EUROCONTROL Guidelines for On-Line Data Interchange (OLDI)

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SUPPORTING EUROPEAN AVIATION

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Abstract

These guidelines provide clarifications and best practices concerning the OLDI data exchanges for flights between air traffic control units by the use of electronic data transfer between flight data processing systems.

This specific edition of the guidelines is in direct support to the EUROCONTROL Specification for On-Line Data Interchange Edition 5.1.

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DOCUMENT CHANGE RECORD

The following table records the complete history of the successive editions of the present document.

EDITION NUMBER	EDITION DATE	REASON FOR CHANGE	PAGES AFFECTED
1.0	14/06/2019	First release	All
1.1	14/07/2020	Updated edition to align with the publication of OLDI Edition 5.0 Foreword Deletion of section 2.2.4 on REV update Updated SSR example 1 (10:06-26) Updated SSR example 2 (10:10-12, 10:25-26) Updated SSR example 3 (10:04, 10:11 and 10:14) New section 2.4 on evolution of OLDI for FRA Updated FRA scenario 1 (12:41) Updated FRA scenario 7 (10:51) New section on en-route cruising level (ECL) Deletion of last sentence of 3.1.3, 3.1.4 Deletion of sections 3.1.6 and 3.1.7 on MAC, ABI, ACT, PAC, RAP updates Review of guidance on PNT message and example Updated AMA forward example (10:18-19, 10:25) Deletion of section 3.5.10, route field in AMA message Deletion of section 3.5.12 on AMA update Deletion of sections 3.6.4 and 3.6.5 on LOF update Replace ATC B by ATC C in case study 1 (13:52) Clarified description of flight in case study 2 Reviewed figure 27	 ix-x 13 17-18 21-22 25 27-28 38 65 69-75 77, 78 79 83-89 94-97 104 104 107 153 156 167
1.2	21/06/2023	Minor editirals of section 1.1 Updated reference list in section 1.9 New paragraph for utilisation of APP type Review of sections 2.4, 3.5.1 and 4.2.1 regarding the scope of CP1 Amendment of sections 3.6.1 and 3.7.1 Deletion of paragraph from section 3.6.2 Addtion of section 3.9 New section 5.2 on data exchanges with towers	See sections

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FOREWORD

1 Responsible Body

The EUROCONTROL Guidelines for On-Line Data Interchange (OLDI) have been prepared by the EUROCONTROL Network Manager Directorate (NMD) in close cooperation with the operational stakeholders within the OLDI Group of the NETOPS working arrangement who provided the main content. The list of contributors is listed below.

2 Relationship with EUROCONTROL Specification OLDI Edition 5.0

The need for the development of guidance material had been previously identified by the OLDI Group and acknowledged by NETOPS when preparing former editions of the EUROCONTROL Specification for OLDI.

These guidelines continue to address that need thereby providing updated clarifications on OLDI Edition 5.0 content and documents best practices for the implementation of OLDI message exchanges and operational procedures.

3 Relationship to Other Documents

This guideline document is bound to the EUROCONTROL Specification OLDI Edition 5.1.

With regard to the format of OLDI messages, it makes reference to:

- ICAO “Procedures for Air Navigation Services - Air Traffic Management, ICAO Document 4444, 16th Edition dated 2016” for OLDI messages in the ICAO format
- EUROCONTROL Specification ADEXP Edition 3.4 for OLDI messages in the ADEXP format

The IFPS messages and procedures described in these guidelines relating to OLDI message exchanges are defined by the EUROCONTROL NM document “Flight Progress Messages Document” Edition 2.6.

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1 Introduction

1.1. Purpose of the document

During the drafting of former editions of the EUROCONTROL Specification for On-Line Data Interchange (OLDI), operational stakeholders identified the need to prepare additional OLDI implementation guidance material both clarifying certain provisions of the OLDI specification and preparing the ground for a future edition.

These EUROCONTROL Guidelines contained the agreed clarifications and best practices, applicable to a number of OLDI messages, functions, relevant processes and some HMI aspects as outlined in Section 1.3. In addition, the guidelines also document specific issues reported by a number of operational stakeholders and potential resolutions to be further developed in the context of forthcoming OLDI Specification review cycles. In view of the central role of OLDI in ATM systems, the latter have been included in these guidelines so that they can be brought to the attention to all stakeholders and initiate early discussions on their resolution.

This edition of the guidelines has been appropriately reviewed by operational stakeholders and aligned with the latest edition of the EUROCONTROL Specification for On-Line Data Interchange (OLDI) [RD 1]. The guideline material is complementary to and does not replace nor override any provision of OLDI Specification 5.1.

1.2. EUROCONTROL Guidelines

EUROCONTROL Guidelines, as defined in EUROCONTROL Regulatory and Advisory Framework (ERAF), are advisory materials and contain:

“Any information or provisions for physical characteristic, configuration, material, performance, personnel or procedure, the use of which is recognised as contributing to the establishment and operation of safe and efficient systems and services related to ATM in the EUROCONTROL Member States.”

Therefore, the application of EUROCONTROL Guidelines document is not mandatory.

In addition, EUROCONTROL Regulatory and Advisory Framework specifies that:

“EUROCONTROL Guidelines may be used, inter alia, to support implementation and operation of ATM systems and services, and to:

- complement EUROCONTROL Rules and Specifications;
- complement ICAO Recommended Practices and Procedures;
- complement EC legislation;
- indicate harmonisation targets for ATM Procedures;
- encourage the application of best practice;
- provide detailed procedural information.”

These EUROCONTROL Guidelines have been developed under the EUROCONTROL Regulatory and Advisory Framework (ERAF) and is maintained by EUROCONTROL in accordance with this Framework.

1.3. Structure of the document

The structure of these guidelines is as follows:

Section 2: Clarification and guidance material applicable to all OLDI messages:

- STAY indicator processing
- Change of ADES processing
- SSR code management for OLDI
- System requirement for the handling of OLDI messages route information

Section 3: Substantial changes of current messages and clarification of operational use and purposes of some OLDI messages):

- Redrafting of MAC messages to comply with the operational Stakeholder needs, especially in cases of trilateral coordination
- CDN message intent, purpose and operational use
- Operational scenario of flight transfer data exchanges (COF, ROF, MAS, TIM) in the context of CPDLC exchanges. The transfer phase data exchanges without CPDLC and procedures applied in case of wrong transfer
- SDM message intent, purpose and operational use
- PNT message intent and operational use
- AMA message clarifications
- LOF upgrade to cater for ATNB2 needs

Section 4: OLDI relationship with other methods for flight data exchanges:

- Clarify the OLDI content and timing versus the current ANSPs/NM data exchanges
- OLDI IOP content mapping

Section 5: OLDI situation awareness messages

- Runway Configuration message (RCM)

Section 6: OLDI relationship with the Core FDP functions

- OLDI handling of re-entrant flight

Section 7: OLDI testing and validation

1.4. Applicability

These guidelines are intended to be read and used by all Air Navigation Service Providers (ANSPs) in the EUROCONTROL Member States (41) and Comprehensive Agreement States (2) that implement the EUROCONTROL On-Line Data Interchange Specification.

EUROCONTROL makes no warranty for the information contained in this document, nor does it assume any liability for its completeness or usefulness. Any decision taken based on the information is at the sole responsibility of the user.

1.5. Conventions

Throughout this document, recommendations and best practice are indicated by the use of the words “these guidelines recommend”.

Throughout this document, numbered requirements of the form OLDI-XXX-XXX-X are those of the EUROCONTROL OLDI Specification [RD 1].

An arrow is used to indicate the transfer between two ATS centres and may be preceded by a message describing which message is being sent. For example, MAC ACC A → UAC C is a MAC message sent from ACC A to UAC C abrogating the coordination.

1.6. Maintenance of the document

The EUROCONTROL Guidelines for On-Line Data Interchange (OLDI) have been prepared by the EUROCONTROL Network Manager Directorate (NMD) in close cooperation with the operational stakeholders within the OLDI Group of the NETOPS working arrangement who provided the main content.

These EUROCONTROL[1] Guidelines have been published under the EUROCONTROL Regulatory and Advisory Framework (ERAF) and are maintained by EUROCONTROL in accordance with this Framework.

The maintenance procedures for these guidelines are described in detail in ANNEX B - Document Update Procedures.

1.7. Definitions

No specific definitions have been elaborated for the purpose of these Guidelines. Refer to the definitions contained in the reference material (see Section 1.9).

1.8. Abbreviations

The abbreviations applied within this document are listed in ANNEX A: List of Abbreviations.

1.9. Reference material

This section describes any relevant material used for the development of this document.

[RD 1] EUROCONTROL Specification for On-Line Data Interchange (OLDI), Edition 5.1, dated 24 May 2023

[RD 2] EUROCONTROL Specification for ATS Data Exchange Presentation (ADEXP), Edition 3.4, dated 24 May 2023

[RD 3] PANS-ATM] Procedures for Air Navigation Services - Air Traffic Management, ICAO Document 4444, Sixteenth Edition dated 10 November 2016

[RD 4] EUROCONTROL Network Manager Flight Progress Messages Document, Edition 2.8, dated 15 May 2022

[RD 5] EURCONTROL IFPS Users Manual – Network Manager - Edition Number 27, dated 28 March 2023

[RD 6] Commission Implementing Regulation (EU) No 2021/116 of 1 February 2021 on the establishment of the Common Project One supporting the implementation of the European Air Traffic Management Master Plan

[1] EUROPEAN ORGANISATION FOR THE SAFETY OF AIR NAVIGATION

2 Clarifications and Guidance Material Applicable to all OLDI Messages

2.1. STAY indicator processing

2.1.1 Introduction

The STAY indicator has been introduced by the Initial Flight Plan Processing System (IFPS) to enable the definition of time delays within the flight plans associated with certain special en-route activities, such as training flights, air-to-air refuelling, and photographic missions etc. The use of the indicator is permitted for flights within the IFPS zone; this feature shall enable the Air Traffic Control (ATC) to make an accurate profile calculation.

Within the flight plan (FPL), the STAY feature is expressed as follows, depending on the format:

- ICAO format – STAY indicator in field 15 and item STAYINFO in field 18
- ADEXP format - STAY indicator in the item ROUTE (ICAO field 15 information) and primary field STAYINFO

The ADEXP Standard defines the following ways to express the STAY feature:

- Within primary field ROUTE – which is in fact identical to how STAY is noted in the ICAO field 15
- Primary field STAYINFO – containing additional information related to the stay data in the ROUTE
- Primary field STAY – containing definition of entry/exit fixes, activity interval – contains the same information as STAY in ICAO field 15
- Subfield PTSTAY – used within field PT/AD, containing activity interval starting at the fix and ending at following fix plus STAY identifier – pointing to the field STAYINFO

At the time when CFMU first introduced the STAY indicator, it was not harmonised with the OLDI Specification. Therefore, the OLDI Specification does not contain any requirements relating to how the STAY indicator should be expressed in OLDI messages.

These guidelines provide best practice on how to insert the STAY indicator In terms of STAY in OLDI messages, it can be specified for two different sets of messages:

- OLDI ABI, ACT, REV and RRV messages in ICAO format
- OLDI ABI, ACT, REV and RRV messages in ADEXP format for which the route is expressed with ADEXP primary item **route**
- OLDI BFD and CFD messages in ADEXP format for which the trajectory is expressed with ADEXP primary field RTEPS (BFD, CFD)

2.1.2 OLDI ABI, ACT, REV and RRV messages in ICAO format

There is no real issue to support the STAY feature for OLDI messages when using the ICAO format. The STAY indicator is inserted in the field 15 as it was received in the original FPL message. Item STAYINFO in the Field 18 is considered as optional for OLDI messages (as other Field 18 items).

2.1.3 OLDI messages (ABI, ACT, REV, RRV) in ADEXP format

When the ADEXP format is used two elements need to be considered

1. OLDI messages contain ADEXP field ROUTE – which is in fact in the syntax of ICAO field 15 – including STAY feature as defined by IFPS.
2. the ADEXP Specification defines primary field STAY – and this field carries the same information as the STAY item in the ICAO field 15.

Both items carry the same information justifying the need to harmonise their use in the context of OLDI notification and coordination messages.

As the FPL disseminated by IFPS would already include the STAY indicator within the routing information, these guidelines recommend to make use of item ROUTE (encoded in ICAO field 15 format) instead of making use of ADEXP primary field STAY. Furthermore, this avoids FPDS to compose a new field and ensures consistency between OLDI messages in ICAO and ADEXP formats.

Use of the ADEXP primary field STAYINFO is considered optional.

2.1.4 OLDI BFD and CFD messages in ADEXP format

These messages are defined in ADEXP format only. These guidelines recommend that the STAY feature is expressed within primary field RTEPTS in subfields PT or AD using the ADEXP subfield ptstay.

Use of the ADEXP primary field STAYINFO is considered optional.

2.1.5 Examples of messages with STAY feature

Original FPL message

(FPL-OMDCR-IX
-P28U/L-SDFGRY/S
-LZZI1300
-N0120A080 MAKAL P27 HLV STAY1/0020 HLV P27 ZLA
-LZZI0200 LKTB
-PBN/A1B2 DOF/171128 OPR/ZXQ ORGN/LZIBZPZX RMK/TRG STAYINFO1/ILS LKTB)

ACT message – ICAO format

(ACTBR/PR255-OMDCR/A4417-LZZI-MAKAL/1329F080-LKZZ-9/P28U/L-15/N0120F080
MAKAL P27 HLV STAY1/0020 HLV P27 ZLA -80/X-81/W/NO Y/EQ)

BFD message to local military – ADEXP format

-TITLE **BFD**
-REFDATA
    -SENDER -FAC **PR**
    -RECVR -FAC **MI**
    -SEQNUM **352**

-ARCID **OMDCR**
-ADEP **LZZI**
-ADES **LZZI**
-EOBT **1100**
-SSRCODE **A1474**
-FLTRUL **I**
-FLTTYP **X**
-ARCTYP **P28U**
-WKTRC **L**
-RFL **F080**
-ASPEED **N0120**
-BEGIN EQCST -EQPT **W/NO** -EQPT **Y/EQ** -EQPT **U/NO** -END EQCST
-ESTDATA -PTID **BILNA** -ETO **171127124000** -FL **F080**
-CSTAT -STATID **COO**
-BEGIN RTEPTS
    -PT -PTID **BILNA** -FL **F080** -ETO **171127124000** -PTSTAY **STAY1 0030**
    -PT -PTID **SOPAV** -FL **F080** -ETO **171127131800**
    -PT -PTID **NS98** -FL **F080** -ETO **171127132000**
    -PT -PTID **BILNA** -FL **F080** -ETO **171127132500**
-END RTEPTS
-ALTRNT1 **LKMT**
-OPR **ZXQ**
-RMK **TRG**
-TTLEET **0130**
-STAYINFO -STAYIDENT **STAY1** -REMARK **ILS LKTB**

<u>Original FPL</u>

(FPL-NATO02-IM
-E3TF/H-SFGHIRTUWXY/CS
-ETNG0800
-N0420F310 NG13 BAM DCT ELBAL DCT BETZO DCT DODEN DCT BOMBI UL984 SULUS UZ650 VEMUT GAT Z650 ROKEM STAY1/0240 NEPOV N871 DOKEL P733 TOMTI OAT P733 EBOGU STAY2/0230 DEKUT/N0420F280 N858 SUBIX UL980 PENEK DCT RISOK TL2 BIGGE DCT GETNI DCT KOPAG DCT NVO DCT GIX/N0250A030 DCT ETNG DCT GIX
-ETNG0900 EBMB
-STS/STATE PBN/B2 DOF/171128 REG/LXN90450 ORGN/ETNGZPZX RMK/OAT OVER GERMANY DCN CZECH REPUBLIC 17NATOCZE REQ APCH AT ETNG FOR 30MIN PRIOR LANDING FUEL1100 POB21 STAYINFO1/REQ ORBIT DLA IN AREA CZ1 FM0900 TIL1140 14NM AROUND 4926N01356E AND 4902N01426E RACETRACK CCW AT FL310 STAYINFO2/REQ ORBIT DLA IN AREA PL1 FM1230 TIL1500 15NM AROUND 5338N01645E AND 5353N01753E RACETRACK CCW AT FL310)

<u>ABI message – ADEXP format</u>

-TITLE **ABI**
-REFDATA
    -SENDER -FAC **DM**
    -RECVR -FAC **PR**
    -SEQNUM **473**
-ARCID **NATO02**
-SSRCODE **A0137**
-ADEP **ETNG**
-COORDATA -PTID **VEMUT** -TO **0849** -TFL **F310**

-ADES **ETNG**
-ARCTYP **E3TF**
-FLTTYP **M**
-BEGIN EQCST -EQPT **W/EQ** -EQPT **Y/EQ** -END EQCST
-WKTRC **H**
-ROUTE **N0420F310 TIPAM VEMUT GAT Z650 ROKEM STAY1/0240 NEPOV N871 DOKEL P733 TOMTI OAT P733 EBOGU STAY2/0230 DEKUT/N0420F280 N858 SUBIX UL980 PENEK DCT RISOK TL2 BIGGE DCT GETNI DCT KOPAG DCT NVO DCT GIX/N0250A030 DCT ETNG DCT GIX**
-STAYINFO -STAYIDENT **STAY1** -REMARK **REQ ORBIT DLA IN AREA CZ1 FM0900 TIL1140 14NM AROUND 4926+**
-STAYINFO -STAYIDENT **STAY2** -REMARK **REQ ORBIT DLA IN AREA PL1 FM1230 TIL1500 15NM AROUND 5338+**

2.2. Processing destination aerodrome (ADES) changes

2.2.1 Introduction

This section addresses the cases when flights have to land at a different destination aerodrome in cases such as the planned destination aerodrome becomes unavailable or there is an on-board emergency. In addition to foreseen operational procedures, the OLDI messages may be transmitted to inform of the change of the destination aerodrome. The ATC Unit in control of the flight can update the system flight plan route to perform the re-routing of the flight leading to the transmission of OLDI messages. The re-routing information may also propagate to other downstream ATC Units as revised ABI or REV messages.

To avoid any possible problems during activation and correlation, these guidelines recommend that any revised ABI message informing of a change of destination aerodrome is sent before the transmission of an ACT message. As bilaterally agreed, if the flight had been previously notified or co-ordinated by means of an OLDI message, a MAC message will be sent to the downstream ATC Unit that is no longer involved in the new flight trajectory.

For the purpose of informing of a change of destination aerodrome with an ABI message, in line with the note of OLDI-ABI-80-M, these guidelines recommend the use of the ADEXP format.

2.2.2 Messages content

When informing a change of destination aerodrome, these guidelines recommend that the OLDI message includes updated routing information to the new destination aerodrome.

2.2.2.1 ICAO format

When informing a change of destination aerodrome with a REV message, further to the formatting requirements specified by OLDI-REV-120-M and OLDI-REV-130-M, these guidelines recommend to incorporate the new destination aerodrome as field 16 data - element a) in field 22 format after the initial five fields (field types 3, 7, 13, 14 and 16).

When using other messages than REV, as bilaterally agreed, a change in destination aerodrome could be specified by adding the new destination aerodrome as field 16 - element a) in field 22 format to unambiguously identify the corresponding flight plan.

2.2.2.2 ADEXP format

The Note of the OLDI Specification, Annex A.11.2 indicates that fields **ades** (for the new destination aerodrome) and **adesold** (for the previous (planned) destination aerodrome) may be used if bilaterally agreed.

When informing of a change of destination aerodrome by transmitting an OLDI message, these guidelines recommend inserting both **ades** and **adesold** fields in the message.

2.2.2.3 Processing in the Receiving Unit

The receiving system should attempt the association of an OLDI message that contains a change in destination aerodrome with a corresponding flight plan. If an associated flight plan is found, the flight plan should be updated with the new destination aerodrome and the route to the new destination aerodrome.

2.2.3 Examples

1. Frankfurt is the initial destination aerodrome for flight DLH757. After an initial ABI message was sent from Sofia ACC to Bucharest ACC, the flight is re-routed to new destination aerodrome Munich. A revised ABI is sent containing the old destination aerodrome Frankfurt, the new destination aerodrome Munich and the updated route to Munich.

