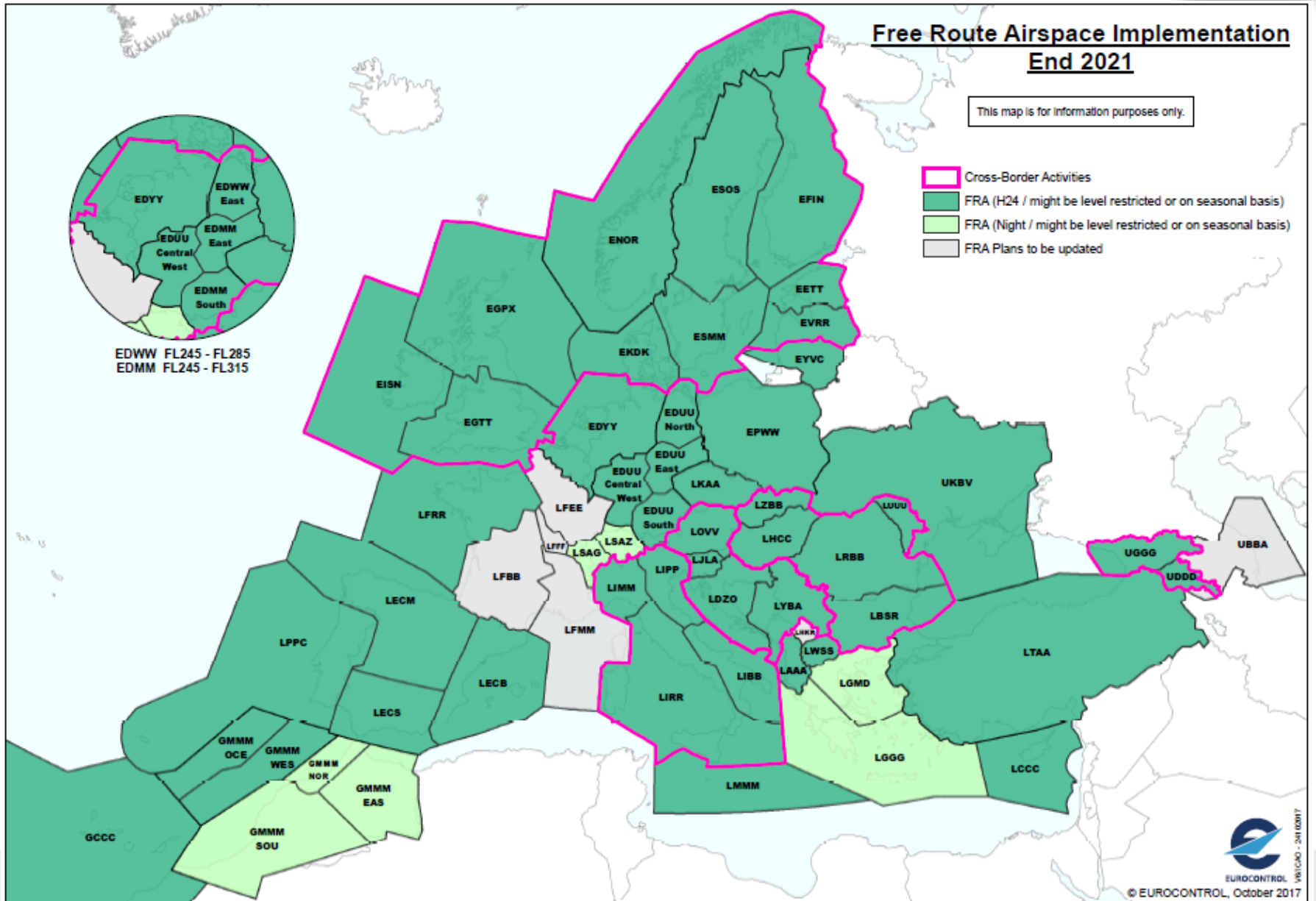
The following FRA projects are planned for implementation before Summer 2017. Listed below are only projects based on FRA Concept:

