

FRA - Boundary Points

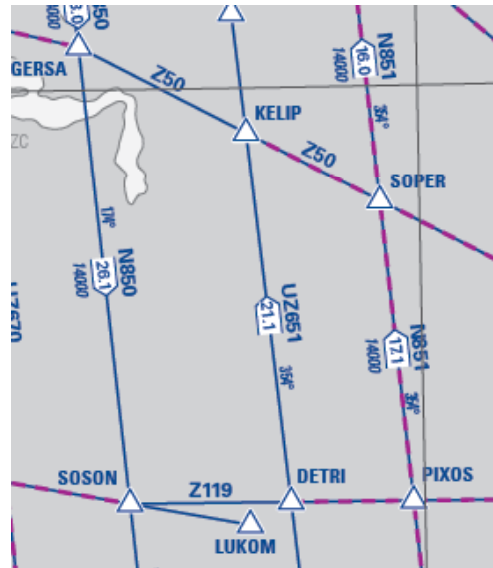
FABEC Expert Workshop on FRA – Paris 12 February 2020

Max Canham - skyguide



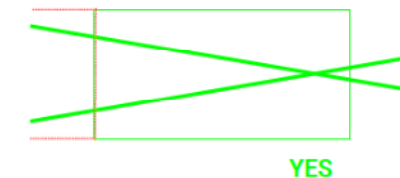
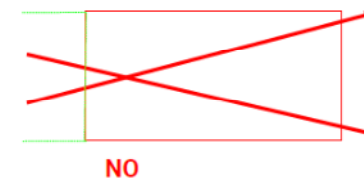
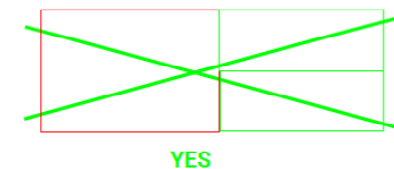
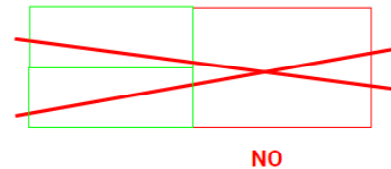
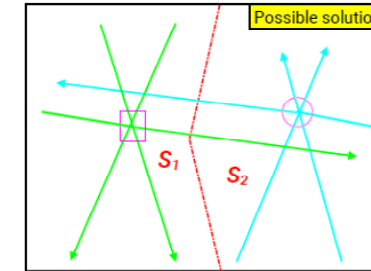
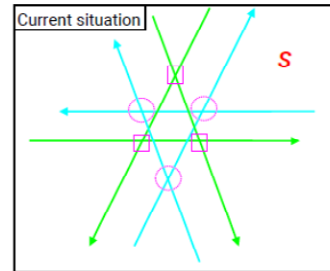
Background

- Conflict points occur on a traditional ATS route network when two routes cross
- Waypoints are established on each route and there will usually be a common waypoint at the conflict point