Example in ICAO Format

Initial ABI (with destination Frankfurt):

(ABISF/OP257-DLH757/A2345-VABB-LUGEB/0425F360-EDDF-9/B744/H-15/N0415F380 UL333 DASIS/N0485F360 UR660 ERZ UW704 SONAD UL746 INB/N0485F380 UL746 ODERO L746 NEPOT L851 DEGET DCT ARSIN DCT SUBEN T161 NIMDI/N0479F360 T161 ERNAS/N0454F280 T161 ASPAT ASPAT2E-80/S-81/W/EQ Y/EQ U/NO)

Revised ABI for a change in destination from Frankfurt to Munich:

(ABISF/OP278-DLH757/A2345-VABB-LUGEB/0425F360-EDDF-9/B744/H-15/N0415F380 UL333 DASIS/N0485F360 UR660 ERZ UW704 SONAD UL746 INB/N0485F380 UL746 ODERO DCT DEGET DCT ARSIN DCT SITNI DCT BAGSI DCT MATIG DCT AMADI Q113 NAPSA NAPSA2A -16/EDDM-80/S-81/W/EQ Y/EQ U/NO)

Example in ADEXP format

Initial ABI (with destination Frankfurt):

-TITLE **ABI**
-REFDATA
    -SENDER -FAC **SF**
    -RECVR -FAC **OP**
    -SEQNUM **257**
-ADEP **VABB**
-ADES **EDDF**
-COORDDATA
    -PTID **LUGEB**
    -TO **0425**
    -TFL **F360**
-ALTNZ **EDFH**
-ARCID **DLH757**
-ARCTYP **B744**
-WKTRC **H**
-SSRCODE **A2345**
-BEGIN EQCST
    -EQPT **W/EQ**
    -EQPT **Y/NO**
    -EQPT **R/EQ**

-SUREQPT **S/EQ/E**
-END EQCST
-FLTRUL **I**
-FLTTYP **S**
-REG **DABVS**
-RMK **TCAS**
-PBN **A1B1C1D1L1O1S1S2**
-SUR **RSP180**
-DAT **1FANSP**
-NAV **RNVD1E2A1**
-ROUTE **N0415F380 UL333 DASIS/N0485F360 UR660 ERZ UW704 SONAD UL746 INB/N0485F380 UL746 ODERO L746 NEPOT L851 DEGET DCT ARSIN DCT SUBEN T161 NIMDI/N0479F360 T161 ERNAS/N0454F280 T161 ASPAT ASPAT2E**

<u>Revised ABI for a change in destination from Frankfurt to Munich:</u>

-TITLE **ABI**
-REFDATA
-SENDER -FAC **SF**
-RECVR -FAC **OP**
-SEQNUM **278**
-ADEP **VABB**
-ADES **EDDM**
-ADESOLD **EDDF**
-COORDDATA
-PTID **LUGEB**
-TO **0425**
-TFL **F360**
-ALTNZ **EDFH**
-ARCID **DLH757**
-ARCTYP **B744**
-WKTRC **H**
-SSRCODE **A2345**
-BEGIN **EQCST**
-EQPT **W/EQ**
-EQPT **Y/NO**
-EQPT **R/EQ**
-SUREQPT **S/EQ/E**
-END EQCST
-FLTRUL **I**
-FLTTYP **S**
-REG **DABVS**
-RMK **TCAS**
-PBN **A1B1C1D1L1O1S1S2**
-SUR **RSP180**
-DAT **1FANSP**
-NAV **RNVD1E2A1**
-ROUTE **N0415F380 UL333 DASIS/N0485F360 UR660 ERZ UW704 SONAD UL746 INB/N0485F380 UL746 ODERO DCT DEGET DCT ARSIN DCT SITNI DCT BAGSI DCT MATIG DCT AMADI Q113 NAPSA NAPSA2A**

2. Flight WZZ5JV has initial destination aerodrome Varna. When the flight is under control of Bucharest ACC it is re-routed to new destination aerodrome Burgas after being previously

co-ordinated by ACT message to Sofia ACC. A REV message is sent to Sofia ACC containing the old destination aerodrome Varna, the new destination aerodrome Burgas and the updated route to Burgas.

Example in ICAO format

Initial ACT (with destination VARNA):

(ACTOP/SF250-WZZ5JV/A2246-EGGW-ORTIP087002/2250F310-LBWN-9/A320/M-15/N0446F350 DCT 4606N02027E DCT BULEN L744 EXIGA-80/S-81/W/EQ Y/EQ)

REV for a change in destination from Varna to Burgas:

(REVOP/SF275-WZZ5JV/A2246-EGGW-ORTIP087002/2250F310-LBWN-15/N0446F350 4432N02407E 4429N02415E DCT BULEN L742 ESENA -16/LBBG-80/S-81/W/EQ Y/EQ)

Example in ADEXP format

-TITLE **ACT**
-REFDATA
    -SENDER -FAC **OP**
    -RECVR -FAC **SF**
    -SEQNUM **250**
-ARCID **WZZ5JV**
-SSRCODE **A2246**
-ADEP **EGGW**
-ADES **LBWN**
-COORDATA
    -PTID **REF01**
    -TO **2250**
    -TFL **F310**
-ARCTYP **A320**
-WKTRC **M**
-FLTTYP **S**
-BEGIN **EQCST**
    -EQPT **W/EQ**
    -EQPT **Y/EQ**
-END EQCST
-REF
    -REFID **REF01**
    -PTID **ORTIP**
    -BRNG **087**
    -DISTNC **002**
-ROUTE **N0446F350 DCT 4606N02027E DCT BULEN L744 EXIGA**
-FLTRUL **I**

REV for a change in destination from Varna to Burgas:

-TITLE **REV**
-REFDATA
    -SENDER -FAC **OP**
    -RECVR -FAC **SF**
    -SEQNUM **275**
-ARCID **WZZ5JV**
-SSRCODE **A2246**
-ADEP **EGGW**
-ADES **LBBG**
-ADESOLD **LBWN**
-COORDATA
    -PTID **REF01**
    -TO **2250**
    -TFL **F310**
-ARCTYP **A320**
-WKTRC **M**
-FLTTYP **S**
-BEGIN EQCST
    -EQPT **W/EQ**
    -EQPT **Y/EQ**
-END EQCST
-REF
    -REFID **REF01**
    -PTID **ORTIP**
    -BRNG **087**
    -DISTNC **002**
-ROUTE **N0446F350 DCT 4606N02027E DCT BULEN L744 EXIGA**
-FLTRUL **I**

3. A medical flight departed from Sofia Airport (LBSF) to Skopje Airport (LWSK). For the purpose of this example, Sofia TMA is a part of the ATC system ATS A and Skopje part of ATS B. FPLs for this flight were distributed to both ATS A and ATS B and CAM messages had also been correctly received and processed in both ATS units.

-TITLE **CAM**
-ARCID **ZZZ785**
-ADEP **LBSF**
-ADES **LWSK**
-SSRCODE **A4455**
-SEQUENCEDATA
    -TXTIME **100955073628**
    -NUM **23**

After the flight was airborne, an ABI message was sent from ATS A to ATS B.

-TITLE **ABI**
-REFDATA
    -SENDER -FAC **ATSA**
    -RECVR -FAC **ATSB**
-SEQNUM **025**
-ARCID **ZZZ785**
-SSRCODE **A4455**
-ADEP **LBSF**

-COORDATA
    -PTID **NORAD**
    -TO **0956**
    -TFL **F120**
-ADES **LWSK**
-ARCTYP **AS50**

Afterwards, the pilot advised ATS A that he was diverting to Ohrid Airport (LWOH). The ATS A ATCO correctly updated the flight plan, which triggered both a new ABI to ATS B and also an IAFP message to IFPS.

-TITLE **ABI**
-REFDATA
    -SENDER -FAC **ATSA**
    -RECVR -FAC **ATSB**
    -SEQNUM **097**
-ARCID **ZZZ785**
-SSRCODE **A4455**
-ADEP **LBSF**
-COORDATA
    -PTID **NORAD**
    -TO **0956**
    -TFL **F120**
-ADES **LWOH**
-ARCTYP **AS50**

-TITLE **IAFP**
-ARCID **ZZZ785**
-ADEP **LBSF**
-ESTDATA
    -PTID **KORAB**
    -ETO **180127094900**
    -FL **F070**
-ROUTE **N0120F100 IM8 UM333 NORAK UG897 IM8**
-ADES **LWOH**
-ADESOLD **LWSK**

Upon reception of the ABI message, ATS B used the criteria {callsign, departure aerodrome, destination aerodrome} to attempt to associate to existing flight plan. However, the ABI message included a combination that could not be associated to an existing FPL so a new FPL was automatically created by the system. This triggered a new FPL IAFP message to be sent to IFPS and a new COR message to be sent to CCAMS. This created undue burden on ATS B in having to manage two flight plans for the same flight.

If the revised ABI message contained the ADESOLD field, which was also used for message association purposes, then none of the resulting burden would have occurred in ATS B.

2.3. OLDI messages and management of SSR codes

2.3.1 Background

The first OLDI Specification was developed in 1992, when SSR Mode A code management was governed by the principle of Originating Regional Code Assignment (ORCAM). In the last two decades, new SSR code management techniques emerged in order to improve the management of discrete codes and see the introduction of conspicuity codes. Nowadays, most of European ANSPs use the Centralised Code Assignment and Management System (CCAMS) and conspicuity code management while the enhanced ORCAM is not used in Europe. However, some European ANSPs still use the basic ORCAM as they have not updated yet their ATM system to manage the CCAMS and the A1000 code.

2.3.2 SSR code item managed by OLDI

Despite all SSR code management technological improvements, the basic principle for the exchange of SSR code remains unchanged. All ICAO documentation indicates that the code to be exchanged between ATS units is the assigned code to the flight to be transferred. If the assigned SSR code is not retainable by the receiving ATS unit, it is the responsibility of receiving ATS unit to allocate a discrete SSR code for that flight, using the FDPS capability to automatically assign a code from the pool of available codes. In rare cases, the transferring ATS unit might get information from the receiving ATS unit (electronically, by phone or in a procedural way) about the new SSR code to be assigned. This information could be provided by OLDI messages using the next SSR code data item, if both systems support the exchange of this information.

In cases when the ABI message is sent by the transferring unit before the flight is assumed, the ABI message needs to contain the SSR code that will be assigned by the transferring unit (in case the SSR code assigned by the upstream unit is not retainable). The current SSR code assigned by the upstream ATS unit to the transferring ATC unit might be provided in the ABI message as previous SSR code. However, such information exchange is not part of the ABI message as specified by OLDI Specification [RD 1]. If it is considered beneficial for the purpose of early correlation, some modifications to the OLDI Specification would need to be foreseen.

To determine the benefit of such information exchanges, this section analyses a series of examples.

The table below summarises the content of SSR data item with regard to OLDI message content taking into considerations the different SSR code management capabilities of transferring and receiving ATS units.

System capabilities of transferring ATS unit \ System capabilities of receiving ATS unit	CCAMS	A1000	Basic ORCAM
CCAMS	Content of OLDI message code Data Item	Content of OLDI message code Data Item	Content of OLDI message code Data Item
	CCAMS Code by transferring ATS unit, retainable by receiving ATS unit	**CCAMS Code by transferring ATS unit, the assignment of conspicuity code to be done by the receiving ATS unit**	**CCAMS Code by transferring ATS unit, the assignment of new SSR code to be done by the receiving ATS unit**
A1000	Content of OLDI message code Data Item	Content of OLDI message code Data Item	Content of OLDI message code Data Item
	A1000, the assignment of new SSR code to be done by the receiving ATS unit	**A1000, the conspicuity code needs to be included in OLDI message as an indication MSCC capability**	**A1000, the assignment of new SSR code to be done by the receiving ATS unit**
Basic ORCAM	Content of OLDI message code Data Item	Content of OLDI message code Data Item	Content of OLDI message code Data Item
	ORCAM SSR Code by transferring ATS unit, the CCAMS code will be assigned by receiving ATS unit	**ORCAM SSR Code by transferring ATS unit, the assignment of conspicuity code to be done by the receiving ATS unit**	**ORCAM SSR Code by transferring ATS unit, the receiving ATS unit may retain or assign a new SSR code. If the transferring unit SSR code is not retainable, a new SSR code to be assigned by the receiving ATS, if transferring unit might get info about this SSR code, it could be included in the OLDI messages**

Table 1 - SSR Code Management Capabilities and OLDI Message Content

2.3.3 Example 1 - ABI message with unassigned SSR code

This example depicts the case when the ABI message is sent with a code that is still to be assigned to the flight by the transferring unit. This example is illustrated by Figure 1. It involves 3 ATS units with Areas of Responsibility (AoR) presented in red for ATS A, in blue for ATS B and in purple for ATS C. ATS A and ATS B allocate their codes based on ORCAM, while ATS C is CCAMS capable. ATS B is a rather small ATS unit and the maximum transversal time in any direction of flight is less than 15 minutes.

The flight WZZ123 departed from LGAT at 07:30 and it is planned to land at EDDM.

IFPS distributed the original FPL (FPL-WZZ123-IS –B737/M-SRWY/C –LGAT0730 -N0420F370 MIRIX UM761 BELOG UM231 NIQAT UL544 RADOX UL601 –EDDM0200) to ATC A, ATS B and ATS C.

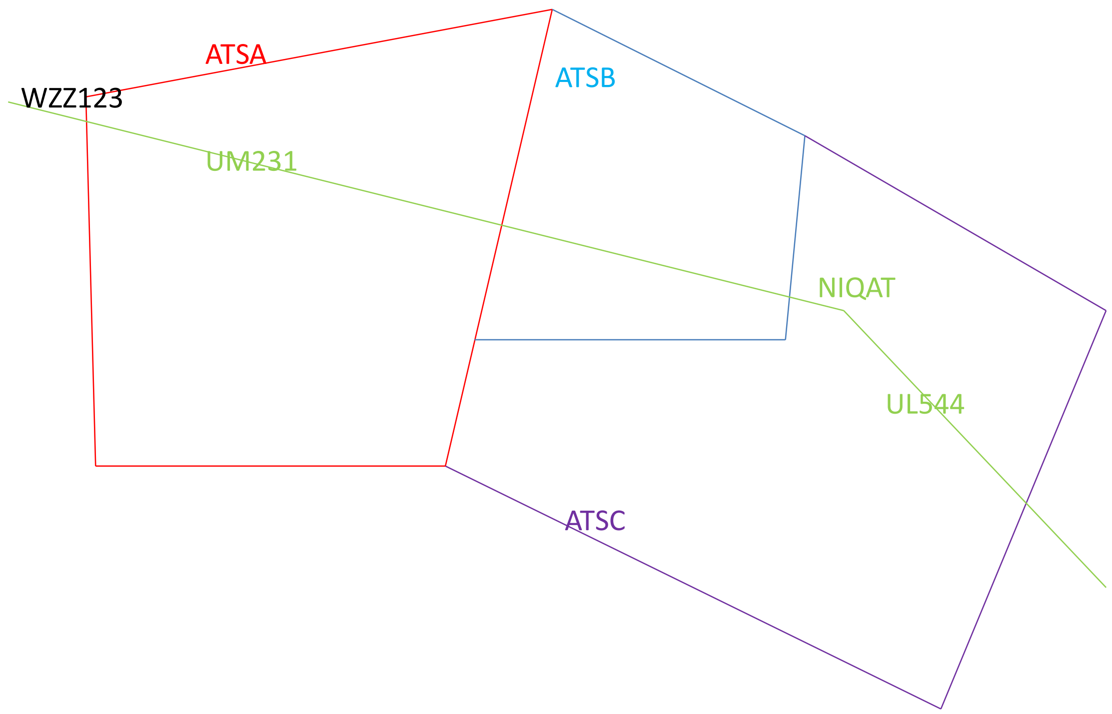


Figure 1 - SSR Code Management between 3 ATS Units

09:50 WZZ123 overflies the entry point of ATS A, the flight is assumed by ATS A and a discreet SSR code 5667 is assigned.

09:52 ATS A sends an ABI message to ATS B.

-TITLE **ABI**
-REFDATA
    -SENDER -FAC **ATSA**
    -RECVR -FAC **ATSB**
-SEQNUM **768**
-ARCID **WZZ123**
-SSRCODE **A5667**
-ADEP **LGAT**
–COORDATA
    -PTID **OUT01**
    -TO **1012**
    -TFL **F370**
-ADES **EDDM**
-ARCTYP **B737**

09:52 ATS B returns a LAM message and tries to update the system flight plan (SFPL) with the ABI message data. The SSR code management function identifies that SSR code 5667 is not retainable within ATS B AoR and it identifies that a new SSR code 4421 needs to be assigned. ATS B uses the current code 5667 to correlate WZZ123 and assigns 4421 as next SSR code.

10:01 ATS A sends an ACT message to ATS B.

-TITLE **ACT**
-REFDATA
    -SENDER -FAC **ATSA**
    -RECVR -FAC **ATSB**
    -SEQNUM **787**
-ARCID **WZZ123**
-SSRCODE **A5667**
-ADEP **LGAT**
-COORDATA
    -PTID **OUT01**
    -TO **1011**
    -TFL **F370**
-ADES **EDDM**
-ARCTYP **B737**

10:01 ATS B returns a LAM message and updates the SFPL with the new time at the COP contained in ACT message. The correlation is kept as well as the new SSR code to be assigned.

10:06 ATS B sends an ABI message to ATS C, the SSR code contained in ABI message will not be the current SSR code assigned by ATS A, but the SSR code that will be assigned by ATS B. The current SSR code might be provided as previous SSR code data item in order to facilitate an early correlation of the flight, but this field is not part of the ABI message specification **-** it is only included as an optional field for the BFD and CFD messages.

-TITLE **ABI**
-REFDATA
    -SENDER -FAC **ATSB**
    -RECVR -FAC **ATSC**
    -SEQNUM **009**
-ARCID **WZZ123**
-SSRCODE **A4421**
-ADEP **LGAT**
-COORDATA
    -PTID **OUT28**
    -TO **1026**
    -TFL **F370**
-ADES **EDDM**
-ARCTYP **B737**

10:06 ATS C returns a LAM message and updates the SFPL with the ABI message data. However, the correlation cannot be established, as code 4421 is still not yet assigned.

10:06 ATS B sends a BFD message to ATS C in order to provide a notification about the current SSR code in use.

-TITLE **BFD**
-REFDATA
    -SENDER -FAC **ATSB**
    -RECVR -FAC **ATSC**
    -SEQNUM **015**
-ARCID **WZZ123**

-SSRCODE **A4421**
-PREVSSRCODE **A5667**

10:06 ATS C returns a LAM message and updates the SFPL with the BFD message data. The SSR code in the received ABI (to be assigned by ATS B) is stored as current SSR code, while the SSR code in the BFD message (currently used by ATS A) is stored as previous SSR code. In order to avoid miscorrelation, ATS C might ensure the correlation geo-check (match in previous SSR code between the track and updated SFPL with BFD message and that track is contained within an eligibility volume based on the flight expected position) is applied. If the geo-check is successful, the correlation can be established.

10:07 ATS C generates a code request (COR) to CCAMS. It should be noted that an automatic generation of COR message could be differently sequenced, after the reception of ACT from ATS B at 10:15. The CCAMS service receives the code request and identifies that A4421 cannot be retained. ATS C receives CAM messages with CCAMS code 0227, to be applied when ATS C assumes the flight. This code ATC C stored as next SSR code.

10:11 ATS A instructs the flight WZZ123 to contact ATS B by sending a COF message.

-TITLE **COF**
-REFDATA
  -SENDER -FAC **ATSA**
  -RECVR -FAC **ATSB**
  -SEQNUM **851**
-ARCID **WZZ123**

10:12 ATS B indicates the establishment of radio contact with the flight WZZ123 by sending a MAS message.

-TITLE **MAS**
-REFDATA
  -SENDER -FAC **ATSB**
  -RECVR -FAC **ATSA**
  -SEQNUM **311**
-ARCID **WZZ123**

10:12 ATS B instructs flight WZZ123 to change to SSR code 4421.

10:13 The pilot changes the SSR code and flight WZZ123 squawks 4421.

10:13 ATS A terminates the SFPL for flight WZZ123; therefore this code change is irrelevant to ATS A. ATS B maintains the correlation as the new code is stored in the next SSR code field of the SFPL. ATS C maintains the correlation as the newly assigned SSR code was already notified.

10:15 ATS B sends ACT to ATS C

-TITLE **ACT**
-REFDATA
  -SENDER -FAC **ATSB**
  -RECVR -FAC **ATSC**
  -SEQNUM **027**
-ARCID **WZZ123**
-SSRCODE **A4421**
-ADEP **LGAT**

-COORDATA
-PTID **OUT28**
-TO **1025**
-TFL **F370**
-ADES **EDDM**
-ARCTYP **B737**

10:15 ATS C sends a LAM message to ATS B and updates the SFPL with the new time at the COP.

10:25 ATS B instructs the flight WZZ123 to contact ATS C, by sending a COF message.

-TITLE **COF**
-REFDATA
-SENDER -FAC **ATSB**
-RECVR -FAC **ATSC**
-SEQNUM **051**
-ARCID **WZZ123**

10:26 ATS C indicates the establishment of radio contact with the flight WZZ123 by sending a MAS message.

-TITLE **MAS**
-REFDATA
-SENDER -FAC **ATSC**
-RECVR -FAC **ATSB**
-SEQNUM **597**
-ARCID **WZZ123**

10:26 ATS C instructs flight WZZ123 to change to SSR code 0227 received by CCAMS.

10:26 The pilot changes the SSR code and flight WZZ123 squawks 0227.

This example shows that, if the BFD message is not exchanged, ATS C cannot correlate the flight between 10:06 (when ATS B sent the ABI message with the planned SSR code to be assigned, but not with current code) and 10:13 (when the flight is assumed by ATS B and the SSR code is changed by the pilot).

2.3.4 Example 2 - ABI message with previously assigned SSR code

This second example concerns the same flight and ATS units as in the first example. It differs in that ATS B provides the currently assigned SSR code by ATS A when sending the ABI message to ATC C, instead of the SSR code that will be assigned by ATC B once the flight is assumed. However, even when sending the current SSR code within the ABI/ACT messages with ATS C, the problem of lost correlation persists.

This second example differs from 10:06 when ATS B sends the ABI message to ATC C.

10:06 ATS B sends an ABI message to ATS C, the SSR code contained in the ABI message is the current SSR code assigned by ATS A, not the SSR code that will be assigned by ATS B.

-TITLE **ABI**
-REFDATA
  -SENDER -FAC **ATSB**
  -RECVR -FAC **ATSC**
  -SEQNUM **068**
-ARCID **WZZ123**
-SSRCODE **A5667**
-ADEP **LGAT**
-COORDATA
  -PTID **OUT28**
  -TO **1026**
  -TFL **F370**
-ADES **EDDM**
-ARCTYP **B737**

10:06 ATS C returns a LAM message and updates the SFPL with the ABI message data. The correlation is established as the current SSR code is provided.

10:07 ATS B identifies the need to change the assigned SSR code. No BFD message is sent to ATS C providing a notification of the SSR code that will be assigned by ATC B once the flight is assumed.

10:10 ATS C receives the CCAMS code 0227, to be assigned when the flight is assumed by ATS C. ATS C stores this code as next SSR code.

-TITLE **CAM**
-ARCID **WZZ123**
-ADEP **LGAT**
-ADES **EDDM**
-SSRCODE **A0227**
-SEQUENCEDATA
  -TXTIME **100959071215**
  -NUM **69**

10:11 ATS A instructs the flight WZZ123 to contact ATS B by sending a COF message.