- ❖ Ireland - FRA H24 FL075+: **12 OCT 2017:**
 - ✓ Lowering of FL from FL245 to FL075;
 - ✓ ATS routes (FL075 - FL245) within the Shannon CTA will be removed. Some ATS routes might remain for “nav capacity” due to regulatory problems of the ATS route removal below FL095;
 - ✓ Implementation NOT combined with the publication of FRA in the AIP.
- ❖ Moldova - FRAC H24 FL095+: **9 NOV 2017:**
 - ✓ Swap from Night to H24 FRA.
- ❖ Albania - FRALB H24 FL195+: **7 DEC 2017:**
 - ✓ Swap from Night to H24 FRA.
- ❖ Armenia - ARMFRA Night FL285+: **7 DEC 2017:**
 - ✓ ATS route network remain available during FRA hours;
 - ✓ Night period is 20:00 - 02:00 UTC.
- ❖ Maastricht UAC - FRAM2 Night FL245+: **7 DEC 2017:**
 - ✓ ATS route network and all allowed DCTs remain available during FRA hours;
 - ✓ Night period 23:00 - 05:00 (22:00 - 04:00) UTC.
- ❖ Bulgaria - FRAS Seasonal H24 FL175+: **1 FEB 2018:**
 - ✓ Extended application of FRA concept within the horizontal boundaries of Sofia CTA;
 - ✓ ATS route network and all allowed DCTs remain available during FRA hours;
 - ✓ Seasonal period till last AIRAC APR within the daytime period 05:00 - 23:00 (04:00 - 22:00) UTC;
 - ✓ Night period no change: SEEN FRA 23:00 - 05:00 (22:00 - 04:00) UTC.
- ❖ Austria, Bosnia and Herzegovina, Croatia, Montenegro, Serbia, Slovenia - SECSI FRA H24 LAL / FL205+: **1 FEB 2018:**
 - ✓ Merge of existing H24 SAXFRA and SEAFRA areas;
 - ✓ Lowering of FL within SEAFRA area from FL325 to FL205.
- ❖ Germany - FRA H24/Night FL245/FL285+: **1 MAR 2018:**
 - ✓ ATS route network and all allowed DCTs remain available during FRA hours;
 - ✓ Creation of FRA cells with either H24 or Night FRA application.



Network Manager
nominated by
the European Commission

FRA - end 2021





Network Manager
nominated by
the European Commission



EUROCONTROL NMOC System Support and FRA Capability



NM FRA Guidelines



Free Route Airspace (FRA)
Application in NMOC - Guidelines

Version 1.1



❖ NMOC System FRA Capability

- ✓ *FRA Models in CACD and corresponding flight planning possibilities in IFPS;*
- ✓ IFPS Proximity Check to an AUA Border;
- ✓ *FRA Vertical Connectivity;*
- ✓ IFPS Distance checking in FRA: distance FRA Horizontal Entry or Exit point to AUA border;
- ✓ IFPS Segments Checking in FRA with the ATS Route Network.

❖ NMOC FRA AURA expression

- ✓ *RAD;*
- ✓ FRA DCT Restrictions;
- ✓ Other data related to FRA.

❖ NMOC FRA ASM expression

- ✓ AURA Provisions;
- ✓ FUA / EU Restrictions in CACD.

❖ NMOC Operational Validation Guidelines

- ✓ Purpose and Objective;
- ✓ *General Requirements for FRA Data Provision and Verification;*
- ✓ *General Requirements for Flight Plan Test Procedures;*
- ✓ Request Form.