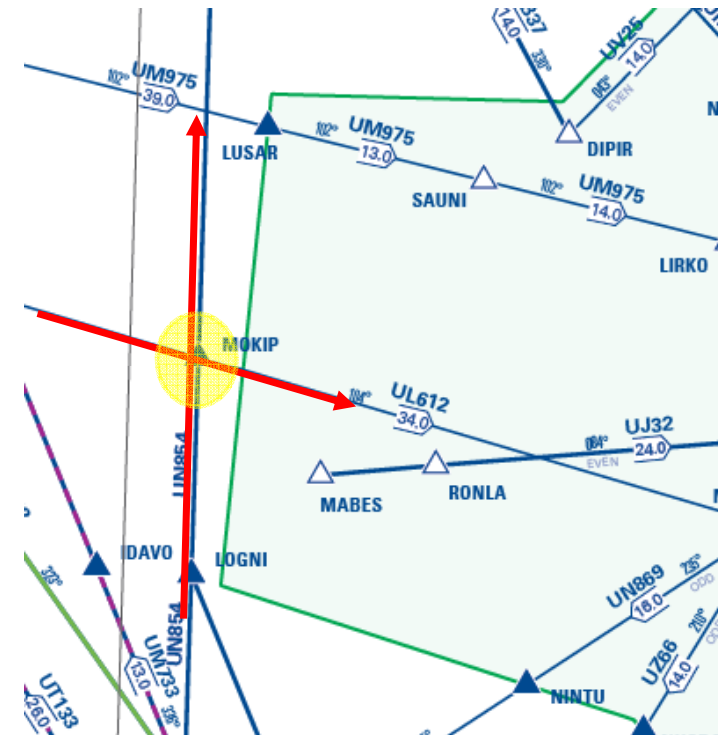
Background

- For operational safety and capacity reasons, current ATC sector structures have been developed around the traditional ATS route network to (amongst other elements)
 - avoid to have different sectors feeding the same sector with converging traffic requiring separation (two coordination tasks for the receiving sector)
 - reduce coordination/workload and facilitate radar hand-over
 - avoid to have conflict points close to the boundary of a sector for entering traffic (increasing workload because of excessive coordination/insufficient anticipation time).



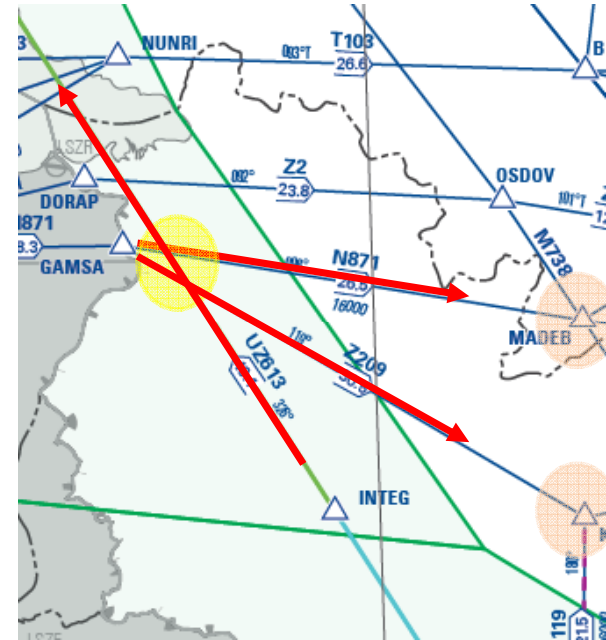
Background

- Current sector boundary examples
 - The sector boundary between Paris and Geneva is established to the east of the UN854 to ensure that this traffic flow does not enter the Geneva sectors.
 - It also ensures that the conflict point MOKIP on UL612 and UN854 is managed by one ATC unit (Paris) and it is on the outer edge of Paris ATC area so they have sufficient time to identify and resolve conflicts.
 - Drawing the boundary to the west would increase the amount of traffic in the Geneva sectors and also not provide the Geneva ATCO sufficient time to resolve any conflicts.



Background

- Current sector boundary examples
 - The sector boundary between Zurich and Karlsruhe is established to the east of the UZ613 to ensure that this traffic flow does not enter the Karlsruhe sectors.
 - It also ensures that the conflict point near GAMSА with UZ613 is managed by one ATC unit (Zurich) and it is on the outer edge of Zurich ATC area so they have sufficient time to identify and resolve conflicts.
 - It is also sufficiently west of the M738 so that Karlsruhe has time to identify and resolve conflicts at these points
 - Drawing the boundary in any other place would increase complexity for Zurich and Karlsruhe.



Background



- As a result of these design practices, waypoints are often not on the ATC sector boundaries.
- Within ANSPs waypoints at or near the ATC sector boundaries have other important operational functions:
 - They serve as system Coordination Points (COP) for inter ATM OLDI messages
 - They serve as reference points for handover conditions specified in letters of agreement.