-TITLE **COF**
-REFDATA
  -SENDER -FAC **ATSA**
  -RECVR -FAC **ATSB**
  -SEQNUM **951**
-ARCID **WZZ123**

10:12 ATS B indicates the establishment of radio contact with the flight WZZ123 by sending a MAS message.

-TITLE **MAS**
-REFDATA
  -SENDER -FAC **ATSB**
  -RECVR -FAC **ATSA**
  -SEQNUM **311**
-ARCID **WZZ123**

10:12 ATS B instructs the flight WZZ123 to change to SSR code 4421.

10:13 The pilot changes the SSR code and flight WZZ123 squawks 4421.

10:13 ATS A terminates the WZZ123 SFPL; therefore this code change is irrelevant to ATS A. ATS B maintains the correlation as the new code is stored in SFPL next SSR code field. ATS C may lose correlation for some period.

10:13 ATS B sends the revised ABI message to ATS C, the SSR code contained in the revised ABI message is the current SSR code assigned by ATS B.

-TITLE **ABI**
-REFDATA
 -SENDER -FAC **ATSB**
 -RECVR -FAC **ATSC**
 -SEQNUM **098**
-ARCID **WZZ123**
-SSRCODE **A4421**
-ADEP **LGAT**
-COORDATA
 -PTID **OUT28**
 -TO **1026**
 -TFL **F370**
-ADES **EDDM**
-ARCTYP **B737**

10:13 ATS C returns a LAM message and updates the SFPL with the ABI message data. The correlation is re-established as currently assigned SSR code is provided.

10:15 ATS B sends ACT to ATS C

-TITLE **ACT**
-REFDATA
 -SENDER -FAC **ATSB**
 -RECVR -FAC **ATSC**
 -SEQNUM **113**
-ARCID **WZZ123**
-SSRCODE **A4421**
-ADEP **LGAT**
-COORDATA
 -PTID **OUT28**
 -TO **1025**
 -TFL **F370**
-ADES **EDDM**
-ARCTYP **B737**

10:15 ATS C sends a LAM message to ATS B and updates the SFPL with the new time at the COP.

10:25 ATS B instructs the flight WZZ123 to contact ATS C by sending a COF message.

-TITLE **COF**
-REFDATA
 -SENDER -FAC **ATSB**
 -RECVR -FAC **ATSC**
 -SEQNUM **098**

-ARCID **WZZ123**

10:26 ATS C indicates the establishment of radio contact with the flight WZZ123 by sending a MAS message.

-TITLE **MAS**
-REFDATA
-SENDER -FAC **ATSC**
-RECVR -FAC **ATSB**
-SEQNUM **597**
-ARCID **WZZ123**

10:26 ATS C instructs the flight WZZ123 to change the SSR code 0227 received by CCAMS.

10:26 The pilot changes the SSR code and flight WZZ123 squawks 0227.

This example shows that ATC C was able to establish code correlation at 10:06 but this could not be maintained or lost until 10:13 due to the code change. This can be explained by several local factors such as:

- ATS C correlation termination timing
- Pilot timing to change SSR code
- Provision of revised ABI by ATS B with the assigned SSR code in 10:13
- Time for the processing of revised ABI and update the SFPL by ATC C
- ATS C correlation reestablishment timing

This means that the correlation might be maintained or lost for several seconds/minutes, depending on message initiation transaction and processing time, as well the correlation re-establishment timing.

2.3.5 Example 3 - Brief entry into intermediate ATS unit

This third example depicts the correlation establishment problem in case of very short traversed sectors, especially imminent in case of vertically layered ATS units. This example is illustrated by Figure 2. It involves 3 ATS units with Areas of Responsibility (AoR) presented in red for ATS A, in purple for ATS B and in orange for ATS C. ATS A and ATS B assign their codes based on ORCAM, while ATS C is CCAMS capable. ATS B is an Upper Air Control Centre above the lower airspace controlled by ATS C for Munich Airport (EDMM). The AoR of ATS A is between FL 090 and FL 460. In case of descending/climbing traffic towards EDDM, the ATS B traversal time is extremely short (less than 5 minutes).

The flight WZZ881 departed from LRCL at 09:00 and it is planned to land at EDDM. IFPS distributed the original FPL (FPL-WZZ881-IS –A320/M-SRWY/C –LRCL0900 -N0430F330 MORUN UM771 LABOG UM117 KEKOM UL544 RADOX UL601–EDDM0130) to ATC A, ATS B and ATS C.

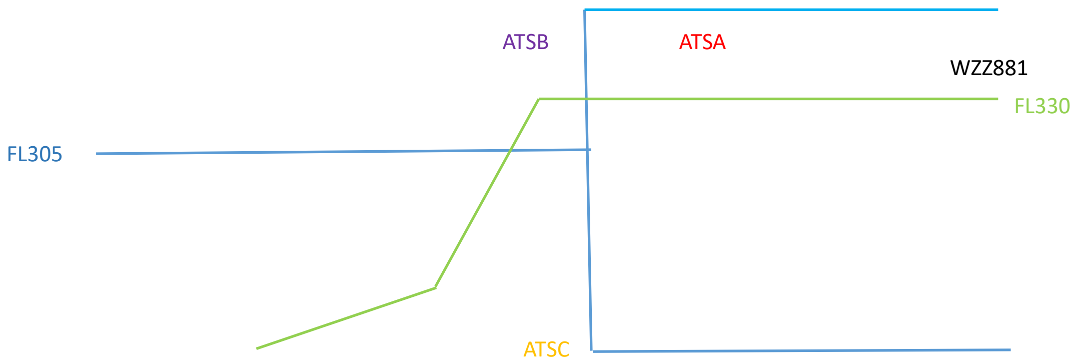


Figure 2 - SSR Code Management and Brief Sector Entry

09:50 WZZ881 overflies the entry point of ATS A, the flight is assumed by ATS A and a discrete SSR code 1155 is assigned.

09:51 ATS A sends an ABI message to ATS B.

-TITLE **ABI**
-REFDATA
    -SENDER -FAC **ATSA**
    -RECVR -FAC **ATSB**
    -SEQNUM **115**
-ARCID **WZZ881**
-SSRCODE **A1155**
-ADEP **LRCL**
-COORDATA
    -PTID **OUT04**
    -TO **1011**
    -TFL **F330**
-ADES **EDDM**
-ARCTYP **A320**

09:51 ATS B returns a LAM messages and attempts to update the SFPL with the ABI message data. The SSR code management function identifies that SSR code 1155 is not retainable within the AoR of ATS B and it identifies that a new SSR code needs to be assigned. ATS B uses the current code 1155 to correlate WZZ881 and assigns 3312 as next SSR code.

09:54 ATS B sends an ABI message to ATS C, the SSR code contained in the ABI message will not be the current SSR code applied by ATS A, but the SSR code that will be assigned by ATS B.

-TITLE **ABI**
-REFDATA
    -SENDER -FAC **ATSB**
    -RECVR -FAC **ATSC**
    -SEQNUM **875**
-ARCID **WZZ881**
-SSRCODE **A3312**
-ADEP **LRCR**
-COORDATA
    -PTID **OUT21**
    -TO **1014**
    -TFL **F310**
-ADES **EDDM**
-ARCTYP **A320**

09:54 ATS C returns a LAM message and updates the SFPL with the ABI message data. However, the correlation cannot be established, as code 3312 is not yet assigned.

10:01 ATS A sends an ACT message to ATS B.

-TITLE **ACT**
-REFDATA
    -SENDER -FAC **ATSA**
    -RECVR -FAC **ATSB**
    -SEQNUM **123**
-ARCID **WZZ881**
-SSRCODE **A1155**
-ADEP **LRCR**
-COORDATA
    -PTID **OUT04**
    -TO **1011**
    -TFL **F330**
-ADES **EDDM**
-ARCTYP **A320**

10:01 ATS B returns a LAM message and updates the SFPL with the new time at the COP contained in the ACT message. The correlation is maintained as well as the new SSR code to be assigned.

10:04 ATS B sends an ACT message to ATS C.

-TITLE **ACT**
-REFDATA
    -SENDER -FAC **ATSB**
    -RECVR -FAC **ATSC**
    -SEQNUM **889**
-ARCID **WZZ881**
-SSRCODE **A3312**
-ADEP **LRCR**
-COORDATA
    -PTID **OUT21**
    -TO **1014**
    -TFL **F310**
-ADES **EDDM**

-ARCTYP **A320**

10:04 ATS C sends a LAM message to ATS B. The SFPL for flight WZZ881 changes to an active status, however, the correlation is not yet established, as the SSR code provided by the ABI and ACT messages is not yet squawked.

10:11 ATS A instructs the flight WZZ881 to contact ATS B by sending a COF message

-TITLE **COF**
-REFDATA
  -SENDER -FAC **ATSA**
  -RECVR -FAC **ATSB**
  -SEQNUM **145**
-ARCID **WZZ881**

10:11 ATS B indicates the establishment of radio contact with the flight WZZ881 by sending a MAS message.

-TITLE **MAS**
-REFDATA
  -SENDER -FAC **ATSB**
  -RECVR -FAC **ATSA**
  -SEQNUM **831**
-ARCID **WZZ881**

10:12 ATS B instructs the flight WZZ881 to change to SSR code 3312.

10:12 The pilot changes the SSR code and flight WZZ881 squawks 3312.

10:12 ATS A terminates the WZZ881 SFPL, therefore this code change is irrelevant to ATS A. ATS B maintains the correlation as the new code is stored in the next SSR code field of the SFPL. ATS C can establish correlation by using the newly assigned SSR code.

10:14 ATS B instructs the flight WZZ881 to contact ATS C by sending a COF message.

-TITLE **COF**
-REFDATA
  -SENDER -FAC **ATSB**
  -RECVR -FAC **ATSC**
  -SEQNUM **922**
-ARCID **WZZ881**

10:14 ATS C indicates the establishment of radio contact with the flight WZZ881 using MAS message.

-TITLE **MAS**
-REFDATA
  -SENDER -FAC **ATSC**
  -RECVR -FAC **ATSB**
  -SEQNUM **597**
-ARCID **WZZ881**

This example shows that ATS C cannot establish correlation with the flight between 09:54 (when ATS B sent the ABI and ACT messages with the planned SSR code to be assigned) and 10:12 (when the flight is assumed by ATS B and the SSR code is changed by the pilot). As WZZ881 enters ATS C airspace at 10:14, the ATS C situational awareness seriously hampered.

If the previous SSR code had been provided by a BFD message, the correlation would have been established at 09:54 (as long as the BFD message included the current and previous SSR codes). A similar result might have been obtained if the previous SSR code had been provided in the ABI or ACT messages.

2.3.6 Summary

In order to overcome the correlation problems (non-establishment or maintenance), the operational Stakeholders might consider replacing the ORCAM SSR code management with the technological improvements related to the Conspicuity Code Management and CCAMS.

Within the ORCAM SSR code management method, the following improvement might be considered as:

- ABI and/or ACT messages might need to include the Previous and Next SSR Mode and Code data items.
- The BFD data exchanges are deemed beneficial to supplement ABI and/or ACT messages.

2.4. Evolution of the OLDI message exchanges and their application in FRA environment

The OLDI Specification was initially developed 25 years ago, taking into account the airspace concept valid in 1990's and the relevant coordination and transfer procedures applied at the time. As Air Traffic Management and associated concepts and processes evolved during the last two decades, the methods for coordination in transfer have evolved as well. One of the major changes was the initial deployment of Air Ground Data Link (AGDL), which is supported by LOF and NAN messages. The OLDI Specification also addressed the role of the tactical controller involvement in the coordination dialogue process by the implementation of RTI and TIP messages.

The initial deployment of Free Route Airspace (FRA) started in 2009 and has progressed steadily thereafter. Free Route is an operational concept that enables airspace users to fly as close as possible to what they consider their optimal route without the constraints of a fixed route network structure. FRA is a specified airspace within which users may freely plan a route between defined FRA entry points and defined FRA exit points, with the possibility to route via intermediate (published or unpublished) waypoints, without reference to the ATS route network. FRA deployment was reinforced through the implementation of EC Regulation (EU) No. 2021/116, known as the Common Project One (CP1). This regulation requires FRA deployment in the airspace for which the Member States are responsible at and above flight level 305 in the ICAO EUR region, by 31 December 2022.

Over the last two years, a significant number of States have implemented or have provided plans to implement FRA. The scope of implementation in some cases has exceeded the CP1 requirement with operations reaching the lower airspace. There are also some FRA cross border and regional implementations with more planned in the large portions of European airspace in the next five years.

The OLDI Specification needs to cope with both the FRA requirement for co-ordination and transfer as well as with the conventional procedures related to the fixed ATS route network.

This Annex addresses the best practices of the OLDI data exchanges within the FRA environment, without any intentions to prescribe the mandatory data exchanges for FRA.

The set of OLDI data messages for FRA environment needs to be aligned with the operational requirements and bilaterally agreed between adjacent ATS units.

Several existing/adapted OLDI features might serve the FRA operational needs, especially those that are deemed very important for State and Regional FRA implementations as:

- There is a need for identification of a dynamic co-ordination point within the FRA environment.
  - The OLDI Specification provides the possibility for the handling of reference points with range and bearing from the published COP.
  - The OLDI Specification provides the possibility, when bilaterally agreed, to handle the coordination point for a flight on a direct route expressed by reference to latitude/longitude.
  - The OLDI Specification also provides the possibility for cases where the reference COP lies within the bilaterally agreed distance from the published COP - here only the COP identifier needs to be included, without any range and bearing. For example, system parameters for COP definition might be tuned so that all reference COPs within 5-10 NM distance from a published COP are considered as published

COPs. These parameters might be tuned per individual COP and would need to be bilaterally agreed with the adjacent ATS unit.
  - Although the OLDI Specification does not support the concept of gates between adjacent ATS units, some ANSPs have introduced the gate concept via specific HMI improvements. The ATS unit entry/exit boundary is divided in gates with a typical length of 10NM correlating the LAT/LONG entry/exit point with gate code. The system calculates the entry/exit gate as the intersection between the boundary and the flight trajectory displaying the gate code and LAT/LONG points where the flight will enter/exit the AoR. However, the OLDI messages contain only the reference to the LAT/LONG coordination point without the gate code plus route info.
- FRA requires that ATS units need to be aware of the traffic flying in close proximity to their Area of Responsibility (AoR) but not actually planned to penetrate their sectors, in order to support conflict probing during FRA clearances.
  - For this type of traffic close to the AoR boundaries, the OLDI specification provides the capability of INF, BFD or CFD data exchanges that might provide the required awareness of traffic intent, which could be used by a conflict probe function.
- FRA requires an exchange of sufficient details for the flight intent for Regional FRA deployment.
  - The exchange of OLDI route information could answer this need for Regional FRA implementations. The updated route info within the OLDI messages is a pre-requisite for having an accurate planned trajectory required for the proper functioning of ATC tools. The content of route information provided by the OLDI messages could be enhanced by using the interactive graphical trajectory editing tools that supports the LAT/LONG point as well as the route points with range and bearing from the published fixes.
  - The REV/RRV/SDM message allows transmitting the route information. SDM permits the route info exchanges until the transfer of the aircraft. Depending on the bi-lateral agreements in place, SDM might be useful to avoid being constrained by the REV/RRV time-out.
  - In case of tactical rerouting initiated by upstream unit, the MAC message might be beneficial for the improved ATCO situational awareness of the change flight intent in the downstream unit.
- In most of the cases within a FRA environment, the co-ordination and transfer of flights over dynamic coordination points should be considered as the standard co-ordination conditions.
  - The usage of referral messages (RAP, RRV) for FRA environment could be considered here, in order to avoid unwanted referrals for standard FRA co-ordinations. The RAP/RRV buffer could be made sufficiently large to accommodate the normal FRA coordination without referral, leaving only special cases that are outside the standard FRA coordination conditions to be referred to the adjacent unit (the defined boundaries in lateral and horizontal dimension like 40/50 NM abeam from the COP or outside FRA vertical limits).
- In some cases, FRA requires the tactical intervention and coordination at the short notice, which OLDI can support by:
  - In case a tactical DCT is requested by the downstream unit (e.g. in case of activation of a military area or in case of adverse weather), the CDN allows that unit to offer that the aircraft be sent on that DCT. It also allows proposing an alternative transfer flight level.
  - The use of SDM from the Accepting to the Transferring Unit will help in bringing situational awareness about the sector and frequency to which the flight has to be transferred. Implementing this message may support “skipping” the default entry sector without implementing the SCO / SKC messages.
  - At interfaces requiring a lot of tactical “short notice” coordination, the use of TIP and RTI may help alleviating the need for a large amount of verbal coordination.

Several FRA concepts, developed at National or cross border FRA, identified other conceptual means for co-ordination and transfer, such as gates, boundary segments or airspace volumes. A move from COP to the FRA coordination concepts would require a radical overhaul of the OLDI Specification and it will not correspond to the requirements stipulated by EC Regulation No 1032/2006. ANSPs might consider increasing the buffer around a COP to 40 or even 50 NM and all co-ordinations may be referenced to the published COP, without any Range and Bearing (R&B) from/to the reference COP, as standard coordination conditions.

2.5. OLDI message route information management and Free Route Airspace

2.5.1 Objective

The exchange of route information has existed since the first edition of the OLDI Specification was published in 1992. Route information is contained in a substantial number of OLDI messages and it is supported by ICAO format (field type 15) or by specific ADEXP primary field. The inclusion of the route information in OLDI messages is considered as a bilaterally agreed item, therefore not mandatory for OLDI exchanges. The ambiguities of processing and non-mandatory nature of the route information can lead to situations where the route information exchanges are incoherently deployed. Several such cases have been detected by operational stakeholders (mostly during system testing) which hampers the exchange of route information, such as:

- Some systems are sending the complete route information in OLDI messages. The receiving units use this route information to update the system flight plan, therefore potentially deteriorating the route content already extracted;
- Some systems only provide route information relevant to their AoR in OLDI messages. The receiving system replaces the extracted route with the route information sent by the upstream unit and potentially deteriorates the trajectory; manual update of system flight plan might be required.
- In some cases, the route information in the OLDI message is not used to amend the system flight plan trajectory but to completely replace it with the received one. Depending on the trajectory contained in the OLDI message this might lead to the deletion of a portion of the trajectory, which is deemed as operationally unacceptable.

New airspace concepts like Free Route Airspace (FRA) require information about the flight intent and the OLDI message exchanges that include route information can support this operational need. Despite the divergent deployments of OLDI route information exchanges, the OLDI group considers that this issue needs to be addressed from the perspective of cross-border FRA and the requirement of “Trajectory exchanges”.

As OLDI exchanges were never meant to be a vehicle for trajectory exchanges, this requirement was understood in the context of exchange of best possible flight intentions via the OLDI route information field. Therefore, these guidelines recommend the utilisation of route information adhering to the principles and examples listed below.

2.5.2 High level assumptions

In order to facilitate the exchanges of trajectories/route information, the OLDI group considers that the following assumptions are applicable. The OLDI specification indicates that the portion of route already overflown should not be included in the OLDI message exchanges. However, this requirement is deemed too restrictive. Therefore, these guidelines recommend that the OLDI messages should contain the route portion between “Route segment start” point and “Route segment end” point, taking into account the following assumptions:

1. “Route segment start” can be:
   - Last overflown fix, or
   - LAT/LONG (current position), or
   - A predefined distance from the exit point based on bilateral agreements.

The principles for the route segment start are applied to full FRA, FRA with intermediate points and the fixed route network.

2. "Route segment end" can be:
   - In the context of full FRA, the point to which the flight is cleared and preferably the route after, or
   - In the context FRA with intermediate points, at least the first intermediate point in the downstream ATS and optionally the remaining portion of the route if it is known, or
   - In the context of Fixed Route network, at least a point after COP and optionally the remaining portion of the route if it is known.

3. Alignment of Receiving ATS trajectory with the content of OLDI message route information:
   - Before COP, a portion of the route might be disregarded by different means (adaptation parameters, VSP, distance), or
   - Within AoR, a re-joining point of received route with the original route needs to be calculated by FDP (if the re-join point is not COP).

It should be noted that by applying these assumptions, the route information content might differ per OLDI messages, depending on the position of the flight.

The above assumptions are considered compatible with the current requirements of the OLDI Specification.