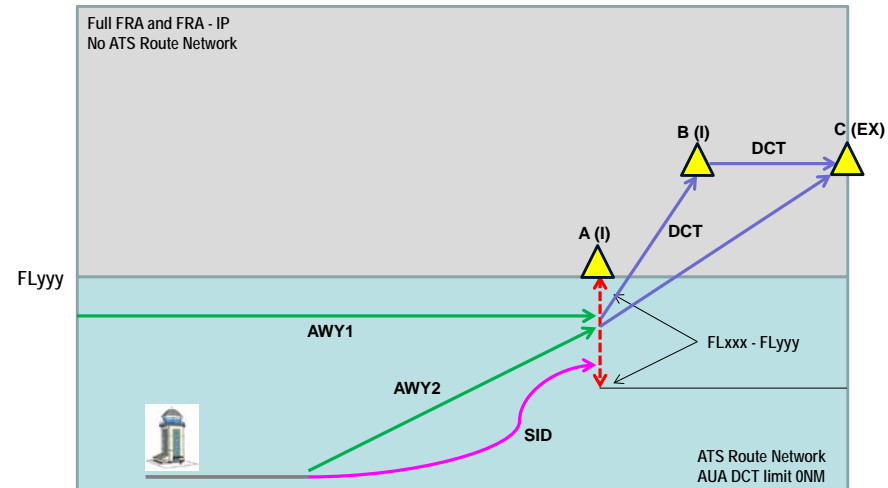
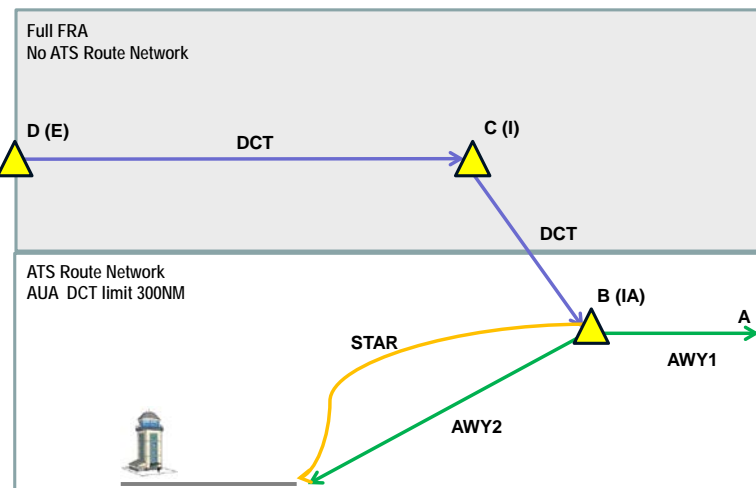


FRA Vertical Connectivity



- ❖ The term “vertical connectivity” defined by IFPS shall be understood in the following manner:
 - ✓ Expresses how to enter or exit FRA area by crossing the FRA vertical limit;
 - ✓ Refers to departing and arriving traffic;
 - ✓ Refers to traffic changing cruising level, only if the change triggers an entry or an exit of the FRA;
 - ✓ Does not refer to cruising traffic that remains within the FRA vertical limits.
- ❖ The “vertical connectivity” process in IFPS is related to the two following cases:
 - ✓ FRA co-exists with ATS route network;
 - ✓ FRA without the ATS route network.

In all cases within the AUA below the FRA the ATS route network exists and ways of processing are based on DCT limits allowed within that AUA.