Messages	COP	Time and/or Distance Parameters	
		Messages from ACC Zurich to UAC Karlsruhe	Messages from UAC Karlsruhe to ACC Zurich
ABI	NATOR MOPAN TITIX VEDOK SONOM LOKTA MINGA UMTEX RAVED GAMSA INTEG	ACC Zurich shall transmit ABI 45 minutes prior UIR-boundary. If less than 45 minutes, ABI shall be transmitted as soon as possible before the ACT-transmission	UAC Karlsruhe shall transmit ABI 30 minutes prior UIR-boundary. If less than 30 minutes, ABI shall be transmitted as soon as possible before the ACT-transmission
		No ABI shall be transmitted after ACT-transmission	No ABI shall be transmitted after ACT-transmission.
		10 minutes but not later than 50NM prior SONOM, VEDOK, TITIX or INTEG	10 minutes prior but not later than 50 NM prior to NATOR MOPAN, UMTEX RAVED, GAMSA, TITIX or VEDOK
		15 minutes but not later than 75 NM prior GAMSA or LOKTA	
		For departures LSZH, LSMD and LFSB immediately after take-off	
		Whenever a flight plan is activated after the above time parameters have already been elapsed, first the ABI and then the ACT shall be transmitted immediately.	Whenever a flight plan is activated after the above time parameters have already elapsed, the ACT shall be transmitted immediately.
LAM		A LAM shall be transmitted within 30 seconds after receiving an ACT	A LAM shall be transmitted within 5 seconds after receiving an ACT
LOF		After transmission of ABI	After transmission of ABI
NAN		After transmission of ACT	After transmission of ACT
REV		Not later than 7 minutes prior to the respective COP (SONOM, VEDOK, GAMSA, LOKTA, MINGA, TITIX or INTEG)	Not later than 5 minutes prior to the AoR boundary.
MAC		n/a	

D.2.1.1 Arrivals

Arrivals	ATS Route	COP	Flight Level Allocation	Special Conditions
LSAS except LSZA / LSZL / LSZS / LSGS / LSGG	UN850 UN869	NATOR	MAX FL270	
LSGG / LSGS / LSZA / LSZL / LSZS			MAX FL310	
LFLB / LFLI / LFLJ / LFLP / LIMC			MAX FL330	
LSGG / LSGS	UL856	RAVED	MAX FL340	RAVED at FL
LFLB / LFLI / LFLJ / LFLP			MAX FL 360	

Deviating FL allocation during winter period (applicable AIRAC date will be agreed bilaterally)

Arrivals	ATS Route	COP	Flight Level Allocation	Special Conditions
LIMC	UN850 UN869	NATOR	MAX FL350	For a certain period of time Zurich ACC SPVR may request arrivals at max FL330. Whenever possible, such measures should be announced 1h in advance.

D.2.1.2 Overflights

ATS-Route	COP	Flight Level Allocation	Special Conditions
UN850 / UN869	NATOR	odd FL	
DCT	UMTEX	even FL	
UL856, DCT	RAVED	even FL	
DCT	GAMSA	even FL	
DCT	TITIX	odd	
	VEDOK	odd	



FRA Boundary Issues – Entry & Exit Points



- The Eurocontrol Free Routes Airspace (FRA) Design Guidelines includes:

2 Establishment of a significant point in FRA

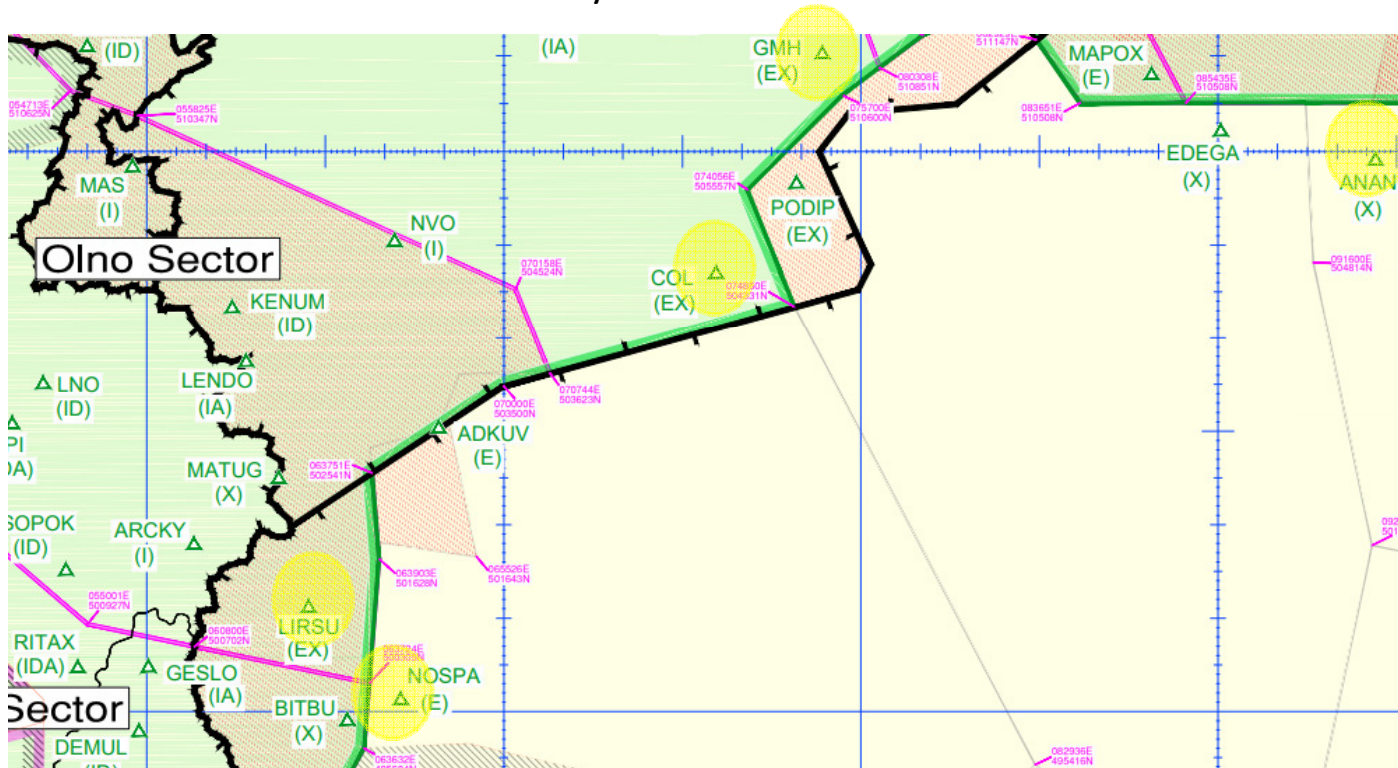
2.1 FRA Horizontal Entry Point (E)

- 2.1.1. A FRA (E) point is a published significant point (5LNC or NAVAID) on the horizontal boundary of the Free Route Airspace from which FRA operations are allowed.
- 2.1.2. A FRA (E) point **should be** located exactly on the horizontal boundary of the relevant FRA area. In exceptional circumstances, only when an airspace design solution cannot be found, the FRA (E) point can be located inside or outside that FRA area **within certain limits and after appropriate coordination with EUROCONTROL NM.**
- 2.1.3. If the proposed location of a particular FRA (E) point **cannot be on a** relevant FRA area boundary:
 - a) A new significant point over that boundary **should** be established and referenced as a FRA (E); or
 - b) Adaptation of the FRA **area** boundary via a **FRA (E) point** **should** be considered in order to reduce to a minimum the existence of inside/outside FRA (E) points.



FRA Boundary Issues – Entry & Exit Points

- All FABEC FRA designs (implemented and proposed) include Entry and Exit points that are not on the FRA boundary