2.5.3 Scenario 1 - Full Free Route

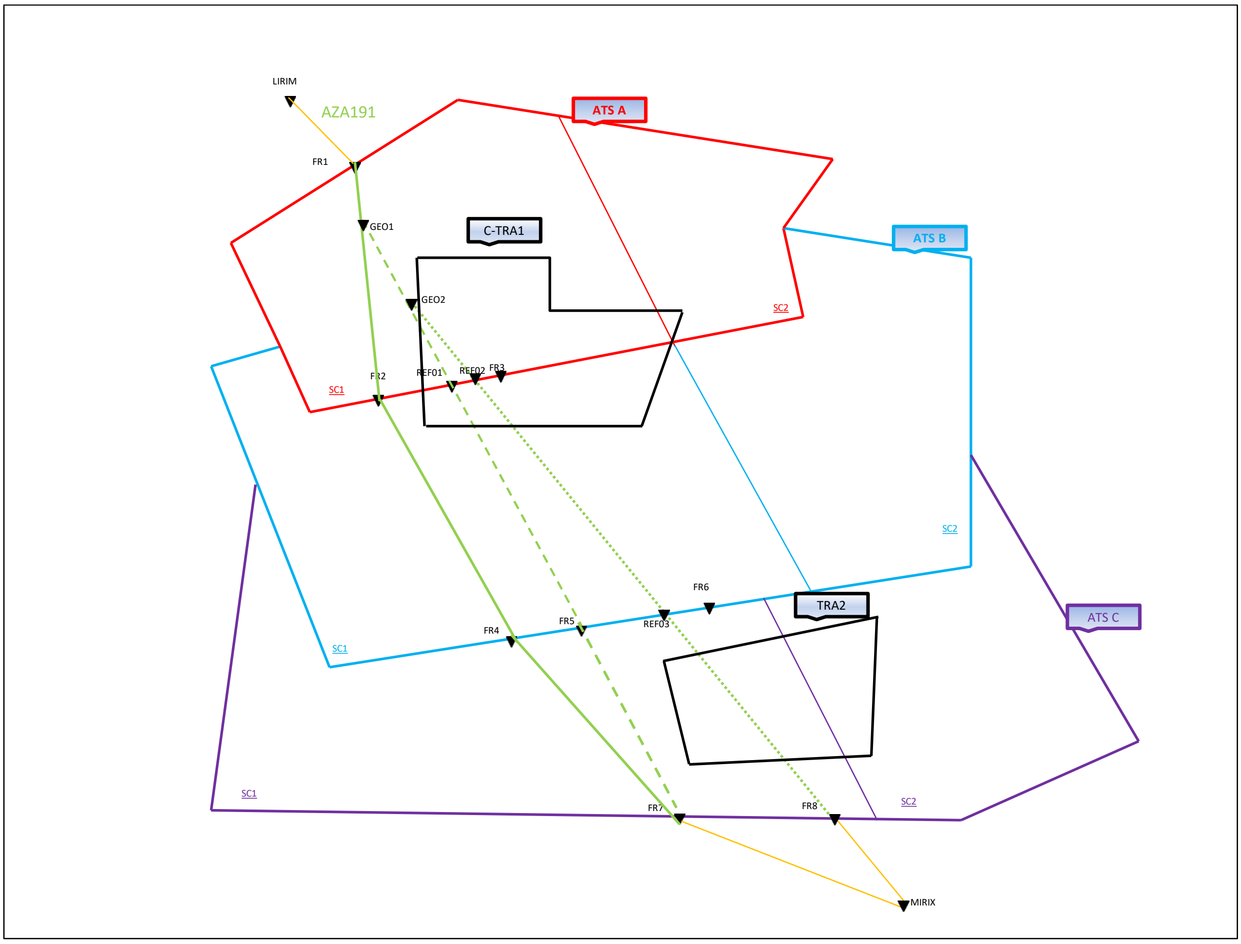


Figure 3 - FRA Full Free Route Scenario

The airspace and flight elements used for this scenario illustrated by Figure 3 are fictitious. Only the departure and destination airports exist. The airspace data is depicted as:

- ATS A in red with two sectors SC1 and SC2
- ATS B in blue with two sectors SC1 and SC2
- ATS C in purple with two sectors SC1 and SC2

The flight trajectories are depicted in green and the FRA Exit/Entry points in black. All ATS units deployed FRA without intermediate points and the fixed route network has been withdrawn. All ATS units retain the relevant static airspace data of the neighbouring FRA.

There is an active cross border area (C-TRA1) within the AORs of ATS A and ATS B, and a Temporarily Restricted Area (TRA2) within the AoR of ATS C, both depicted in black.

As bilaterally agreed, the ABI, ACT and REV messages sent between the concerned ATS units handle the route information elements as follows:

- A point with range and bearing from the COP, and/or
- A GEO point with LAT and LONG data.

Due to active C-TRA and TRA, the filed flight plan needs to circumnavigate around the reserved airspace. The IFPS distributed the original FPL (FPL-AZA191-IS –A320/M-SRWY/C –LIRF1130 -N0460F330 MIRIJ UM761 LIRIM UL908 FR1 DCT FR2 DCT FR4 DCT FR7 UM221 MIRIX UM231 –LCLK0240) to ATS A, ATS B and ATS C.

12:20 AZA191 overflies point LIRIM.

- ATS A extracts the following 2-D trajectory for flight AZA191 within its Area of Interest (AoI) as: LIRIM FR1 FR2 FR4 FR7 MIRIX
- ATS B calculates the following 2-D trajectory for flight AZA191 within its AoI as: FR1 FR2 FR4 FR7 MIRIX
- ATS C calculates the following 2-D trajectory for flight AZA191 within its AoI as: FR2 FR4 FR7 MIRIX

12:22 ATS A sends an ABI message to ATS B. The route elements contained in the ABI message are:

- Route segment start – Last overflown fix (LIRIM);
- Point between segment start /end – FR1;
- Route segment end - the point to which the flight is cleared (FR2) and route after (DCT FR4 DCT F7 DCT MIRIX).

-TITLE **ABI**
-REFDATA
    -SENDER -FAC **ATSA**
    -RECVR -FAC **ATSB**
    -SEQNUM **265**
-ARCID **AZA191**
-SSRCODE **A5571**
-ADEP **LIRF**
-COORDATA
    -PTID **FR2**
    -TO **1242**
    -TFL **F330**
-ADES **LCLK**
-ARCTYP **A320**
-ROUTE **N0460F330 LIRIM DCT FR1 DCT FR2 DCT FR4 DCT FR7 DCT MIRIX**

12:22 ATS B sends a LAM message to ATS A, correlates the received ABI with its corresponding flight plan data and attempts to align the AZA191 trajectory with the ABI message route information. The LIRIM point is disregarded due to its distance from the inbound COP, the remaining part of trajectory (FR1 FR2 FR4 FR7 MIRIX) is identical with the previously extracted from the FPL and the ABI message data is used for the timing recalculation over the points.

12:25 ATS A assumes flight AZA191.

12:27 The cross-border area (C-TRA1) is released earlier than planned. ATS A is notified via the real time Airspace Management (ASM) exchanges that this C-TRA1 is now available for planning purposes.

12:27 ATS A clears the flight AZA191 from the current position (GEO01) direct to FR5. By clearing the flight direct to FR5, the ATS A exit point changes to dynamic COP (REF01). The new trajectory for flight AZA191 within the AoI of ATS A is: LIRIM FR1 GEO01 REF01 FR5.

12:27 ATS A sends a revised ABI message to ATS B. The route elements contained in the ABI message are:

- Route segment start – Current position (GEO01);
- Point between segment start /end – Dynamic co-ordination point (REF01), which can be omitted as it is the calculated point and it is contained in the “coordata” field;
- Route segment end - the point to which the flight is cleared (FR5). The route after FR5 is not known and therefore is not provided.

-TITLE **ABI**
-REFDATA
    -SENDER -FAC **ATSA**
    -RECVR -FAC **ATSB**
    -SEQNUM **269**
-ARCID **AZA191**
-SSRCODE **A5571**
-ADEP **LIRF**
-COORDATA
    -PTID **REF01**
    -TO **1241**
    -TFL **F330**
-ADES **LCLK**
-ARCTYP **A320**
-REF
    -REFID **REF01**
    -PTID **FR3**
    -BRNG **255**
    -DISTNC **012**
-ROUTE **N0460F330 4205N02301E DCT FR5**

12:27 ATS B returns a LAM message and attempts to update the SFPL with the revised ABI message data. The co-ordination point is changed from FR2 to REF01 (reference to FR3 with range and bearing). ATS B keeps the first trajectory point FR1, inserts the point before COP (GEO01) according to the distance, the FRA entry/exit points with its AoR as provided by ABI message (route and coordination point) are considered. The ATS B FDP calculates the re-joining point of the received route information with the original route (FR7). The new trajectory for flight AZA191 within the AoI of ATS B is: FR1 GEO01 REF01 FR5 FR7 MIRIX.

12:31 ATS A sends an ACT message to ATS B and as bilaterally agreed, without any route information.

-TITLE **ACT**
-REFDATA
    -SENDER -FAC **ATSA**
    -RECVR -FAC **ATSB**
    -SEQNUM **389**
-ARCID **AZA191**
-SSRCODE **A5571**
-ADEP **LIRF**
-COORDATA

-PTID **REF01**
-TO **1241**
-TFL **F330**
-ADES **LCLK**
-ARCTYP **A320**
-REF
-REFID **REF01**
-PTID **FR3**
-BRNG **255**
-DISTNC **012**

12:31 ATS B returns a LAM message and the SFPL for flight AZA191 moves to a coordinated status. There is no update of the SFPL trajectory, as the route information was not provided by the ACT message. The coordination point REF01 is confirmed.

12:34 ATS B sends an ABI message to ATS C. The route elements contained in the ABI message are:

- Route Segment start – Last overflown fix (GEO01);
- Point between segment start /end – REF01, calculated point that is omitted;
- Route Segment end - the point to which the flight is cleared (FR5) and route after (FR7 MIRIX).

-TITLE **ABI**
-REFDATA
-SENDER -FAC **ATSB**
-RECVR -FAC **ATSC**
-SEQNUM **087**
-ARCID **AZA191**
-SSRCODE **A5571**
-ADEP **LIRF**
-COORDATA
-PTID **FR5**
-TO **1254**
-TFL **F330**
-ADES **LCLK**
-ARCTYP **A320**
-ROUTE **N0460F330 4205N02301E DCT FR5 DCT FR7 DCT MIRIX**

12:34 ATS C returns a LAM message and attempts to update the SFPL with the revised ABI message data. The co-ordination point is changed from FR4 to FR5. ATS C keeps the point before the COP (GEO01 and the FRA entry/exit points with its AoR as provided by ABI message (coordination point and route) are considered. The new trajectory for flight AZA191 within the AoI of ATS C is: GEO01 FR5 FR7 MIRIX.

12:37 The Restricted Area (TRA2) is released earlier than planned. ATS A is notified via the real time ASM exchanges that this TRA is available for GAT traffic.

12:38 ATS A performs the re-routing of the flight AZA191 from the current position (GEO02) direct to MIRIX. By clearing the flight direct to MIRIX, the ATS A exit point changes to dynamic COP (REF02). The new trajectory for flight AZA191 within the AoI of ATS A is: LIRIM FR1 GEO01 GEO02 REF02 MIRIX.

12:38 Due to non-standard conditions, a RRV message is sent to ATS B. As the ATS A/ATS B bilateral agreement requires a provision of route information within RRV messages, the route elements contained in the RRV message are:

- Route Segment start – Current Position (GEO02);
- Point between segment start /end – Dynamic Coordination point (REF02), which can be omitted as it is the calculated point and it is contained in "coordata" field;
- Route Segment end - the point to which the flight is cleared (MIRIX). The route after MIRIX is not known and therefore is not provided.

-TITLE **RRV**
-REFDATA
    -SENDER -FAC **ATSA**
    -RECVR -FAC **ATSB**
    -SEQNUM **457**
-ARCID **AZA191**
-SSRCODE **A5571**
-ADEP **LIRF**
-COORDATA
    -PTID **REF02**
    -TO **1241**
    -TFL **F330**
-ADES **LCLK**
-ARCTYP **A320**
-REF
    -REFID **REF02**
    -PTID **FR3**
    -BRNG **247**
    -DISTNC **007**
-ROUTE **N0460F330 4204N02300W DCT MIRIX**
-REASON **MANUAL**

12:38 The ATS B FDP receives the RRV message, returns a SBY message and refers the RRV message to the ATCO of sector SC1.

-TITLE **SBY**
-REFDATA
    -SENDER -FAC **ATSB**
    -RECVR -FAC **ATSA**
    -SEQNUM **323**
-MSGREF
    -SENDER -FAC **ATSA**
    -RECVR -FAC **ATSB**
    -SEQNUM **457**

12:39 ATS B SC1 reviews the ATS A proposal for the change of co-ordination conditions, tests for MTCD's conflict with "what-if" tool and identifies no issue in accepting it. ATS B SC1 accepts the proposed route modifications by sending an ACP message and a change of AZA191 trajectory is performed. The co-ordination point is changed from REF01 to REF02 (reference to FR3 with range and bearing). ATS B keeps the point before the COP (GEO02) according to its distance to its AoR, the FRA entry point as provided by the ABI message "coordata" field is considered, the FRA exit point is calculated as REF03 (reference to FR6 with range and bearing) as well as the point to which the flight is cleared (MIRIX). The new trajectory for flight AZA191 within the AoI of ATS B is: GEO02 REF02 REF03 MIRIX.

-TITLE **ACP**
-REFDATA
    -SENDER –FAC **ATSB**
    -RECVR -FAC **ATSA**
    -SEQNUM **369**
-MSGREF
    -SENDER -FAC **ATSA**
    -RECVR -FAC **ATSB**
    -SEQNUM **457**
-ARCID **AZA191**
-ADEP **LIRF**
-ADES **LCLK**

12:39 ATS B sends a revised ABI message to ATS C. The route elements contained in the ABI message are:

- Route segment start - Present position (GEO02);
- Point between segment start /end - REF02 omitted as calculated point while REF03 is also omitted as it is contained in “coordata” field;
- Route segment end - The point to which the flight is cleared (MIRIX), the route after is unknown.

-TITLE **ABI**
-REFDATA
    -SENDER -FAC **ATSB**
    -RECVR -FAC **ATSC**
    -SEQNUM **099**
-ARCID **AZA191**
-SSRCODE **A5571**
-ADEP **LIRF**
-COORDATA
-PTID **REF03**
-TO **1256**
-TFL **F330**
-ADES **LCLK**
-ARCTYP **A320**
-REF
    -REFID **REF03**
    -PTID **FR6**
    -BRNG **266**
    -DISTNC **011**
-ROUTE **N0460F330 4204N02301W DCT MIRIX**

12:40 ATS C returns a LAM message and attempts to update the SFPL with the revised ABI message data. The co-ordination point is changed from FR5 to REF03 (reference to FR6 with range and bearing). ATS C keeps point GEO02, the FRA entry/exit points with its AoR as provided by ABI are considered and MIRIX point is reconfirmed. The new trajectory for flight AZA191 within the AoI of ATS C is: GEO02 REF03 FR8 MIRIX.

12:41 ATS A instructs the flight AZA191 to contact ATS B by sending a COF message.

-TITLE **COF**
-REFDATA
    -SENDER -FAC **ATSA**
    -RECVR -FAC **ATSB**
    -SEQNUM **579**
-ARCID **AZA191**

12:41 ATS B indicates the establishment of radio contact with the flight AZA191 by sending a MAS message.

-TITLE **MAS**
-REFDATA
    -SENDER -FAC **ATSB**
    -RECVR -FAC **ATSA**
    -SEQNUM **476**
-ARCID **AZA191**

12:42 ATS A terminates AZA191 flight.

2.5.4 Scenario 2 - FRA Intermediate Point

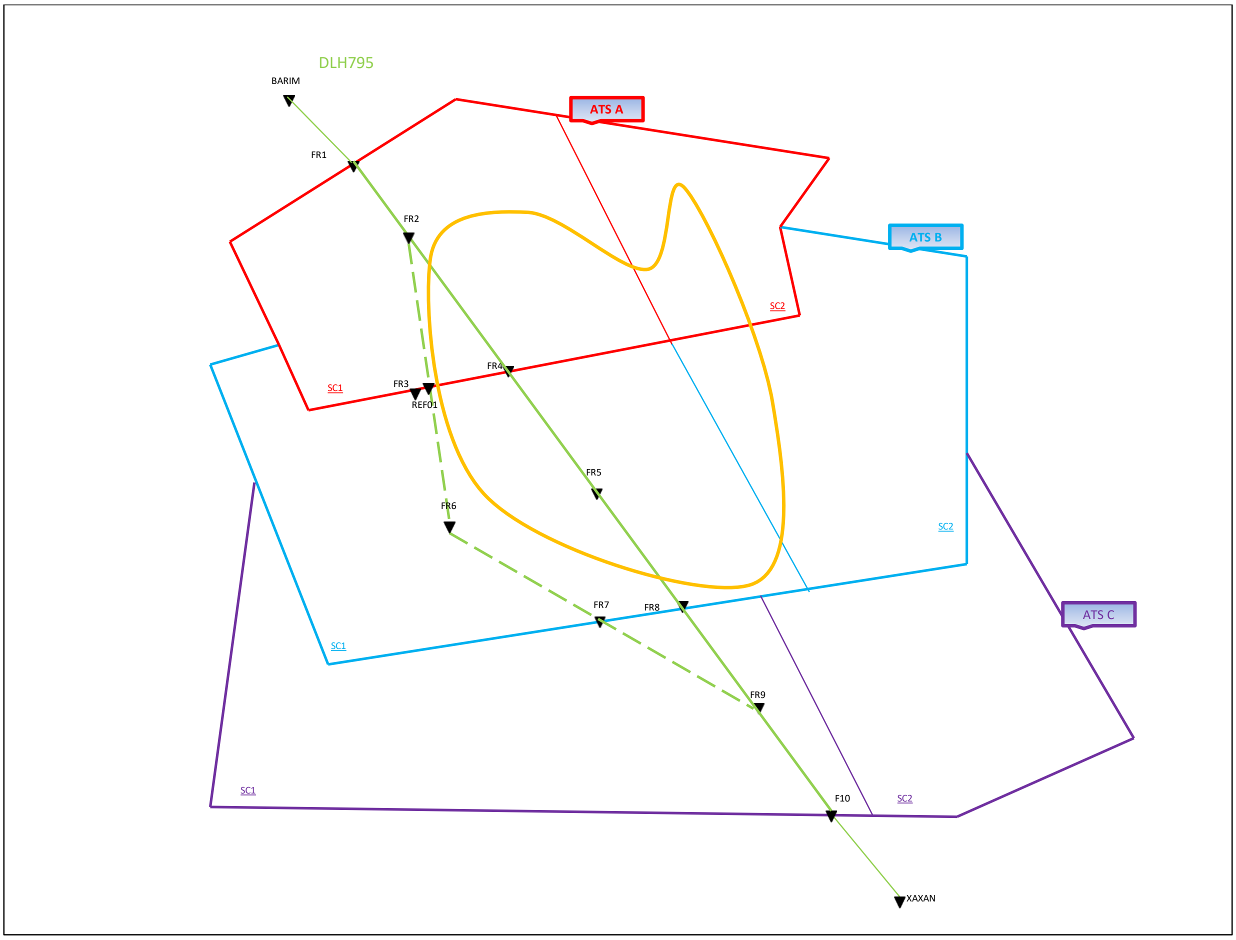


Figure 4 - FRA Intermediate Point Scenario

The airspace and flight elements used for this scenario illustrated by Figure 4 are fictitious. Only the departure and destination airports exist. The airspace data is depicted as:

- ATS A in red with two sectors SC1 and SC2

- ATS B in blue with two sectors SC1 and SC2
- ATS C in purple with two sectors SC1 and SC2

The flight trajectories are depicted in green and the FRA Exit/Entry points in black. All ATS units deployed FRA with intermediate points and the fixed route network has been withdrawn. The ATS units retain some static airspace data of the neighbouring FRA.

The IFPS distributed the original FPL (FPL-DLH795-IS –A320/M-SRWY/C –EDDM0730 -N0420F370 BARIM LG818 FR1 DCT FR2 DCT FR4 DCT FR5 DCT FR8 DCT FR9 DCT F10 UG671 XAXAN UM337 –LWSK0210) to ATS A, ATS B and ATS C.

Severe weather has developed a few hours before the DLH795 departure within the airspace of ATS A and ATS B, the weather contours are indicated in orange.

07:25 DLH795 overflies point BARIM.

- ATS A extracts the following 2-D trajectory for flight DLH795 within its AoI as: BARIM FR1 FR2 FR4 FR5
- ATS B calculates the following 2-D trajectory for flight DLH795 within its AoI as: FR2 FR4 FR5 FR8 FR9
- ATS C calculates the following 2-D trajectory for flight DLH795 within its AoI as: FR5 FR8 FR9 F10 XAXAN

07:28 ATS A sends an ABI message to ATS B. The route elements contained in the ABI message are:

- Route segment start - Last overflown fix (BARIM);
- Points between segment start /end - FR1, FR2 and FR4 (coordination point);
- Route segment end - The first intermediate point in the downstream ATS (FR5), the remaining portion of the route is unknown.

-TITLE **ABI**
-REFDATA
    -SENDER -FAC **ATSA**
    -RECVR -FAC **ATSB**
    -SEQNUM **009**
-ARCID **DLH795**
-SSRCODE **A1165**
-ADEP **EDDM**
-COORDATA
    -PTID **FR4**
    -TO **0748**
    -TFL **F370**
-ADES **LWSK**
-ARCTYP **A320**
-ROUTE **N0420F370 BARIM DCT FR1 DCT FR2 DCT FR4 DCT FR5**

07:28 ATS B sends a LAM message to ATS A, correlates the received ABI with its corresponding flight plan data and attempts to align the DLH795 trajectory with the ABI message route information. The BARIM and FR1 points are disregarded due to their distance from the inbound COP, the remaining part of trajectory (FR2 FR4 FR5) is identical with the portion of previously extracted from the FPL and the ABI message data is used for the timing recalculation over the points.

07:30 ATS A assumes flight DLH795.

07:31: As severe weather develops in south-east part of ATS A SC1, the pilot requests weather avoidance re-routing.

07:32 ATS A clears the flight DLH795 from the FRA intermediate point (FR2) direct to FR6. By clearing the flight direct to FR6, the ATS A exit point changes to dynamic COP (REF01). The new trajectory for flight DLH795 within the AoI of ATS A is: BARIM FR1 FR2 REF01 FR6.

07:32 ATS A sends a revised ABI message to ATS B. The route elements contained in the ABI message are:

- Route segment start - Last overflown point (FR2).
- Point between segment start /end - Dynamic co-ordination point (REF01), which can be omitted as it is the calculated point and it is contained in “coordata” field.
- Route segment end - The first intermediate point in the downstream ATS (FR6). The route after FR6 is not known and therefore is not provided.