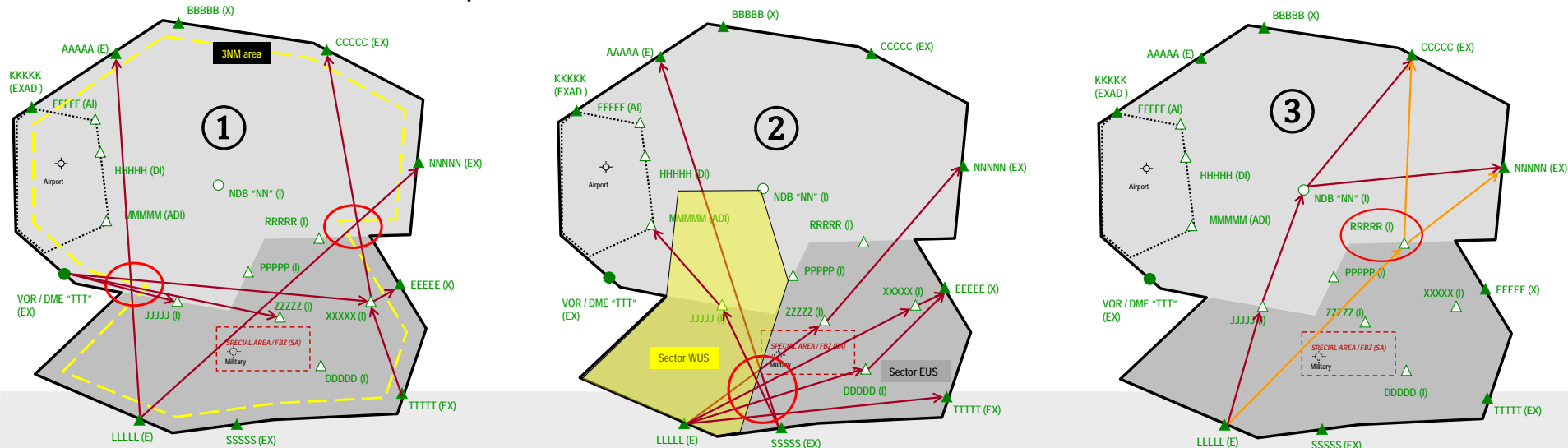


FRA in the RAD



- ❖ As FRA is a specified airspace within which users may freely plan a route without reference to the ATS route network the relevant parts of States / FABs / ANSPs RAD for FRA shall contain a list of restrictions valid only on specific:
 - ✓ Significant point/s; or
 - ✓ Airspace Volume/s (ACC/UAC sector/s).
 All relevant RAD restrictions referenced to ATS routes shall be revised and adapted.

- ❖ The RAD gives the possibility to describe:
 - ✓ FRA limits for “local” FRA areas and “Cross-border” FRA area;
 - ✓ FRA Connecting Routes;
 - ✓ FRA border - close proximity DCT protection (1);
 - ✓ FRA Flows Crossing Prevention (2);
 - ✓ Mandatory FRA Intermediate points (3);
 - ✓ FRA Horizontal Entry/Exit point “directional” use;
 - ✓ FRA Avoidance of Special Areas.





❖ Procedures for Coding and Test Procedure Groups / Flight Plan Examples

Symbol	Possible Values
Success criteria (one letter)	A - Flight plan has to be <u>A</u> ccepted by the system R - Flight plan has to be <u>R</u> ejected by the system
Test Group (one letter)	F - <u>F</u> RA area boundary compliance S - <u>S</u> pecial areas avoidance E - Transition To/From <u>E</u> xternal Airports L - Transition To/From <u>L</u> ocal Airports C - Transition Due Change of <u>C</u> ruising Level P - FRA relevant <u>P</u> oints Restriction R - <u>R</u> AD Restrictions N - FRA <u>N</u> ormal Operations T - <u>T</u> ime Limits Compliance (for none H24 FRA only)
Procedure Number (one digit)	Procedure sequence
Flight Plan Number (two digits)	Sequential number identifying the flight plans from the procedure

For example test flight plan call-sign **AS101** means:
A - The flight plan is supposed to be accepted by the system
S - The test flight plan pertains to the "Special Area" test group
1 - The flight plan pertains to procedure number one from the test group
01 - This is the first flight plan from the procedure

Procedure Identifier:	F1
Procedure Purpose:	To test NMOC system ability to <u>reject</u> flight plans that are not compatible with FRA borders (crossing the FRA lateral limits).
Success Criteria:	All flight plans from this procedure are rejected by NMOC system
Number of FPLs	2
FPL Reference:	RF101 - DCT from entry to exit
(FPL-RF101-IS -B744/H-SDE2E3FGHIJ3J4J5M1RWXYZ/LB1D1 -OMDB2130 -... N0484F360 ... LLLLL DCT KKKKK ... -EDDF0610 EDFH -PBN/A1B1C1D1L1O1S1S2 NAV/RNVD1E2A1 DAT/SVM REG/DABTF EET/... SEL/BFKQ RVR/200 IFP/MODESASP OPR/DLH ORGN/EDDFDLHI RMK/TCAS ADSB)	