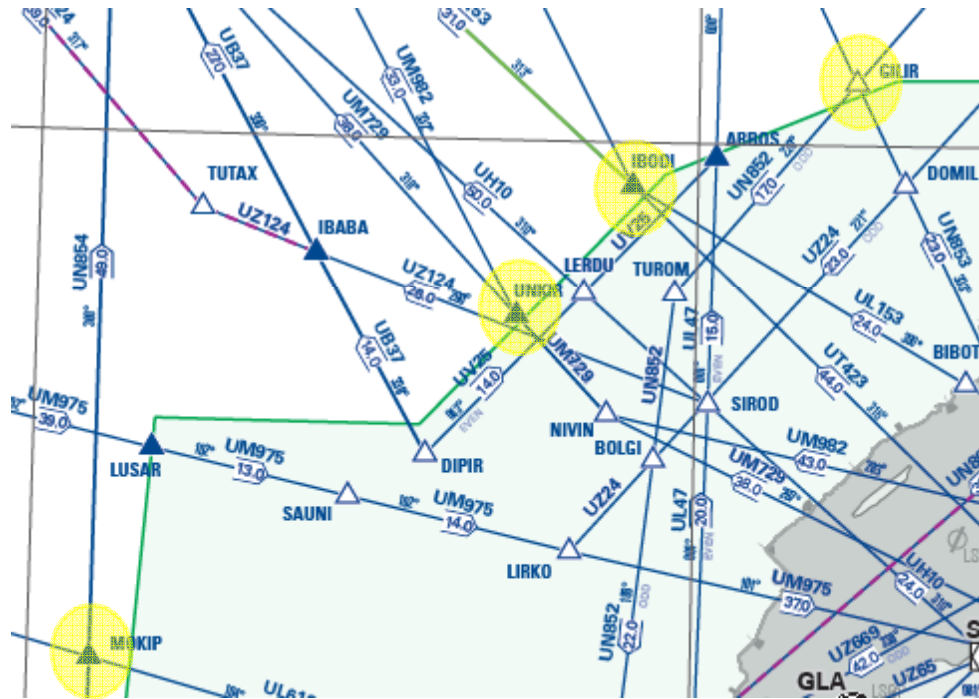
Current FRA waypoints, MUAC – DFS Boundary



FRA Boundary Issues – Entry & Exit Points



- All FABEC FRA designs (implemented and proposed) include Entry and Exit points that are not on the FRA boundary



Proposed FRA waypoints, skyguide – DSNA Boundary



FRA Boundary Issues – Entry & Exit Points



b) Adaptation of the FRA area boundary via a FRA (E) point should be considered in order to reduce to a minimum the existence of inside/outside FRA (E) points.

- From an ANSP perspective, this is not simple and it may have negative impacts on the network
 - Adjusting the boundaries at best requires adaption of LoAs, and at worst requires re-negotiation of state agreements/treaties
 - Moving the sector boundaries could result in unwanted traffic flows within some sector volumes impacting sector capacities
 - Moving the sector boundaries can have safety implications as in relation to management of conflict points.