-TITLE **ABI**
-REFDATA
    -SENDER -FAC **ATSA**
    -RECVR -FAC **ATSB**
    -SEQNUM **021**
-ARCID **DLH795**
-SSRCODE **A1165**
-ADEP **EDDM**
-COORDATA
    -PTID **REF01**
    -TO **0748**
    -TFL **F370**
-ADES **LWSK**
-ARCTYP **A320**
-REF
    -REFID **REF01**
    -PTID **FR3**
    -BRNG **011**
    -DISTNC **007**
-ROUTE **N0420F370 FR2 DCT FR6**

07:32 ATS B returns a LAM message and attempts to update the SFPL with the revised ABI message data. The co-ordination point is changed from FR4 to REF01 (reference to FR3 with range and bearing). ATS B keeps the first trajectory point FR2 according to its distance, inserts the FRA entry point (REF01) and intermediate FRA point (F6) as provided by the ABI message. The ATS B FDP calculates the re-joining point of the received route information with the original route (FR9). The ATS B FDP calculates the FRA exit to be FR7. The new trajectory for flight DLH795 within the AoI of ATS B is: FR2 REF01 FR6 FR7 FR9.

07:38 ATS A sends an ACT message to ATS B and as bilaterally agreed, without any route information.

-TITLE **ACT**
-REFDATA

-SENDER -FAC **ATSA**
-RECVR -FAC **ATSB**
-SEQNUM **035**
-ARCID **DLH795**
-SSRCODE **A1165**
-ADEP **EDDM**
-COORDATA
-PTID **REF01**
-TO **0748**
-TFL **F370**
-ADES **LWSK**
-ARCTYP **A320**
-REF
-REFID **REF01**
-PTID **FR3**
-BRNG **011**
-DISTNC **007**

07:38 ATS B returns a LAM message and the SFPL for flight DLH795 changes to a coordinated status. There is no update of the SFPL trajectory, as the route information was not provided by the ACT message. The coordination point REF01 is confirmed.

07:41 ATS B sends an ABI message to ATS C. The route elements contained in the ABI message are:

- Route segment start - Last overflown fix (FR2);
- Points between segment start /end - FR6 and FR7;
- Route segment end - The first intermediate point in the downstream ATS (FR9), the remaining portion of route is not known to ATS B.

-TITLE **ABI**
-REFDATA
-SENDER -FAC **ATSB**
-RECVR -FAC **ATSC**
-SEQNUM **753**
-ARCID **DLH795**
-SSRCODE **A1165**
-ADEP **EDDM**
-COORDATA
-PTID **FR7**
-TO **0801**
-TFL **F370**
-ADES **LWSK**
-ARCTYP **A320**
-REF
-REFID **REF01**
-PTID **FR3**
-BRNG **011**
-DISTNC **007**
-ROUTE **N0420F370 FR2 DCT FR6 DCT FR7 DCT FR9**

07:41 ATS C returns a LAM message and attempts to update the SFPL with the revised ABI message data. The co-ordination point is changed from FR8 to FR7. The points before the COP

(FR2) are disregarded according to the distance criteria, while another point before the COP is kept (FR6). The FRA entry point is provided by the ABI message as well as the point where the route re-joins the previously calculated route (FR9). The new trajectory for flight DLH795 within the AoI of ATS C is: FR6 FR7 FR9 F10 XAXAN.

2.5.5 Scenario 3 - Fixed route

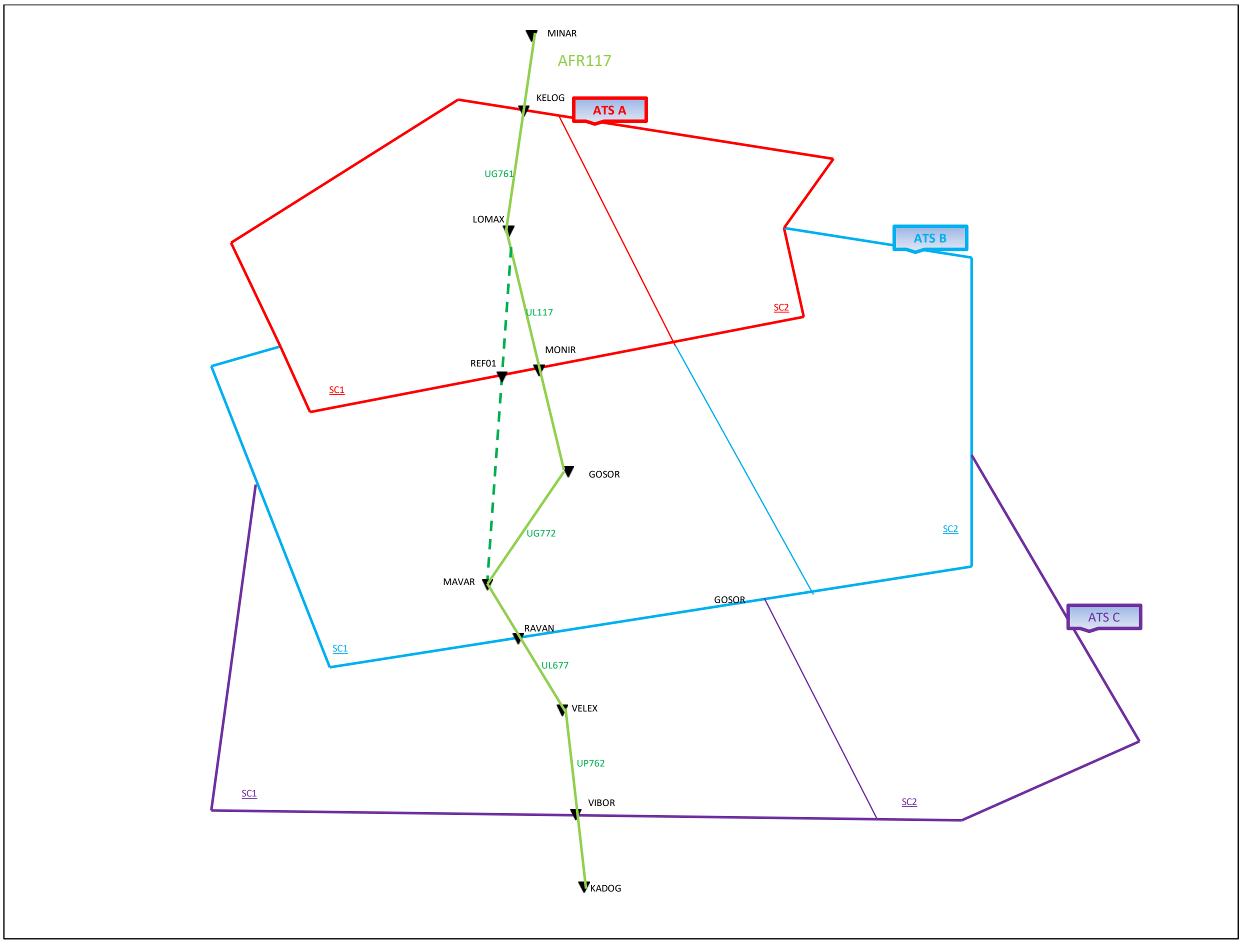


Figure 5 - FRA Fixed Route Scenario

The airspace and flight elements used for this scenario illustrated by Figure 5 are fictitious. Only the departure and destination airports exist. The airspace data is depicted as:

ATS A in red with two sectors SC1 and SC2

ATS B in blue with two sectors SC1 and SC2

ATS C in purple with two sectors SC1 and SC2

The flight trajectories are depicted in green and the route crossing and ATS Exit/Entry points in black. The ATS units retain limited static airspace data of the neighbouring FRA.

The IFPS distributed the original FPL (FPL-AFR117-IS –A319/M-SRWY/C –EDDF0930 -N0420F350 LOGOS UP117 MINAR UG761 LOMAX UL117 GOSOR UG772 MAVAR UL677 VELEX UP762 KAGOG UP761 ZAZAN –LBSF0200) to ATS A, ATS B and ATS C.

09:45 AFR117 overflies point MINAR.

- ATS A extracts the following 2-D trajectory for flight AFR117 within its AoI as: MINAR KELOG LOMAX MONIR GOSOR
- ATS B calculates the following 2-D trajectory for flight AFR117 within its AoI as: LOMAX MONIR GOSOR MAVAR RAVAN VELEX
- ATS C calculates the following 2-D trajectory for flight AFR117 within its AoI as: MAVAR RAVAN VELEX VIBOR KADOG

09:48 ATS A sends an ABI message to ATS B. The route elements contained in the ABI message are:

- Route segment start – Last overflown fix (MINAR);
- Points between segment start /end – KELOG, LOMAX and MONIR;
- Route segment end - The point after the COP (GOSOR), the remaining portion of the route is unknown.

-TITLE **ABI**
-REFDATA
    -SENDER -FAC **ATSA**
    -RECVR -FAC **ATSB**
    -SEQNUM **786**
-ARCID **AFR117**
-SSRCODE **A2007**
-ADEP **EDDF**
-COORDATA
    -PTID **MONIR**
    -TO **1008**
    -TFL **F350**
-ADES **LBSF**
-ARCTYP **A319**
-ROUTE **N0420F350 MINAR DCT KELOG DCT LOMAX DCT MONIR DCT GOSOR**

09:48 ATS B sends a LAM message to ATS A, correlates the received ABI with its corresponding flight plan data and attempts to align the AFR117 trajectory with the ABI message route information. The MINAR and KELOG points are disregarded due to their distance from the inbound COP, the remaining part of trajectory (LOMAX MONIR GOSOR) is identical with the portion of previously extracted from the FPL and the ABI message data is used for the timing recalculation over the points.

09:50 ATS A assumes flight AFR117.

09:54 AFR117 overflies point LOMAX.

09:55 AFR117 requests a direct route to MAVAR.

09:56 ATS A clears the flight AFR117 after LOMAX direct to MAVAR. By clearing the flight direct to MAVAR, the ATS A exit point changes to dynamic COP (REF01). The new trajectory for flight AFR117 within the AoI of ATS A is: MINAR KELOG LOMAX REF01 MAVAR.

09:56 ATS A sends a revised ABI message to ATS B. The route elements contained in the ABI message are:

- Route segment start - Last overflown point (LOMAX);
- Point between segment start /end - Dynamic co-ordination point (REF01), which can be omitted as it is the calculated point and it is contained in “coordata” field;

- Route segment end - The point after the COP (MAVAR). The route after MAVAR is not known and therefore is not provided.

  -TITLE **ABI**
  -REFDATA
      -SENDER -FAC **ATSA**
      -RECVR -FAC **ATSB**
      -SEQNUM **797**
  -ARCID **AFR117**
  -SSRCODE **A2007**
  -ADEP **EDDF**
  -COORDATA
      -PTID **REF01**
      -TO **1007**
      -TFL **F350**
  -ADES **LBSF**
  -ARCTYP **A319**
  -REF
      -REFID **REF01**
      -PTID **MONIR**
      -BRNG **265**
      -DISTNC **006**
  -ROUTE **N0420F350 LOMAX DCT MAVAR**

09:56 ATS B returns a LAM message and attempts to update the SFPL with the revised ABI message data. The co-ordination point is changed from MONIR to REF01 (reference to MONIR with range and bearing). ATS B keeps the first trajectory point LOMAX according to its distance, inserts the entry point (REF01) and the point after the COP (MAVAR) as provided by ABI message. The ATS B FDP calculates the re-joining point of the received route information with the original route (MAVAR). The remaining route portion is unaltered. The new trajectory for flight AFR117 within the AoI of ATS B is: LOMAX REF01 MAVAR RAVAN VELEX.

09:57 ATS A sends ACT to ATS B and as bilaterally agreed, without any route information.

-TITLE **ACT**
-REFDATA
    -SENDER -FAC **ATSA**
    -RECVR -FAC **ATSB**
    -SEQNUM **812**
-ARCID **AFR117**
-SSRCODE **A2007**
-ADEP **EDDF**
-COORDATA
    -PTID **REF01**
    -TO **1007**
    -TFL **F350**
-ADES **LBSF**
-ARCTYP **A319**
-REF
    -REFID **REF01**
    -PTID **MONIR**
    -BRNG **265**
    -DISTNC **006**

09:57 ATS B returns a LAM message and the SFPL for flight AFR117 changes to a coordinated status. There is no update of the SFPL trajectory, as the route information was not provided by the ACT message. The coordination point REF01 is confirmed.

10:00 ATS B sends an ABI message to ATS C. The route elements contained in the ABI message are:

- Route segment start - Last overflown fix (LOMAX);
- Point between segment start /end - MAVAR, RAVAN (which can be omitted as it is contained in “coordata” field);
- Route segment end - The point after the COP (VELEX). The route after VELEX is unknown and therefore is not provided.

-TITLE **ABI**
-REFDATA
    -SENDER -FAC **ATSB**
    -RECVR -FAC **ATSC**
    -SEQNUM **455**
-ARCID **AFR117**
-SSRCODE **A2007**
-ADEP **EDDF**
-COORDATA
    -PTID **RAVAN**
    -TO **1020**
    -TFL **F350**
-ADES **LBSF**
-ARCTYP **A319**
-ROUTE **N0420F370 LOMAX DCT MAVAR DCT VELEX**

10:00 ATS C returns a LAM message and attempts to update the SFPL with the revised ABI message data. The co-ordination point remains the same (RAVAN). The point before the COP (LOMAX) is disregarded according to the distance criteria, while another point before the COP is kept (MAVAR). The entry point is provided by ABI message (“coordata” field) and the remaining route portion is unaltered. The ABI message does not cause a change to the ATS C 2-D trajectory for flight AFR117 and the ABI message data is used for the timing recalculation over the points.

2.5.6 Scenario 4 - Route change initiated by the downstream unit

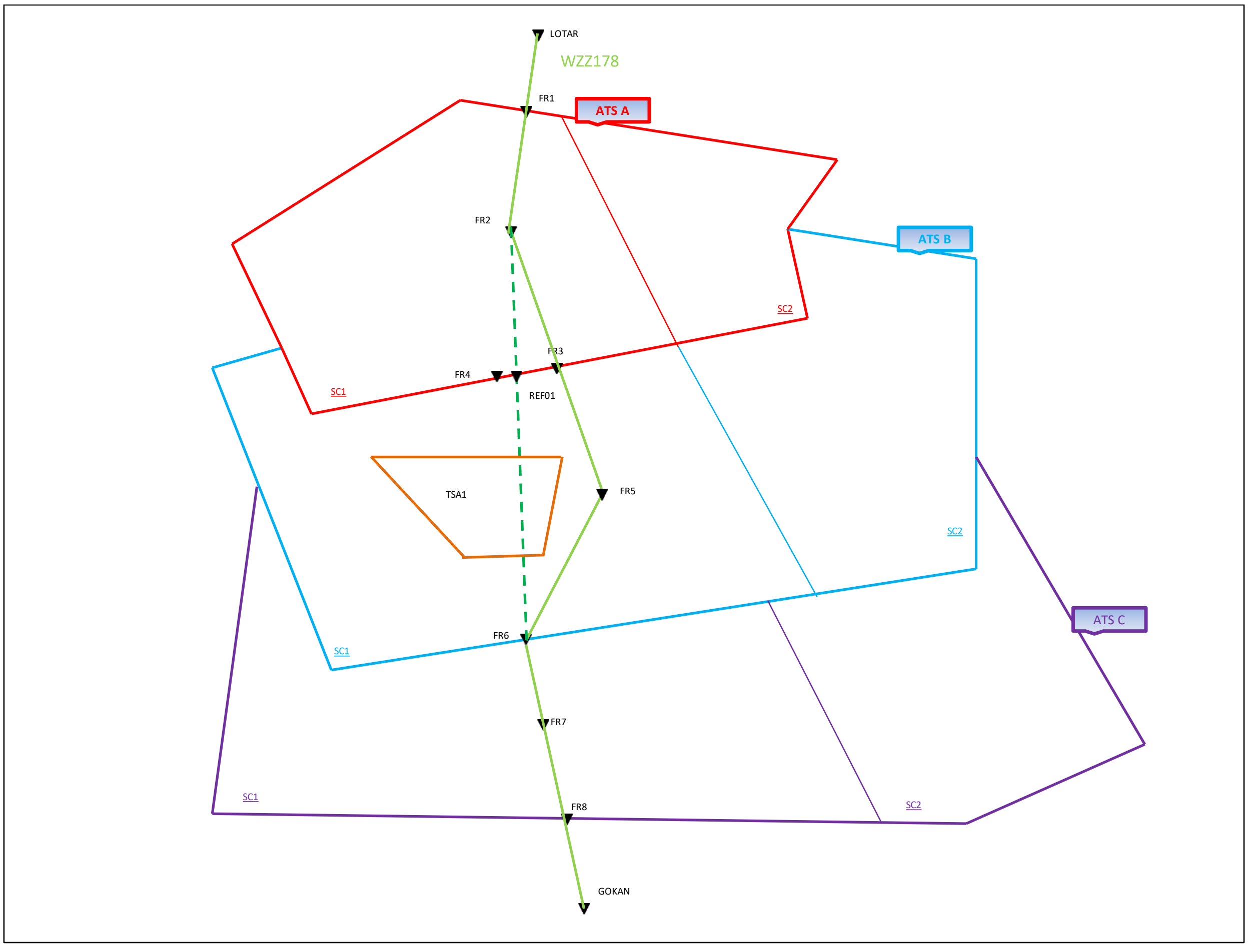


Figure 6 - FRA Route Change Scenario

The airspace and flight elements used for this scenario illustrated by Figure 6 are fictitious. Only the departure and destination airports exist. The airspace data is depicted as:

- ATS A in red with two sectors SC1 and SC2
- ATS B in blue with two sectors SC1 and SC2
- ATS C in purple with two sectors SC1 and SC2

The flight trajectories are depicted in green and the route crossing and ATS Exit/Entry points in black. The ATS units retain limited static airspace data of the neighbouring FRA.

There is an active Temporarily Segregated Area (TSA1) within AoR of ATS B depicted in brown.

The IFPS distributed the original FPL (FPL-WZZ178-IS –A320/M-SRWY/C –LWSK0930 -N0420F350 XEROX UL761 MINIM UG912 LOTAR DCT FR1 DCT FR2 DCT FR3 DCT FR5 DCT FR6 DCT FR 7 DCT FR8 DCT GOKAN UP118 MILAR UG782 LOMAG –EDDM0220) to ATS A, ATS B and ATS C.

10:15 WZZ178 overflies point LOTAR.

- ATS A extracts the following 2-D trajectory for flight WZZ178 within its AoI as: LOTAR FR1 FR2 FR3 FR5 FR6

- ATS B calculates the following 2-D trajectory for flight WZZ178 within its AoI as: FR1 FR2 FR3 FR5 FR6 FR7 FR8
- ATS C calculates the following 2-D trajectory for flight WZZ178 within its AoI as: FR3 FR5 FR6 FR7 FR8 GOKAN

10:18 ATS A sends an ABI message to ATS B. The route elements contained in the ABI message are:

- Route segment start - Last overflown fix (LOTAR);
- Point between segment start /end - FR1, FR2 and FR3 (coordination points);
- Route segment end - The first intermediate point in the downstream ATS (FR5) and the remaining portion of the route (FR6).

-TITLE **ABI**
-REFDATA
    -SENDER -FAC **ATSA**
    -RECVR -FAC **ATSB**
    -SEQNUM **023**
-ARCID **WZZ178**
-SSRCODE **A3064**
-ADEP **LWSK**
-COORDATA
    -PTID **FR3**
    -TO **1038**
    -TFL **F350**
-ADES **EDDM**
-ARCTYP **A320**
-ROUTE **N0420F350 LOTAR DCT FR1 DCT FR2 DCT FR3 DCT FR5 DCT FR6**

10:18 ATS B sends a LAM message to ATS A, correlates the received ABI with its corresponding flight plan data and attempts to align the WZZ178 trajectory with the ABI message route information. The LOTAR point is disregarded due to its distance from the inbound COP, the remaining part of trajectory (FR1 FR2 FR3 FR5 FR6) identical with the portion previously extracted from the FPL is kept and the ABI message data is used for the timing recalculation over the points.

10:20 ATS A assumes WZZ178.

10:24: The Temporarily Segregated Area (TSA1) is released earlier than planned. ATS B was notified via the real time ASM exchanges that this TRA is available for GAT traffic, but ATS A is unaware that TSA1 has been released.

10:24: ATS A and ATS B have bilaterally agreed that in the case of an early release of segregated airspace within the AoR of ATS B, ATS B should propose a re-routing to make use of such opportunities. In that respect, ATS B creates a direct tentative trajectory FR2 DCT FR6. The ATS B system trajectory is not updated as ATS B SC1 only composes a proposal that ATS A may accept or reject.

10:24 ATS B sends a tactical instruction request (RTI message) to ATS A.

-TITLE **RTI**
-REFDATA
    -SENDER -FAC **ATSB**
    -RECVR -FAC **ATSA**

-SEQNUM **776**
-ARCID **WZZ178**
-SSRCODE **A3064**
-ADEP **LWSK**
-DCT **FR2 FR6**
-ADES **EDDM**

10:25 The ATS A FDP receives the RTI message, returns a SBY message and refers the RTI message to the ATCO of sector SC1.

-TITLE **SBY**
-REFDATA
-SENDER -FAC **ATSA**
-RECVR -FAC **ATSB**
-SEQNUM **035**
-MSGREF
-SENDER -FAC **ATSB**
-RECVR -FAC **ATSA**
-SEQNUM **776**

10:26 The proposed trajectory change is graphically presented on ATS A SC1, ATS A SC1 reviews the ATS B proposal for direct routing and change of coordination conditions, tests for MTCD's conflict with "what-if" tool and identifies no issue in accepting it. ATS A SC1 accepts the proposed route modifications by sending an ACP message.