Network Manager
nominated by
the European Commission



FRA AIP Publication



- ❖ **Terminology in GEN 2.2 Abbreviations used in AIS publications:**
 - ✓ Explanation how to publish the common FRA terminology and relevant terms/abbreviations used for FRA operations.

- ❖ **FRA General Procedures in ENR 1.3 Instrument Flight Rules:**
 - ✓ Explanation how to publish all procedures related to the FRA, including explanation and definitions of applied FRA relevant points.

- ❖ **Flight planning in ENR 1.10:**
 - ✓ Explanation how to publish clear and understandable procedures and principles for FRA flight planning; easy to use and coherent with procedures for the fixed ATS route network.

- ❖ **Free Route Airspace structures in ENR 2.1 and ENR 2.2 - General rule:**
 - ✓ Explanation how to publish FRA structures, including sectors depending if FRA is based on FIR/UIR or ATC unit boundaries or if the FRA lateral limits do not coincide with FIR/UIR or ATC unit boundaries.

- ❖ **Cross-border application of FRA in ENR 2.2 Other regulated airspace:**
 - ✓ Explanation how to publish if FRA is implemented cross-border between adjacent FIRs/UIRs or CTAs/UTAs.



- ❖ **Delegation of the responsibility for provision of ATS in ENR 2.2 Other regulated airspace:**
 - ✓ Explanation how to publish the areas where the responsibility for provision of ATS is delegated, in order to facilitate the publication of the FRA applicability in these areas.

- ❖ **FRA Connecting Routes to/from terminal airspace and aerodromes:**
 - ✓ Explanation how to publish access to/from terminal airspace and connection to/from aerodromes when required. This may require definition of FRA connecting routes to facilitate flight planning, providing e.g. the route from FRA departure/arrival points to a published SID/STAR points at an aerodrome, or from/to an aerodrome within the TMA which does not have SID/STAR.

- ❖ **FRA Significant Points in ENR 4.1 and ENR 4.4:**
 - ✓ Explanation how to publish the FRA significant points with a clear reference to the Free Route Airspace and indication of the FRA relevance of the point;
 - ✓ Explanation on FRA significant points letters and matrix used for AIP publication;
 - ✓ Template AIP publication examples.

- ❖ **Airspace reservations in ENR 5:**
 - ✓ Explanation how to publish the FRA issues related to information of Special Areas (SA).



FRA AIP Template



AIP	ENR 1.3-1 27 NOV 03
ENR 1.3 INSTRUMENT FLIGHT RULES	
1. Rules applicable to all IFR flights ...	
2. Rules applicable to IFR flights within controlled airspace ...	
3. Rules applicable to IFR flights outside controlled airspace ...	
4. Free Route Airspace general procedures	
<u>4.1 Area of application</u> e.g. "FRA procedures are available in Amwell FIR above FL245. If applicable specify airspace where provision of service is delegated to another ANSP. For further details see ENR 2.2. and ENR Charts."	
<u>4.2 Flight Procedures</u>	
<u>4.2.1 General</u> e.g. "Traffic will be subject to General Rules (ENR 1.1), RAD and Letters of Agreement (LoA) between neighbouring ACCs." e.g. "Within FRA users will be able to plan user-preferred trajectories through the use of significant points included in AIP ... (State) ENR 4.4 Name-code designators for significant points and ENR 4.1 Radio navigation aids - en-route, respectively. Segments between significant points will be indicated by means of "DCT" instructions." DCT usage / limitations e.g. "Within the FRA area there will be no limitations on the use of "DCT".	
<u>4.2.2 Overflying traffic</u> e.g. "Overflying traffic should plan directly from Amwell FIR entry point to the Amwell FIR exit point."	
<u>4.2.3 Access to/from Terminal Airspace</u> e.g. "Arriving traffic should plan directly from Amwell FIR entry point to the FRA Arrival Connecting Point (A) / STAR initial waypoint." e.g. "Departing traffic should plan directly from FRA Departure Connecting Point (D) / SID final point to the Amwell FIR exit point." <i>Flight planning within the FRA area will comply with adjacent ATS route network orientation.</i> e.g. "For southbound traffic via NELSO connecting to UN741, ODD and EVEN levels are available 50NM prior arriving NELSO waypoint."	
<u>4.2.4 Cross-Border Application</u> Cross-border - DCT - (NOT) allowed. Describe the exception of the segments as applicable. e.g. "Airspace users will have to plan their trajectory inside FRA in Amwell FIR through the use of the intermediate significant points."	
(Amendment Number)	(Name of Publishing Authority)