FRA Boundary Issues – Entry & Exit Points

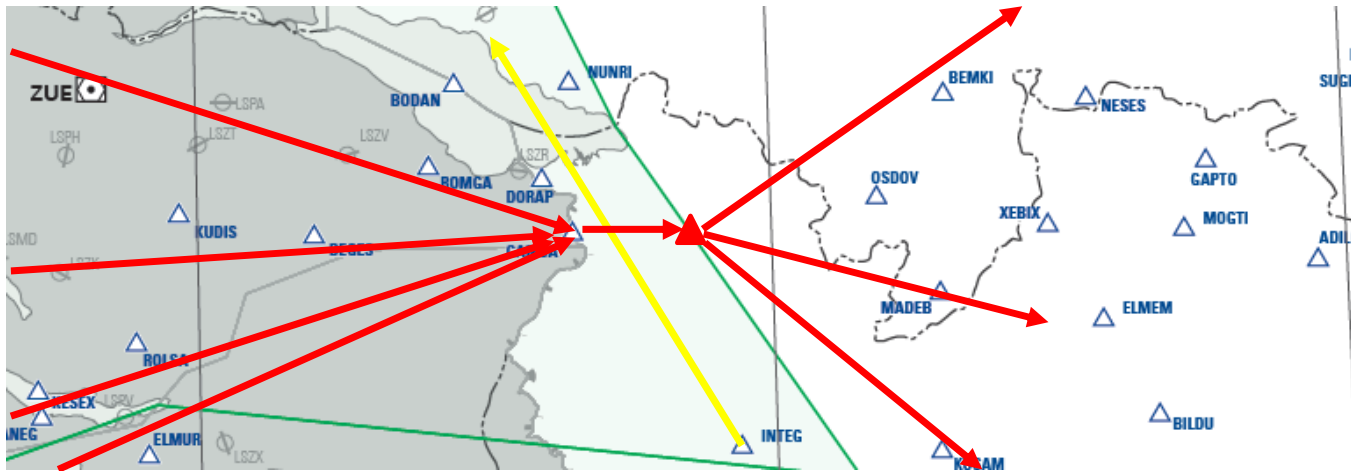
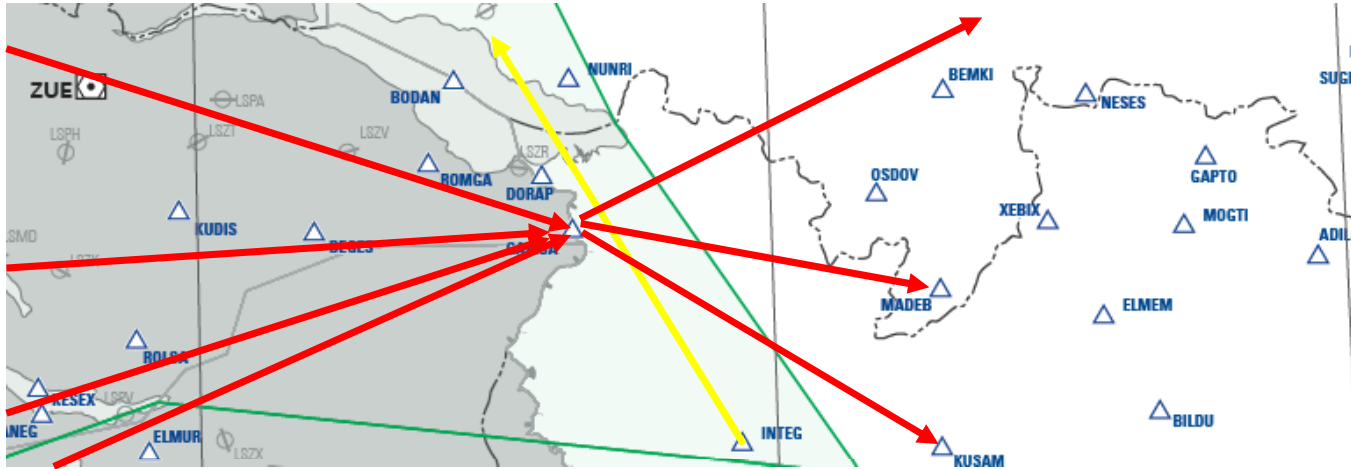


a) A new significant point over that boundary should be established and referenced as a FRA (E); or

- Again, this is not simple and it may have negative impacts on the network
 - Finding many new 5LNC for the required waypoints is difficult
 - New waypoints and transfer points requires adaption of
 - LoAs and ATC working practices. This can increase the amount of ATC training required for the change.
 - ATM technical systems. This may be complicated on older legacy systems.
 - Also, adding new waypoints whilst limiting the impact of the elements above may reduce the efficiency of the trajectories on the interfaces
 - Finally, in a structurally limited FRA, adding new waypoints will require additional RAD to manage the traffic flows via these waypoints



FRA Boundary Issues – Entry & Exit Points



FRA Boundary Issues – Open points

- NM Systems
 - Given that there are many existing FRA relevant entry and exit points not on FRA boundaries, NM systems are capable of processing these differences
 - FABEC requests that the NM acknowledges this coordination and accepts the proposed entry and exit points to simplify the initial FRA implementations
 - Improvements can be examined and implemented at a later stage if needed
- 2.1.2. A FRA (E) point should be located exactly on the horizontal boundary of the relevant FRA area. In exceptional circumstances, only when an airspace design solution cannot be found, the FRA (E) point can be located inside or outside that FRA area within certain limits and after appropriate coordination with EUROCONTROL NM.
- CFSPs and AOs
 - Are flight planning systems able to accept and use these points that are not on the FRA boundary to correctly generate flight plans for entering and leaving the FABEC FRAs?