-TITLE **ACP**
-REFDATA
-SENDER –FAC **ATSA**
-RECVR -FAC **ATSB**
-SEQNUM **043**
-MSGREF
-SENDER -FAC **ATSB**
-RECVR -FAC **ATSA**
-SEQNUM **776**
-ARCID **WZZ178**
-ADEP **LWSK**
-ADES **EDDM**

10:26 By accepting the RTI message, ATS A FDPS automatically updates the system trajectory using the RTI message data (DCT FR2 FR6). ATS A FDPS identifies that the FR2 point as the start of route change and the FR6 point as the end of route. It also calculates a new coordination point (REF01) with range and bearing relative to FR3. The points before FR2 are kept, the segment between FR2 and FR6 is updated (FR4 and FR5 are removed while REF01 is added). The new trajectory for flight WZZ178 within the AoI of ATS A is: LOTAR FR1 FR2 REF01 FR6.

10:26 ATS A clears the flight WZZ178 to proceed direct from the FRA intermediate point (FR2) to FR6.

10:26 ATS A sends a revised ABI to ATS B. The route elements contained in the ABI message are:

- Route Segment start – Last overflown point (FR1);

- Point between segment start /end – FR2 and Dynamic Coordination point (REF01), which can be omitted as it is the calculated point and it is contained in "coordata" field;
- Route Segment end - the point to which the flight is cleared (FR6). The route after FR6 is unknown and therefore is not provided.

-TITLE **ABI**
-REFDATA
    -SENDER -FAC **ATSA**
    -RECVR -FAC **ATSB**
    -SEQNUM **076**
-ARCID **WZZ178**
-SSRCODE **A3064**
-ADEP **LWSK**
-ADES **EDDM**
-ARCTYP **A320**
-REF
    -REFID **REF01**
    -PTID **FR4**
    -BRNG **035**
    -DISTNC **07**
-COORDATA
    -PTID **REF01**
    -TO **1038**
    -TFL **F350**
-ROUTE **N0420F370 FR1 DCT FR2 DCT FR6**

10:27 ATS B returns a LAM message and attempts to update the WZZ178 SFPL with the revised ABI message data. The co-ordination point is changed from FR3 to REF01 (reference to FR4 with range and bearing). ATS B keeps the first two trajectory points FR1 and FR2 according to their distance, inserts the entry point (REF01), calculates the re-joining point of the received route with the original FPL route (FR6) which is also the exit point. The new trajectory for flight WZZ178 within the AoI of ATS B is: FR1 FR2 REF01 FR6 FR7 FR8.

10:28 ATS A sends an ACT message to ATS B and as bilaterally agreed, without any route information.

-TITLE **ACT**
-REFDATA
    -SENDER -FAC **ATSA**
    -RECVR -FAC **ATSB**
    -SEQNUM **089**
-ARCID **WZZ178**
-SSRCODE **A3064**
-ADEP **LWSK**
-COORDATA
    -PTID **REF01**
    -TO **1038**
    -TFL **F350**
-ADES **EDDM**
-ARCTYP **A320**
-REF
    -REFID **REF01**
    -PTID **FR4**
    -BRNG **035**

-DISTNC **07**

10:28 ATS B returns a LAM message and the SPFL for flight WZZ178 moves to a coordinated status. There is no update of the SFPL trajectory, as the route information was not provided by the ACT message. The coordination point REF01 is confirmed.

10:34 ATS B sends an ABI message to ATS C. The route elements contained in the ABI message are:

- Route segment start - Last overflown fix (FR2);
- Points between segment start /end - REF01(which can be omitted as it is the calculated point) and FR6 (which can be omitted as it is a coordination point);
- Route segment end - The first intermediate point in the downstream ATS (FR7) and the remaining portion of route FR8.

For the purpose of this scenario, the calculated and coordination points are included in the route field of the ABI message.

-TITLE **ABI**
-REFDATA
  -SENDER -FAC **ATSB**
  -RECVR -FAC **ATSC**
  -SEQNUM **558**
-ARCID **WZZ178**
-SSRCODE **A3064**
-ADEP **LWSK**
-COORDATA
  -PTID **FR6**
  -TO **1054**
  -TFL **F350**
-ADES **EDDM**
-ARCTYP **A320**
-ROUTE **N0420F370 FR2 DCT FR3035007 DCT FR6 DCT FR7 DCT FR8**

10:34 ATS C returns a LAM message and attempts to update the SFPL with the revised ABI message data. The co-ordination point is not changed (FR6). The point before the COP (FR2) is disregarded according to the distance criteria, while another point before the COP is kept (REF01). The FRA entry/intermediate/exit points within the AoR as provided by the ABI message are considered and the segment after FR8 remains unaltered. The new trajectory for flight WZZ178 within the AoI of ATS C is: REF01 FR6 FR7 FR8 GOKAN.

2.5.7 Scenario 5 - Vertical route change (XFL application)

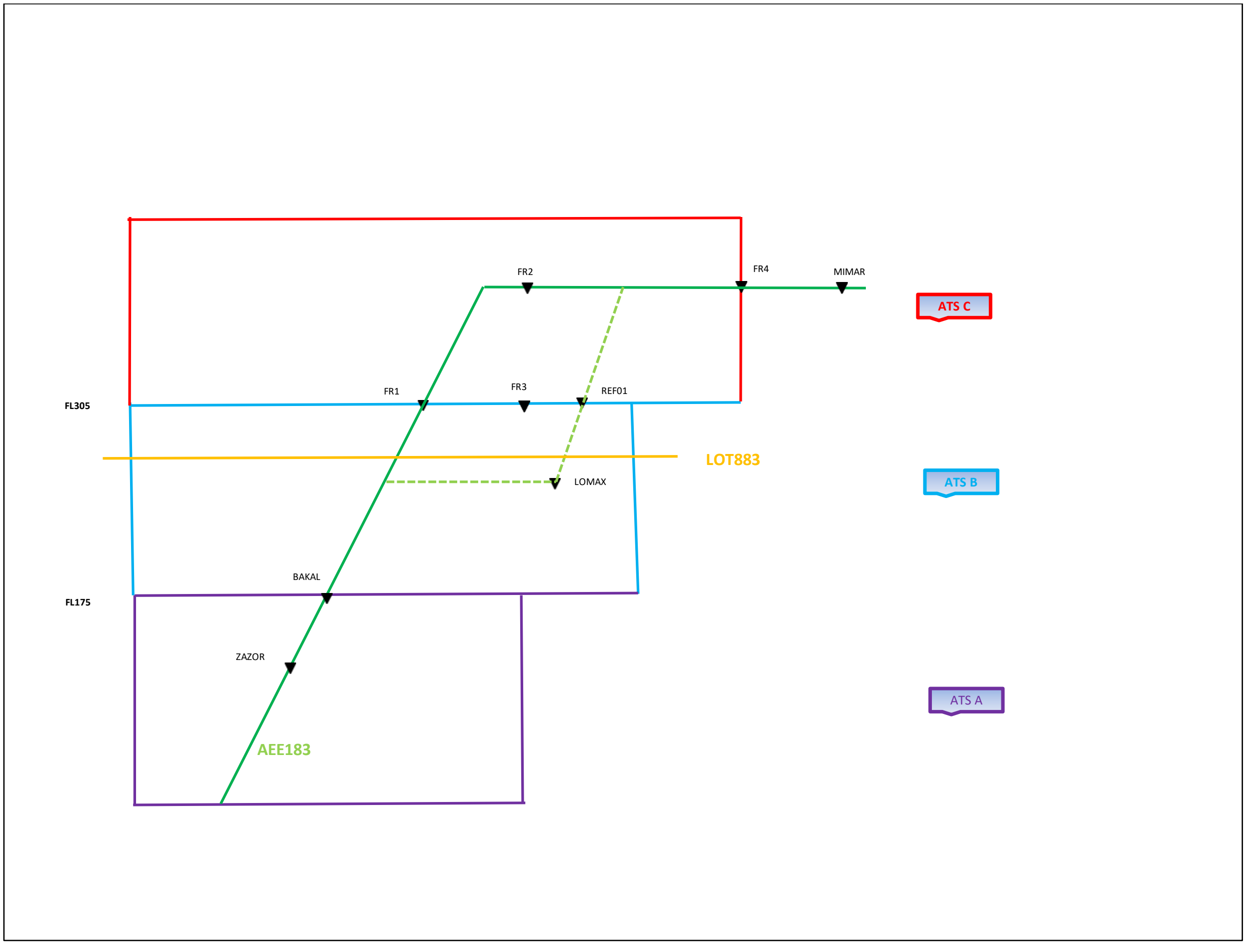


Figure 7 - FRA Vertical Route Change Scenario (XFL)

The airspace and flight elements used for this scenario illustrated by Figure 7 are fictitious. Only the departure and destination airports exist. The airspace data is depicted as:

- ATS C in red
- ATS B in blue
- ATS A in purple

The flight trajectories are depicted in green and the route crossing and ATS Exit/Entry points in black. All depicted ATS units retain full static airspace data of the neighbouring airspaces. However, they apply different trajectory prediction algorithms and different default rates of climb.

This scenario is applicable in cases that the downstream ATS unit can coordinate flight levels (FLs) and issue clearances outside the vertical boundaries assigned to the concerned ATS units.

Athens (LGAV) TWR unit and ATS A use the same FDPS, the OLDI messages concerning LGAV departures are provided by ATS A.

The IFPS distributed the original FPL (FPL-AEE183-IS –CRJ7/M-SRWY/C –LGAV0930 -N0420F350 ZAZOR LM178 BAKAL UM981 FR1 DCT FR2 DCT FR4 UR091 MIMAR UL762 GOROZ UL881 NAZAR LG761 KOBIL –EPWA0230) to ATS A, ATS B and ATS C.

ATS A extracts the following 4-D trajectory for flight AEE183 within its AoI as:

Horizontal position	LGAV	ZAZOR	BAKAL
FL	00	120	170
Time	0930	0937	0939

ATS B calculates the following 2-D trajectory for flight AEE183 within its AoI as:

Horizontal position	ZAZOR	BAKAL	FR1	FR2	FR4
FL	130	180	310	350	350
Time	0937	0939	0947	0953	0959

ATS C calculates the following 2-D trajectory for flight AEE183 within its AoI as:

Horizontal position	BAKAL	FR1	FR2	FR4	MIMAR
FL	180	300	350	350	350
Time	0940	0948	0954	1000	1006

09:25 ATS A sends a PAC message to ATS B with the estimated take-off time (ETOT). The route information is not provided as bilaterally agreed between ATS A and ATS B.

-TITLE **PAC**
-REFDATA
    -SENDER -FAC **ATSA**
    -RECVR -FAC **ATSB**
    -SEQNUM **135**
-ARCID **AEE183**
-ADEP **LGAV**
-ETOT **0931**
-SSRCODE **A3065**
-ARCTYP **CRJ7**
-ADES **EPWA**
-BEGIN EQCST
    -EQPT **W/EQ**
    -EQPT **Y/NO**
    -EQPT **R/NO**
    -SUREQPT **S/UN**
-END EQCST
-RWYDEP **18**
-SID **9**
-CFL
    -FL **F220**

09:25 ATS B sends a LAM message to ATS A, updates the AEE183 SFPL with the PAC message data. As the route information is not provided, only the ETOT will be used for SFPL update and the SSR code is linked to AEE183. The ETOT provided within PAC is different from the one contained in the FPL provided by IFPS. This will cause a time shift of ATS B AEE183 trajectory as follows (the changes are indicated in purple):

Horizontal position	ZAZOR	BAKAL	FR1	FR2	FR4
FL	130	180	310	350	350
Time	**0938**	**0940**	**0948**	**0954**	**1000**

09:27 ATS A sends an updated PAC message to ATS B with the estimated time at the COP.

-TITLE **PAC**
-REFDATA
-SENDER -FAC **ATSA**
-RECVR -FAC **ATSB**
-SEQNUM **145**
-ARCID **AEE183**
-SSRCODE **A3065**
-ADEP **LGAV**
-COORDATA
-PTID **BAKAL**
-TO **0941**
-TFL **F220**
-SFL **F170A**
-ARCTYP **CRJ7**
-ADES **EPWA**

09:27 ATS B sends a LAM message to ATS A, updates the AEE183 SFPL with the PAC message data. As the route information is not provided, only the time over BAKAL and the supplementary flight level (SFL) will be used for the SFPL update as the most accurate estimates for the crossing conditions. This will cause a time shift of ATS B AEE183 trajectory as follows (the changes are indicated in purple):

Horizontal position	ZAZOR	BAKAL	FR1	FR2	FR4
FL	130	**170**	310	350	350
Time	**0939**	**0941**	**0949**	**0955**	**1001**

09:32 AEE183 takes-off. The SFPL changes to a live status and the SSR code A3065 is squawked. ATS A clears AEE183 to climb to FL220.

09:32 ATS A sends an ACT message to ATS B and as bilaterally agreed, without any route information.

-TITLE **ACT**
-REFDATA
-SENDER -FAC **ATSA**
-RECVR -FAC **ATSB**
-SEQNUM **176**
-ARCID **AEE183**
-SSRCODE **A3065**
-ADEP **LGAV**
-COORDATA
-PTID **BAKAL**
-TO **0941**

-TFL **F220**
-SFL **F170A**
-ADES **EPWA**
-ARCTYP **CRJ7**

09:32 ATS B returns a LAM and the SFPL for flight AEE183 moves to a coordinated status. There is no update of the SFPL trajectory, as the data provided by updated PAC message were confirmed and no new route information is provided by the ACT message.

09:33 ATS B sends an ABI message to ATS C. The route elements contained in the ABI message are:

- Route segment start - Last overflown point is not applicable in this case as no point was overflown. In this case ATS B provides the first point in the trajectory (ZAZOR);
- Points between the segment start /end - BAKAL and FR1 (also contained in "coordata" field) as well as the corresponding route indicators connecting these points;
- Route segment end - The point after the COP (FR2) and the remaining known route part FR4.

-TITLE **ABI**
-REFDATA
-SENDER -FAC **ATSB**
-RECVR -FAC **ATSC**
-SEQNUM **366**
-ARCID **AEE183**
-SSRCODE **A3065**
-ADEP **LGAW**
-COORDATA
-PTID **FR1**
-TO **0949**
-TFL **F350**
-SFL **F310A**
-ADES **EPWA**
-ARCTYP **CRJ7**
-ROUTE **N0420F350 ZAZOR LM178 BAKAL UM981 FR1 DCT FR2 DCT FR4**

09:33 ATS C sends a LAM message to ATS B, correlates the received ABI with its corresponding flight plan data and attempts to align the AEE183 trajectory with the ABI message route information. The ZAZOR point is disregarded due to its distance from the inbound COP, the remaining part of trajectory (BAKAL UM981 FR1 DCT FR2 DCT FR4) identical with the portion previously extracted from the FPL is kept and the ABI message data is used for the timing recalculation of over the points. This will cause ATS C AEE183 trajectory update as follows (the changes are indicated in purple):

Horizontal position	BAKAL	FR1	FR2	FR4	MIMAR
FL	180	**310**	350	350	350
Time	**0940**	**0949**	**0955**	**1001**	**1007**

09:39 AEE183 overflies point ZAZOR.

09:40 ATS A transfers AEE183 to ATS B and ATS B assumes the flight.

09:41 AEE183 overflies a point near to BAKAL.

09:42 Due to the conflicting traffic (LOT883), ATS B clears the flight AEE183 till FL 270, instructs the pilot to maintain FL 270 and to continue the climb to FL 350 (RFL) after LOMAX. By clearing the flight via LOMAX, the ATS B exit point changes to a dynamic COP (REF01). The new trajectory for flight AEE183 within the AoI of ATS B is as follows (the changes are indicated in purple):

Horizontal position	ZAZOR	BAKAL	LOMAX	REF01	FR4
FL	130	170	**270**	**310**	350
Time	0939	0941	**0953**	**0955**	**1003**

09:42 ATS B sends a revised ABI to ATS C. The route elements contained in the ABI message are:

- Route segment start - Last overflown point (BAKAL);
- Points between the segment start /end - LOMAX and Dynamic Coordination point (REF01), which can be omitted as it is the calculated point and it is contained in "coordata" field;
- Route segment end - The point after the COP (FR4). The route after FR4 is unknown and therefore is not provided.

-TITLE **ABI**
-REFDATA
    -SENDER -FAC **ATSB**
    -RECVR -FAC **ATSC**
    -SEQNUM **389**
-ARCID **AEE183**
-SSRCODE **A3065**
-ADEP **LGAV**
-COORDATA
    -PTID **REF01**
    -TO **0955**
    -TFL **F350**
    -SFL **F310A**
-ADES **EPWA**
-ARCTYP **CRJ7**
-REF
    -REFID **REF01**
    -PTID **FR3**
    -BRNG **154**
    -DISTNC **020**
-ROUTE **N0420F350 BAKAL DCT LOMAX DCT FR4**

09:42 ATS C returns a LAM message and attempts to update the AEE183 SFPL with the revised ABI message data. The co-ordination point is changed from FR1 to REF01 (reference to FR3 with range and bearing). ATS C FDPS keeps the first trajectory point BAKAL according to its distance, inserts the next point LOMAX and the co-ordination point REF01 and re-joins the original route at FR4. The remaining route portion is unaltered. The new trajectory for flight AEE183 within the AoI of ATS C is as follows (the changes are indicated in purple):

Horizontal position	BAKAL	**LOMAX**	**REF01**	FR4	MIMAR
FL	180	**270**	**310**	350	350
Time	0941	**0953**	**0955**	**1003**	**1009**

09:45 ATS B sends an ACT message to ATS C and as bilaterally agreed without any route information.

-TITLE **ACT**
-REFDATA
    -SENDER -FAC **ATSB**
    -RECVR -FAC **ATSC**
    -SEQNUM **398**
-ARCID **AEE183**
-SSRCODE **A3065**
-ADEP **LGAV**
-COORDATA
    -PTID **REF01**
    -TO **0955**
    -TFL **F350**
    -SFL **F310A**
-ADES **EPWA**
-ARCTYP **CRJ7**
-REF
    -REFID **REF01**
    -PTID **FR3**
    -BRNG **154**
    -DISTNC **020**

09:45 ATS C returns a LAM message and the SPFL for flight AEE183 moves to a coordinated status. There is no update of the SFPL trajectory, as the route information was not provided by the ACT message. The coordination point REF01 is confirmed.

2.5.8 Scenario 6 - Vertical route change (RFL application)

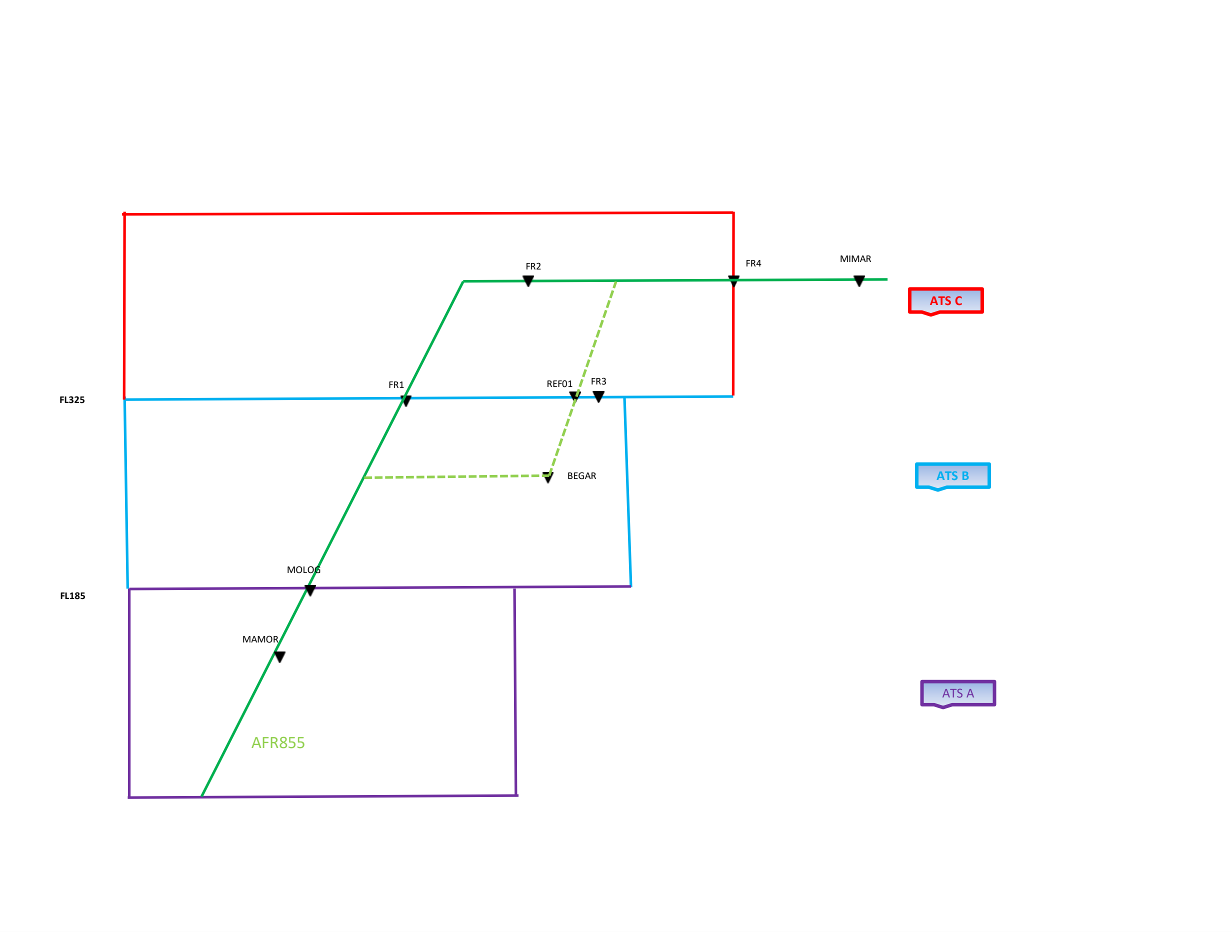


Figure 8 - FRA Vertical Route Change Scenario (RFL)

The airspace and flight elements used for this scenario illustrated by Figure 8 are fictitious. Only the departure and destination airports exist. The airspace data is depicted as:

- ATS C in red
- ATS B in blue
- ATS A in purple

The flight trajectories are depicted in green and the route crossing and ATS Exit/Entry points in black. All depicted ATS units retain full static airspace data of the neighbouring airspaces. However, they apply different trajectory prediction algorithms and different default rates of climb.