❖ ENR 6 En-route Charts:

- ✓ Explanation on possible alternatives for publication..

❖ Aerodrome Charts (SID/STAR and Area Charts):

- ✓ Explanation how to publish appropriate refinements to TMA structures initiated, including the definition of additional SIDs/STARs to permit more flexibility.

❖ FRA Chart symbols:

- ✓ Examples and indication of points.

Example 1



BUMAB

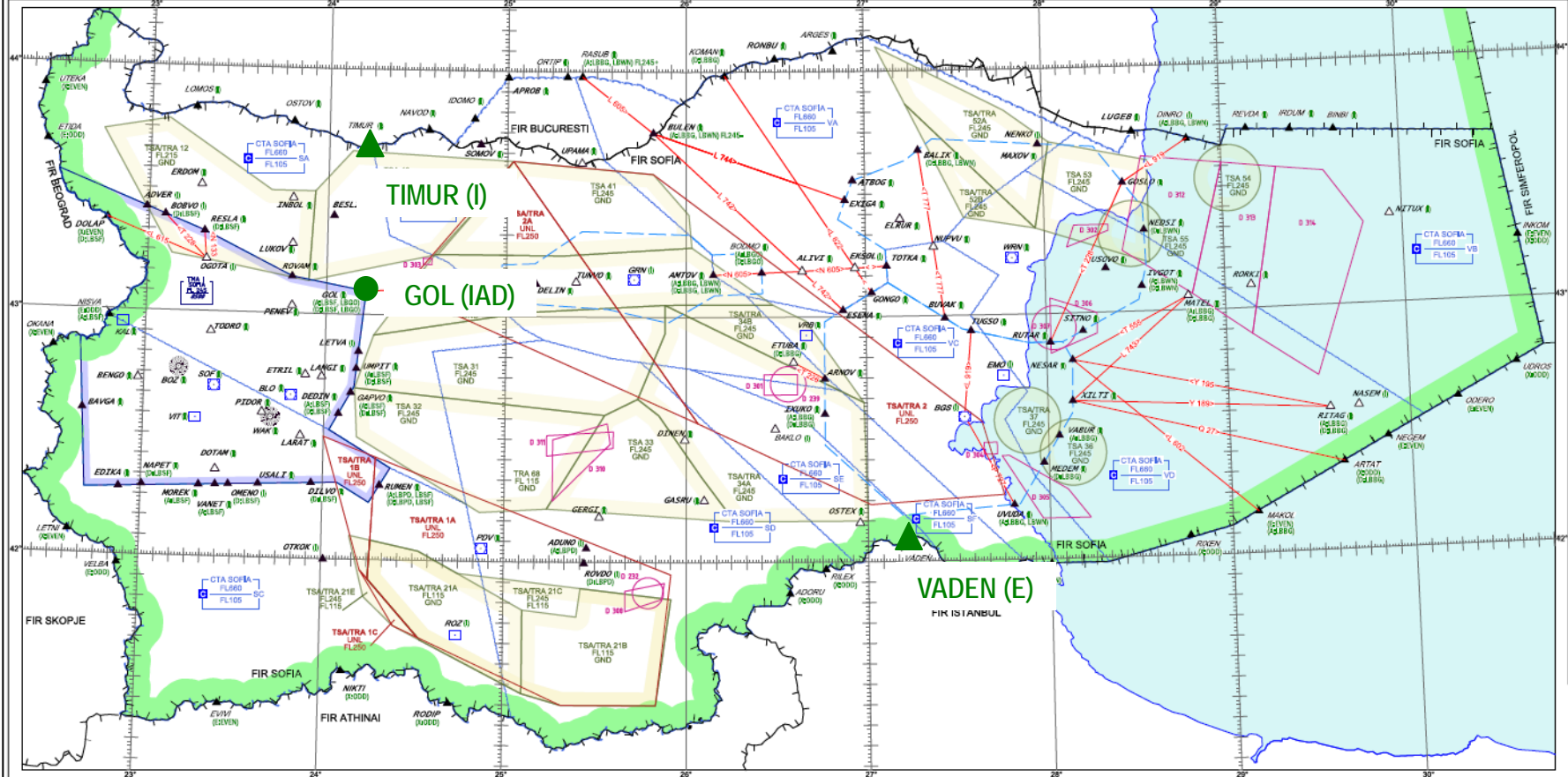
(EX)