This scenario is applicable in cases that the downstream ATS unit can clear the flight within the vertical limits of the concerned ATS units using the last useable FL.

Nantes (LFRS) TWR unit and ATS A use the same FDPS, the OLDI messages concerning LFRS departures are provided by ATS A.

The IFPS distributed the original FPL (FPL-AFR855-IS –CRJ7/M-SRWY/C –LFRS1030 -N0420F370 MAMOR LM185 MOLOG UM971 FR1 DCT FR2 DCT FR4 UR071 MIMAR UL762 GOROZ UL881 NAZAR LG761 KOBIL –EPWA0230) to ATS A, ATS B and ATS C.

ATS A extracts the following 4-D trajectory for flight AFR855 within its AoI as:

Horizontal position	LFRS	MAMOR	MOLOG
FL	00	120	180
Time	1040	1047	1049

ATS B calculates the following 2-D trajectory for flight AFR855 within its AoI as:

Horizontal position	MAMOR	MOLOG	FR1	FR2	FR4
FL	130	180	320	370	370
Time	1047	1049	1057	1103	1109

ATS C calculates the following 2-D trajectory for flight AFR855 within its AoI as:

Horizontal position	MOLOG	FR1	FR2	FR4	MIMAR
FL	190	330	370	370	370
Time	1050	1058	1104	1110	1116

10:36 ATS A sends a PAC message to ATS B with the estimated take-off time (ETOT). The route information is provided as bilaterally agreed between ATS A and ATS B

-TITLE **PAC**
-REFDATA
    -SENDER -FAC **ATSA**
    -RECVR -FAC **ATSB**
    -SEQNUM **558**
-ARCID **AFR855**
-ADEP **LFRS**
-ETOT **1041**
-SSRCODE **A4055**
-ARCTYP **CRJ7**
-ADES **EPWA**
-BEGIN EQCST
    -EQPT **W/EQ**
    -EQPT **Y/NO**
    -EQPT **R/NO**
    -SUREQPT **S/UN**
-END EQCST
-RWYDEP **18**
-ROUTE **N0420F370 MAMOR LIM185 MOLOG**
-SID **9**
-CFL
    -FL **F220**

10:36 ATS B sends a LAM message to ATS A, updates the AFR855 SFPL with the PAC message data. As the route information contained within ABI confirmed the route (no updates), only ETOT will be used for SFPL update and the SSR code is linked to AFR855. The ETOT provided within the PAC message is different from the one contained in the FPL provided by IFPS. This will cause a time shift of ATS B AFR855 trajectory as follows (the changes are indicated in purple):

Horizontal position	MAMOR	MOLOG	FR1	FR2	FR4
FL	130	180	320	370	370
Time	**1048**	**1050**	**1058**	**1104**	**1110**

10:37 ATS A sends an updated PAC message to ATS B with the estimated time at the COP.

-TITLE **PAC**
-REFDATA
    -SENDER -FAC **ATSA**
    -RECVR -FAC **ATSB**
    -SEQNUM **598**
-ARCID **AFR855**
-SSRCODE **A4055**
-ADEP **LFRS**
-COORDATA
    -PTID **MOLOG**
    -TO **1051**
    -TFL **F180**
-ARCTYP **CRJ7**
-ADES **EPWA**
-ROUTE **N0420F370 MAMOR LIM185 MOLOG**

10:37 ATS B sends a LAM message to ATS A, updates the AFR855 SFPL with the PAC message data. The route information does not contain any additional, the confirmation of RFL370 indicates the intention to enter ATS B whilst climbing, and the updated time over MOLOG will be used to update the SFPL. This will cause a time shift of ATS B AFR855 trajectory as follows (the changes are indicated in purple):

Horizontal position	MAMOR	MOLOG	FR1	FR2	FR4
FL	130	180	320	370	370
Time	**1049**	**1051**	**1059**	**1105**	**1111**

10:42 AFR855 takes-off. The SFPL is turned to a live status and the SSR code A4055 is squawked. ATS A clears AFR855 to climb to FL180.

10:42 ATS A sends an ACT message to ATS B and as bilaterally agreed, with route information.

-TITLE **ACT**
-REFDATA
    -SENDER -FAC **ATSA**
    -RECVR -FAC **ATSB**
    -SEQNUM **638**
-ARCID **AFR855**
-SSRCODE **A4055**
-ADEP **LFRS**
-COORDATA
    -PTID **MAMOR**
    -TO **1051**
    -TFL **F180**

-ADES **EPWA**
-ARCTYP **CRJ7**
-ROUTE **N0420F370 MAMOR LIM185 MOLOG**

10:42 ATS B returns a LAM message and the SFPL for flight AFR855 moves to a coordinated status. There is no update of the SFPL trajectory, as the data provided by the ACT message were confirmed.

10:43 ATS B sends an ABI message to ATS C. The route elements contained in the ABI message are:

- Route segment start - Last overflown point is not applicable in this case as no point was overflown. In this case ATS B provides the first point in the trajectory (MAMOR);
- Points between segment start /end – MOLOG and FR1 (also contained in “coordata” field) as well as the corresponding route indicators connecting these points;
- Route segment end - The point after COP (FR2) and the remaining known route part FR4.

-TITLE **ABI**
-REFDATA
    -SENDER -FAC **ATSB**
    -RECVR -FAC **ATSC**
    -SEQNUM **125**
-ARCID **AFR855**
-SSRCODE **A4055**
-ADEP **LFRS**
-COORDATA
    -PTID **FR1**
    -TO **1059**
    -TFL **F320**
-ADES **EPWA**
-ARCTYP **CRJ7**
-ROUTE **N0420F370 MAMOR LM185 MOLOG UM971 FR1 DCT FR2 DCT FR4**

10:43 ATS C sends a LAM message to ATS B, correlates the received ABI with its corresponding flight plan data and attempts to align the AFR855 trajectory with ABI message route information. The MAMOR point is disregarded due to its distance from the inbound COP, the remaining part of trajectory (MOLOG UM971 FR1 DCT FR2 DCT FR4) identical with the portion previously extracted from the FPL is kept and the ABI message data is used for the timing recalculation of the over points. The difference between TFL and RFL indicates that the flight is entering the ATS B airspace in a climbing condition. This will cause ATS C AFR855 trajectory update as follows (the changes are indicated in purple):

Horizontal position	MOLOG	FR1	FR2	FR4	MIMAR
FL	190	330	370	370	370
Time	**1050**	**1059**	**1105**	**1111**	**1117**

10:49 AFR855 overflies point MAMOR.

10:50 ATS A transfers AFR855 to ATS B and ATS B assumes the flight. AFR855 is cleared to climb to FL 320 (the last useable ATS B FL).

10:51 AFR855 overflies a point near to MOLOG.

10:52 Due to the conflicting traffic (DLH115), ATS B re-clears the flight AFR855 till FL 280, instructs the pilot to maintain FL 280 and to continue the climb to FL 320 (ATS B last useable FL) after BEGAR. By clearing the flight via BEGAR, the ATS B exit point changes to a dynamic COP (REF01). The new trajectory for flight AFR855 within the AoI of ATS B is as follows (the changes are indicated in purple):

Horizontal position	MAMOR	MOLOG	BEGAR	REF01	FR4
FL	130	180	**280**	**320**	370
Time	1049	1051	**1103**	**1105**	**1113**

10:52 ATS B sends a revised ABI message to ATS C. The route elements contained in the ABI message are:

- Route segment start - Last overflown point (BEGAR);
- Points between segment start /end - BEGAR and dynamic co-ordination point (REF01), which can be omitted as it is the calculated point and it is contained in “coordata” field;
- Route segment end - The point after the COP (FR4). The route after FR4 is unknown and therefore is not provided.

-TITLE **ABI**
-REFDATA
 -SENDER -FAC **ATSB**
 -RECVR -FAC **ATSC**
 -SEQNUM **152**
-ARCID **AFR855**
-SSRCODE **A4055**
-ADEP **LFRS**
-COORDATA
 -PTID **REF01**
 -TO **1105**
 -TFL **F320**
-ADES **EPWA**
-ARCTYP **CRJ7**
-REF
 -REFID **REF01**
 -PTID **FR3**
 -BRNG **154**
 -DISTNC **020**
-ROUTE **N0420F370 MOLOG DCT BEGAR DCT FR4**

10:52 ATS C returns a LAM message and attempts to update the AFR855 SFPL with the revised ABI message data. The co-ordination point is changed from FR1 to REF01 (reference to FR3 with range and bearing). ATS C FDPS keeps the first trajectory point MOLOG according to its distance, inserts the next point BEGAR and the co-ordination point REF01 and re-joins the original route at FR4. The remaining route portion is unaltered. The difference between RFL within route field and TFL indicates that the flight will enter ATS C in climbing conditions. The new trajectory for flight AFR855 within the AoI of ATS C is as follows (the changes are indicated in purple):

Horizontal position	MOLOG	**BEGAR**	**REF01**	FR4	MIMAR
FL	190	**280**	**320**	370	370
Time	1051	**1103**	**1105**	**1113**	**1119**

10:55 ATS B sends an ACT message to ATS C and as bilaterally agreed, with route information.

-TITLE **ACT**
-REFDATA
    -SENDER -FAC **ATSB**
    -RECVR -FAC **ATSC**
    -SEQNUM **172**
-ARCID **AFR855**
-SSRCODE **A4055**
-ADEP **LFRS**
-COORDATA
    -PTID **REF01**
    -TO **1105**
    -TFL **F320**
-ADES **EPWA**
-ROUTE **N0420F370 MOLOG DCT BEGAR DCT FR4**
-ARCTYP **CRJ7**
-REF
    -REFID **REF01**
    -PTID **FR3**
    -BRNG **154**
    -DISTNC **020**

10:55 ATS C returns a LAM message and the SFPL for flight AFR855 moves to a coordinated status. There is no update of the SFPL trajectory as the data contained in the ACT message confirms the revised ABI message data. The co-ordination point REF01 is confirmed as well as the climbing entry conditions.

2.5.9 Scenario 7 - Vertical route change initiated by the downstream unit

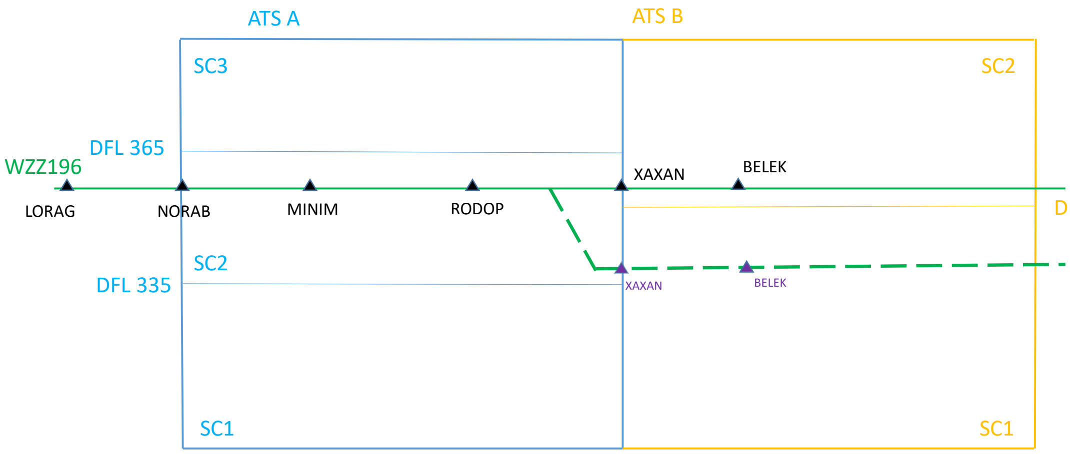


Figure 9 - FRA Vertical Route Change by D-ATSU Scenario

The airspace and flight elements used for this scenario illustrated by Figure 9 are fictitious. Only the departure and destination airports exist. The airspace data is depicted as:

- ATS A in blue
- ATS B in orange

ATS A is vertical divided into three sectors as:

- SC1 (FL 245-FL335)
- SC2 (FL 335-FL365)
- SC3 (FL 365-FL410)

ATS B is vertical divided into sectors as:

- SC1 (FL 175-FL355)
- SC2 (FL 355-UNL)

The flight trajectories are depicted in green and the route crossing and ATS Exit/Entry points in black. The ATS units retain limited static airspace data of the neighbouring FRA.

The IFPS distributed the original FPL (FPL-WZZ196-IS –B737/M-SRWY/C –LIRF1010 -N0420F360 MILON UL881 GOROK UG175 LORAG UM188 RODOP UL765 PERAM DCT MIMAR –EGAV0120) to ATS A and ATS B.

10:35 WZZ196 overflies point LORAG.

ATS A extracts the following 4-D trajectory for flight WZZ196 within its AoI:

Horizontal position	LORAG	NORAB	MINIM	RODOP	XAXAN	BELEK
FL	360	360	360	360	360	360
Time	1035	1040	1045	1050	1058	1106

ATS B calculates the following 4-D trajectory for flight WZZ196 within its AoI:

Horizontal position	RODOP	XAXAN	BELEK
FL	360	360	360
Time	1052	1100	1109

10:38 ATS A sends an ABI message to ATS B. The route elements contained in the ABI message are:

- Route segment start - Last overflown fix (LORAG);
- Point between segment start /end - NORAB MINIM RODOP XAXAN (coordination point);
- Route segment end - The first intermediate point in the downstream ATS (BELEK) and the remaining portion of the route is unknown.

-TITLE **ABI**
-REFDATA
    -SENDER -FAC **ATSA**
    -RECVR -FAC **ATSB**
    -SEQNUM **557**
-ARCID **WZZ196**
-SSRCODE **A2455**
-ADEP **LIRF**
-COORDATA
    -PTID **XAXAN**
    -TO **1058**
    -TFL **F360**
-ADES **LGAV**
-ARCTYP **B737**
-ROUTE **N0420F360 LORAG DCT NORAB DCT MINIM DCT RODOP DCT XAXAN DCT BELEK**

10:38 ATS B sends a LAM message to ATS A, correlates the received ABI with its corresponding flight plan data and attempts to align the WZZ196 trajectory with the ABI message route information. Due to their distance from the inbound COP, some points are disregarded (LORAG, NORAB and MINIM), the remaining part of trajectory (RODOP XAXAN BELEK) identical with the portion previously extracted from the FPL is kept and the ABI message data is used for the timing recalculation over the points. This will cause ATS WZZ196 trajectory update as follows (the changes are indicated in purple):

Horizontal position	RODOP	XAXAN	BELEK
FL	360	360	360
Time	**1050**	**1058**	**1106**

10:40 ATS A assumes WZZ196.

10:45 WZZ196 overflies point MINIM.

10:48 ATS A sends an ACT message to ATS B and as bilaterally agreed, with route information. The route elements contained in the ACT message are:

- Route segment start - Last overflown fix (MINIM);
- Points between segment start /end - RODOP XAXAN (coordination points);
- Route Segment end - The first intermediate point in the downstream ATS (BELEK) and the remaining portion of the route is unknown.

-TITLE **ACT**
-REFDATA
    -SENDER -FAC **ATSA**
    -RECVR -FAC **ATSB**
    -SEQNUM **569**
-ARCID **WZZ196**
-SSRCODE **A2455**
-ADEP **LIRF**
-COORDATA
    -PTID **XAXAN**
    -TO **1058**
    -TFL **F360**
-ADES **LGAV**
-ARCTYP **B737**
-ROUTE **N0420F360 MINIM DCT RODOP DCT XAXAN DCT BELEK**

10:48 ATS B returns a LAM message and the SPFL for flight WZZ196 moves to a coordinated status. The coordination point XAXAN is confirmed. The MINIM point is disregarded due to its distance from the inbound COP, the remaining part of trajectory (RODOP XAXAN BELEK) identical with the portion previously extracted from the FPL is kept and the ACT message data could be used for the timing recalculation of over the points.

10:50 WZZ196 overflies point RODOP.

10:51: For de-complexion of traffic situation within ATS B SC2, ATS B intends to apply the level cap for the flight WZZ196, in order to force it the lower sector. In order to achieve the level cap for WZZ196 and force the entry into the lower sector (ATS B SC1), ATS B SC2 proposes to ATS A change of Planned Entry Level from FL360 to FL340. The ATS B system trajectory is not updated, as ATS B SC2 only composes a proposal that ATS A may accept or reject.

10:51 ATS B sends a CDN message to ATS A.

-TITLE **CDN**
-REFDATA
    -SENDER -FAC **ATSB**
    -RECVR -FAC **ATSA**
    -SEQNUM **056**
-ARCID **WZZ196**
-SSRCODE **A2455**
-ADEP **LIRF**
-PROPFL
    -TFL **F340**
-ADES **LGAV**

10:51 The ATS A FDP receives the CDN message, returns a SBY message and refers the CDN message to the ATCO of sector SC2.

-TITLE **SBY**
-REFDATA
    -SENDER -FAC **ATSA**
    -RECVR -FAC **ATSB**
    -SEQNUM **580**
-MSGREF
    -SENDER -FAC **ATSB**
    -RECVR -FAC **ATSA**
    -SEQNUM **056**

10:52 The proposed FL change is graphically presented to ATS A SC2, ATS A SC2 reviews the ATS B proposal for the change of coordination conditions, tests for MTCD's conflict with "what-if" tool and identifies no issue in accepting it. ATS A SC2 accepts the proposed route modifications by sending an ACP message.

-TITLE **ACP**
-REFDATA
    -SENDER –FAC **ATSA**
    -RECVR -FAC **ATSB**
    -SEQNUM **589**
-MSGREF
    -SENDER -FAC **ATSB**
    -RECVR -FAC **ATSA**
    -SEQNUM **056**
-ARCID **WZZ196**
-ADEP **LIRF**
-ADES **LGAV**

10:52 With the acceptance of the CDN message, ATS A FDPS automatically updates the system trajectory using the CDN message data (ATS A Exit Flight Level 340). The lateral trajectory is not changed, but the vertical profile adheres to the tactical constraint and the timing over fixes is adapted as follows (the changes are indicated in purple).

Horizontal position	LORAG	NORAB	MINIM	RODOP	XAXAN	BELEK
FL	360	360	360	360	**340**	**340**
Time	1035	1040	1045	1050	**1100**	**1108**

10:52 After the reception of the ACP message, ATS B returns a LAM message and updates the entry conditions for flight WZZ196. The new trajectory for flight WZZ196 within the AoI of ATS B is (the changes are indicated in purple):

Horizontal position	RODOP	XAXAN	BELEK
FL	360	**340**	**340**
Time	1050	1058	1106

10:53 ATS A clears flight WZZ196 to FL 340.

10:53 As the WZZ196 vertical re-routing triggered the update of time over the XAXAN point by 2 minutes (which exceeds the threshold bilaterally agreed between ATS A and ATS B), a REV message is sent from ATS A to ATS B. The route elements contained in the REV message are:

- Route segment start - Last overflown point (RODOP);
- Point between segment start /end - XAXAN (coordination point);
- Route segment end - The first intermediate point in the downstream ATS (BELEK) and the remaining portion of the route is unknown.

-TITLE **REV**
-REFDATA
    -SENDER -FAC **ATSA**
    -RECVR -FAC **ATSB**
    -SEQNUM **625**
-ARCID **WZZ196**
-SSRCODE **A2455**
-ADEP **LIRF**
-ADES **LGAV**
-ARCTYP **B737**
-COORDATA
    -PTID **XAXAN**
    -TO **1100**
    -TFL **F340**
-ROUTE **N0420F360 RODOP DCT XAXAN DCT BELEK**

10:53 ATS B returns a LAM message and tries to update the WZZ196 SFPL with the REV message data. The co-ordination point and TFL are confirmed, but the time over the COP has changed. The horizontal component of the trajectory and its vertical profile were not changed, only the timing over the fixes are updated. The new trajectory for flight WZZ196 within the AoI of ATS B is as follows (the changes are indicated in purple):

Horizontal position	RODOP	XAXAN	BELEK
FL	360	**340**	**340**
Time	1050	**1100**	**1108**

2.5.10 DCT handling

The DCT field is used to indicate a direct route between two points. The point might be a published point, a geographical point, or a reference point. Within the OLDI specification, the DCT field is used by the following data items:

- Route (Section A.13 of the OLDI Specification [RD 1], ADEXP field “route”, as ICAO field 15 can contain DCT indicator), used by almost all OLDI messages as a bilaterally agreed data item
- Direct Clearance (Section A.20, ADEXP field “DCT”), used by HOP, SDM, TIM, TIP, RTI, COF and CFD as mandatory or a bilaterally agreed item
- Direct Routing Request (Section A.21 of the OLDI Specification [RD 1], ADEXP field “DCT”), optional item for CDN message

The DCT indicator needs to be used in the OLDI message route field to connected FRA entry/intermediate and exit points. If these points are published points or reference to published points, the DCT indicator needs to be used to interconnect the FRA significant points as:

- UL761 FRA01 DCT FRA02 DCT REF01 DCT FRA03 UL117

Within the OLDI message route field, the DCT indicator also needs to interconnect GEO points with Published point/Reference Points as:

- UL761 FRA01 DCT 4620N007806E DCT DUB190040 DCT FRA03 UL117

Within the OLDI message route field, the DCT indicator is not needed only in case of linkage between two GEO points as:

- UL761 FRA01 DCT 4620N007806E 4629N007810E DCT FRA03 UL117

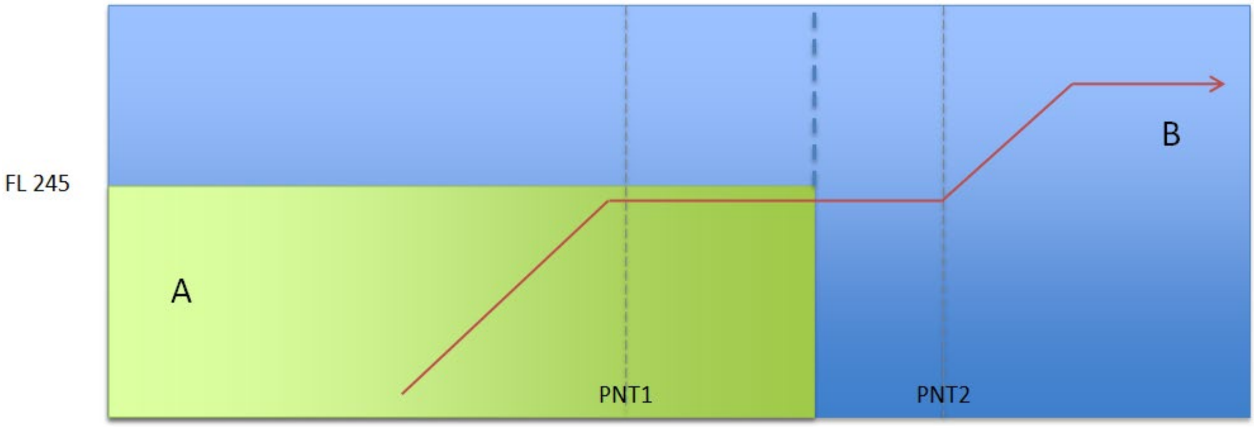
These guidelines recommend the usage of Direct Clearance and Direct Routing Request with DCT indicator to be continued within the FRA environment, to support the tactical re-routing especially in cases of large cross-border FRA.