FRA - Chart Publication (2)

АИР РЕПУБЛИКА БЪЛГАРИЯ
AIR REPUBLIC OF BULGARIA
EN-ROUTE CHART-ICAO

ENR 6.2-4
30 MAR 17



SCALE 1 : 1 800 000 DATUM: WGS-84 PROJECTION: Lambert Conformal Conic: Parallels: 38N, 48N

FRA is available from 2300 III 0500 (2200 III 0400)

Relevance and conditions for use of points within FRA are expressed as follows:

- (I) - Intermediate point
- (E:SEVEN ODD) - Entry point and applicable cruising levels
- (X: EVEN ODD) - Exit point and applicable cruising levels
- (A:LBxx) - Arrival point and applicable aerodrome(s)
- (D:LBxx) - Departure point and applicable aerodrome(s)

Flight levels are indicated by '+' or '-' sign where applicable.

SEEN FRA Example

Airport	SID last point	FRA departure route
GONGO	GONGO L622 KOMAN	GONGO L622 EKSOL N605 AMTOV
	XILTI	XILTI L743 MATEL XILTI Y189 RITAG XILTI Q27 ARTAT
	ARNOV	ARNOV T236 ETUBA BUVAK 1777 BALIK
LBWN	TOTKA	TOTKA N605 AMTOV
	DELIN	DELIN N605 GOL
LDGO	AMTOV	AMTOV N605 BODMO
	OGOTA	OGOTA N133 RESLA OGOTA T28 BOBVO OGOTA L615 DOLAP

Airport	STAR first point/IAP	FRA Arrival Route
LBBG	ESENA	RASUB L605 BULEN L742 ESENA (above FL245) BULEN L742 ESENA (below FL245) AMTOV N605 ALIVI L742 ESENA
	NESAR	MATEL T355 NESAR RITAG Y195 NESAR MAKOL L602 NESAR
	RUTAR	DINRO L919 GOSLO T228 RUTAR
LBWN	EXIGA	RASUB L605 BULEN L744 EXIGA (above FL245) BULEN L744 EXIGA (below FL245)
	TUGSO	UVUDA P727 BGS L919 TUGSO
	TOTKA	AMTOV N605 TOTKA
LBGO	GOSLO	DINRO L919 GOSLO
	DELIN	GOL N605 DELIN
	AMTOV	BODMO N605 AMTOV



Network Manager
nominated by
the European Commission



END

Questions and Comments