2.6. Utilisation of En-route Cruising Level (ECL)

2.6.1 Introduction

DSNA presented to the OLDI group members the utilisation of en-route cruising level (ECL) for management of “up-down” transitions. For this purpose, a specific ECL field is used for exchanges of OLDI messages between French ACCs. Many ANSPs apply similar practices for internal data exchanges to indicate the flight intent, but this is not used for inter-ANSP exchanges. Moreover, there is no specific ADEXP field for en-route cruising level. The unused ADEXP field EFL is included in different OLDI message for illustration of ECL use cases.

2.6.2 Scenarios for ECL field (Simple configuration)



The airspace and flight elements used for this scenario are fictitious.

The airspace data is depicted as:

- ATS A in green
- ATS B in blue

ATS B is divided into two sectors as:

- SC1 on top of ATS A (FL 245-660)
- SC2 on the side of ATS A (FL 000-660)

The boundary between these sectors is depicted in dotted blue. The flight trajectories are depicted in red.

The IFPS distributed the original FPL (FPL –FPL0001-IS –B737/M-SRWY/C –ADEP1010 -N0420F240 PNT1 DTC PNT2/N0420F300 AIRWAY PNTX –ADES0120) to ATS A and ATS B. The transition between ATS A and ATS B is initially through a wall, at level F240, toward SC2.

10:35: ATS A sends an ABI to ATS B. The ECL is not present as the transition is through the wall.

-TITLE **ABI**
-REFDATA
    -SENDER -FAC **ATSA**
    -RECVR -FAC **ATSB**
    -SEQNUM **001**

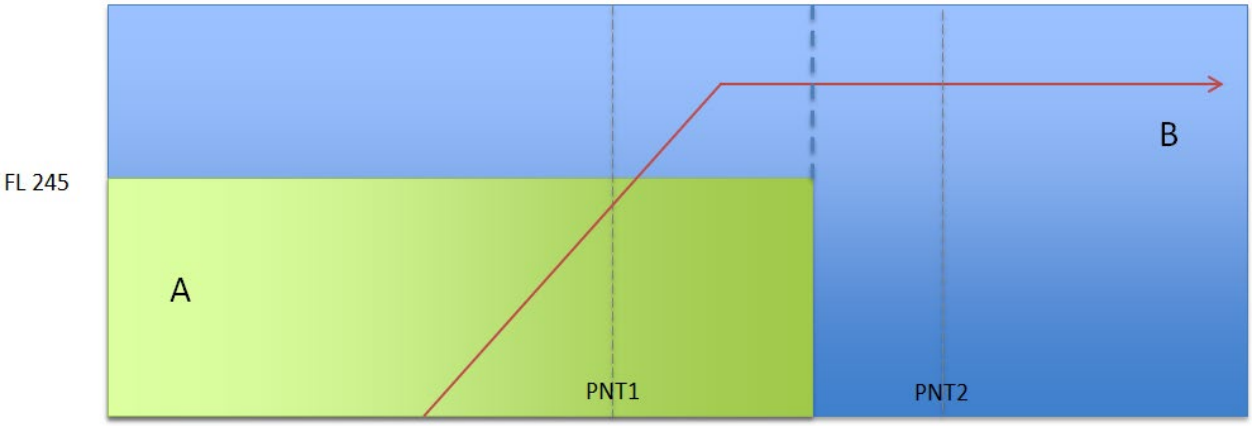
-ARCID **FPL0001**
-SSRCODE **A1234**
-ADEP **ADEP**
-COORDATA
    -PTID **PNT1**
    -TO **1058**
    -TFL **F240**
-ADES **ADES**
-ARCTYP **B737**

10:40: Following coordination between ATS A and ATS B, it is decided that the flight will be sent to B through the ceiling, toward another sector (SC 2). During the coordination, it is also decided that the flight will directly climb toward its next RFL.

ATS A sends an ACT to ATS B. The ECL is now present as the transition is through the ceiling. (In this example, we consider that the coordination point is not modified by the change of typology)

-TITLE **ACT**
-REFDATA
    -SENDER -FAC **ATSA**
    -RECVR -FAC **ATSB**
    -SEQNUM **002**
-ARCID **FPL0001**
-SSRCODE **A1234**
-ADEP **ADEP**
-COORDATA
    -PTID **PNT1**
    -TO **1054**
    -TFL **F240**
-ADES **ADES**
-ARCTYP **B737**
- EFL **F300**

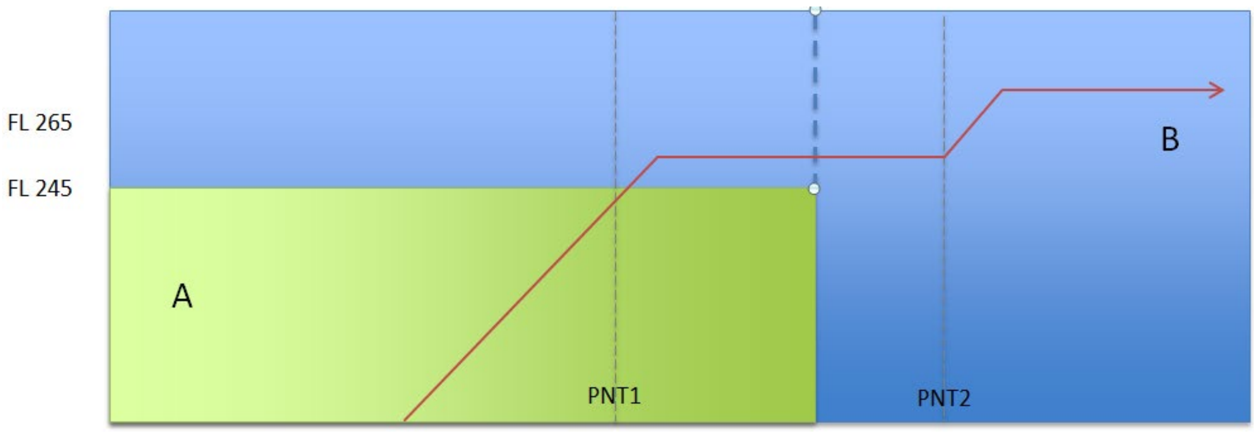
The reception of this message allows ATS B system to automatically update its view.



10:43: Following a verbal coordination, ATCO from B SC 1 informs ATCO from ATS A that finally, the flight will not climb directly toward its next RFL, but toward FL 260.

ATS A sends a REV to ATS B. The ECL is still present, but changed with the new objective of the flight. The coordination level is unchanged.

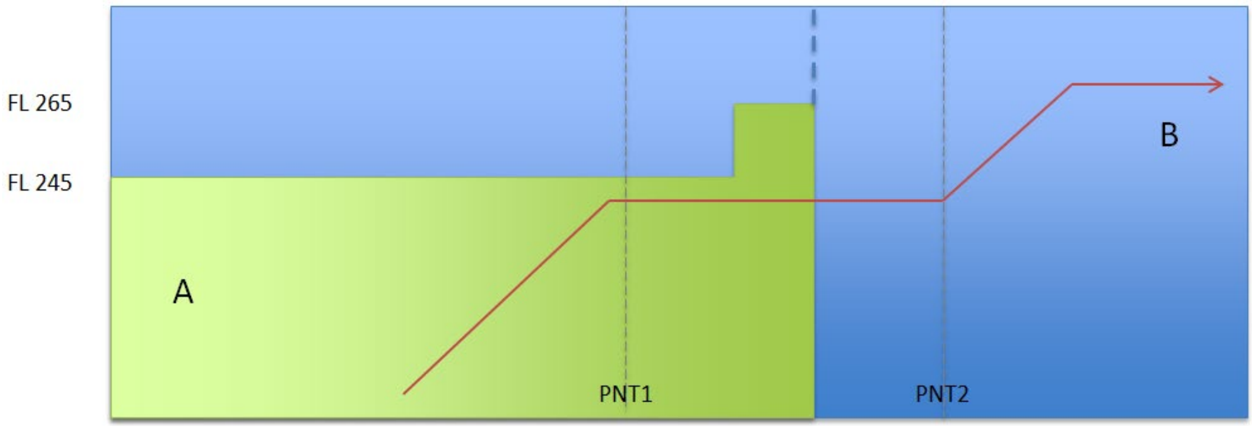
-TITLE **REV**
-REFDATA
    -SENDER -FAC **ATSA**
    -RECVR -FAC **ATSB**
    -SEQNUM **003**
-ARCID **FPL0001**
-SSRCODE **A1234**
-ADEP **ADEP**
-COORDATA
    -PTID **PNT1**
    -TO **1054**
    -TFL **F240**
-ADES **ADES**
-ARCTYP **B737**
-EFL **F260**



The reception of this message allows B system to automatically update its view.

In this situation, with another ATSU configuration, this change of ECL could induce re-entrances (alternative next scenario).

2.6.3 Scenarios for ECL field (Complex configuration)



The airspace and flight elements used for this scenario are fictitious.

The airspace data is depicted as:

- •ATS A in green
- •ATS B in blue

ATS B is divided into two sectors as:

- •SC1 on top of ATS A (FL 245/265-660)
- •SC2 on the side of ATS A (FL 000-660)

The boundary between these sectors is depicted in dotted blue. The flight trajectories are depicted in red.

The IFPS distributed the original FPL (FPL –FPL0002-IS –B737/M-SRWY/C –ADEP1010 -N0420F240 PNT1 DTC PNT2/N0420F300 AIRWAY PNTX –ADES0120) to ATS A and ATS B. The transition between ATS A and ATS B is initially through a wall, at level F240, toward SC2.

10:35: ATS A sends an ABI to ATS B. The ECL is not present as the transition is through the wall.

-TITLE **ABI**
-REFDATA
    -SENDER -FAC **ATSA**
    -RECVR -FAC **ATSB**
    -SEQNUM **001**
-ARCID **FPL0002**
-SSRCODE **A1234**
-ADEP **ADEP**
-COORDATA
    -PTID **PNT1**
    -TO **1058**
    -TFL **F240**
-ADES **ADES**
-ARCTYP **B737**

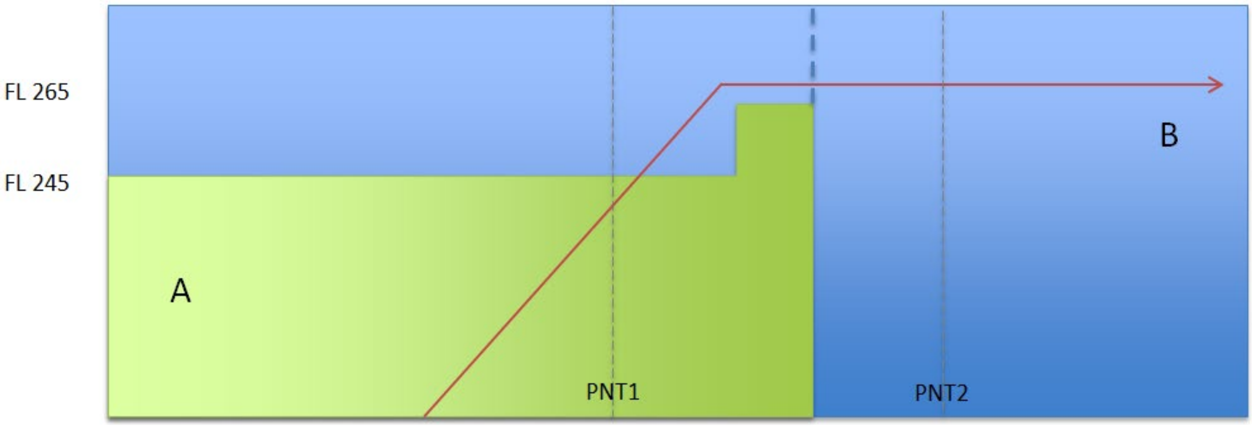
10:40: Following coordination between ATS A and ATS B, it is decided that the flight will be sent to B through the ceiling, toward another sector (SC 2). During the coordination, it is also decided that the flight will directly climb toward its next RFL.

ATS A sends an ACT to ATS B. The ECL is now present as the transition is through the ceiling. (In this example, we consider that the coordination point is not modified by the change of typology)

-TITLE **ACT**
-REFDATA
    -SENDER -FAC **ATSA**
    -RECVR -FAC **ATSB**
    -SEQNUM **002**
-ARCID **FPL0002**
-SSRCODE **A1234**
-ADEP **ADEP**
-COORDATA
    -PTID **PNT1**

-TO **1054**
-TFL **F240**
-ADES **ADES**
-ARCTYP **B737**
-EFL **F300**

The reception of this message allows ATS B system to automatically update its view.

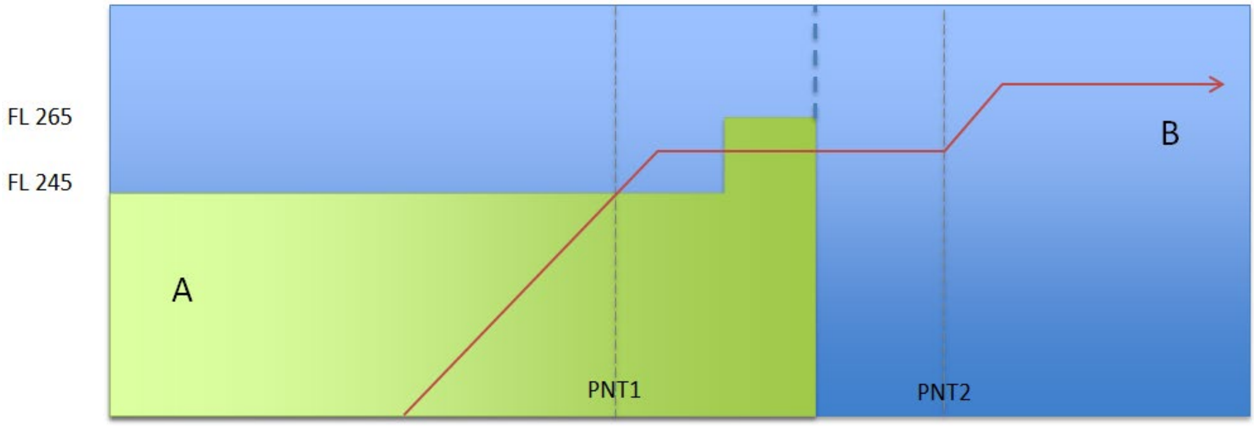


10:43: Following a verbal coordination, ATCO from B SC 1 informs ATCO from ATS A that finally, the flight will not climb directly toward its next RFL, but toward FL 260.

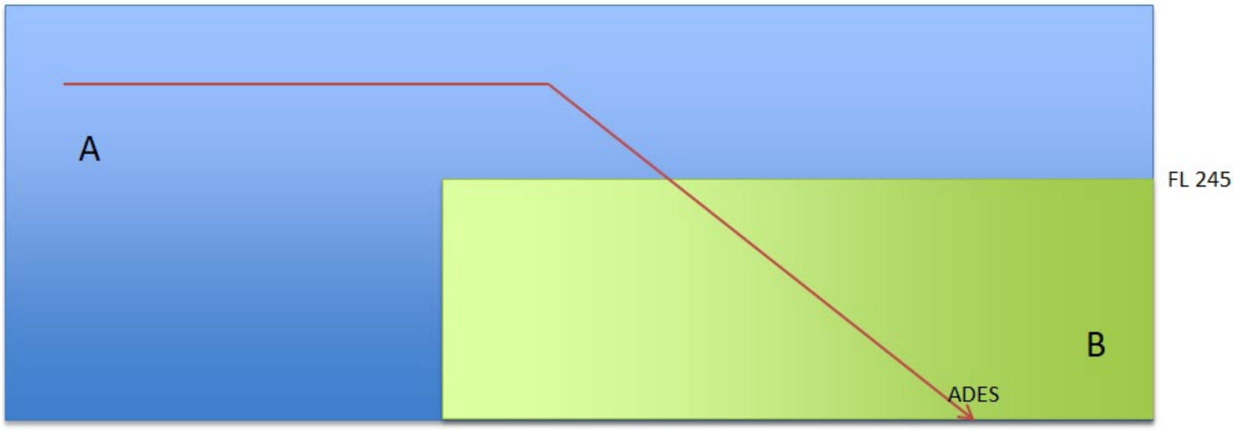
ATS A sends a REV to ATS B. The ECL is still present, but changed with the new objective of the flight. The coordination level is unchanged

-TITLE **REV**
-REFDATA
-SENDER -FAC **ATSA**
-RECVR -FAC **ATSB**
-SEQNUM **003**
-ARCID **FPL0002**
-SSRCODE **A1234**
-ADEP **ADEP**
-COORDATA
-PTID **PNT1**
-TO **1054**
-TFL **F240**
-ADES **ADES**
-ARCTYP **B737**
-EFL **F260**

The reception of this message allows B system to automatically update its view. The value of ECL allows ATS A and ATS B systems to be aware of the re-entrance



2.6.4 Scenarios for ECL field (Particular case of the last descent)



The airspace and flight elements used for this scenario are fictitious.

The airspace data is depicted as:

- ATS A in blue
- ATS B in green

The flight trajectory is depicted in red.

The IFPS distributed the original FPL (FPL –FPL0003-IS –B737/M-SRWY/C –ADEP1010 -N0420F350 PNT1 AIRWAY PNTX –ADES0120) to ATS A and ATS B. The transition between ATS A and ATS B is through the floor, at level F250.

10:35: ATS A sends a PAC to ATS B. The ECL is Equal to 0 as the only remaining objective of the flight is the landing

-TITLE **PAC**
-REFDATA
  -SENDER -FAC **ATSA**

-RECVR -FAC **ATSB**
-SEQNUM **001**
-ARCID **FPL0003**
-SSRCODE **A1234**
-ADEP **ADEP**
-COORDATA
-PTID **PNT1**
-TO **1058**
-TFL **F250**
-ADES **ADES**
-ARCTYP **B737**
-EFL **F000**

3 Clarifications of Operational Use and Purposes of Some OLDI Messages

3.1. MAC message

3.1.1 Introduction

The implementation of the MAC message requires some guidance in order to avoid that the strict interpretation of the OLDI Specification requirements does not negatively affect the (system) coordination.

A few use cases have been identified in areas where the interface is complex, with incoming and outgoing coordination being effected almost simultaneously (e.g. when the crossing time in one unit is short).

3.1.2 General

As clearly stated in Section 6.5.1 of the OLDI Specification [RD 1], the reception of a MAC message shall not erase basic flight plan data!

3.1.3 Re-entry flights

In Figure 10, the aircraft is transferred first from ACC A to UAC B when climbing to its RFL, and then back from UAC B to ACC A when in the descent to its destination. Those flights have two "legs".

The crossing time in UAC B is pretty short, meaning that UAC B sends the ACT#2 message to ACC A quite quickly after receiving the ACT#1 message from the same ACC A.

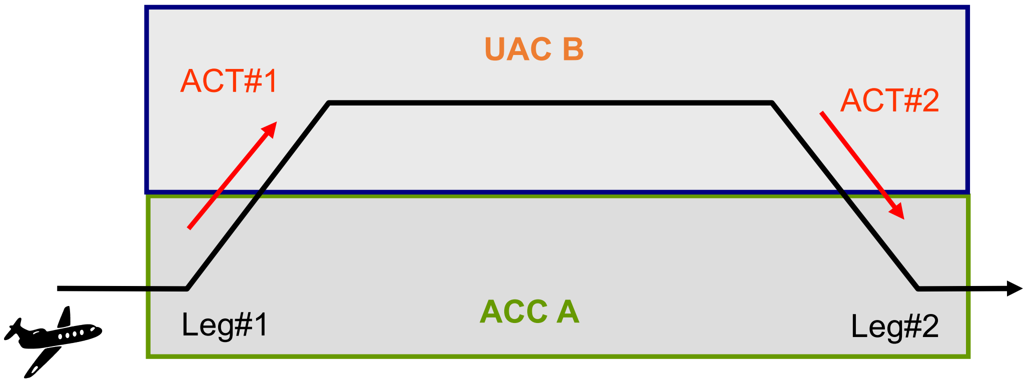


Figure 10 - Re-entry Flight

In case a MAC message is sent from ACC A to UAC B (e.g. because of level cap below the division flight level), UAC B will send a MAC message "back" to ACC A.

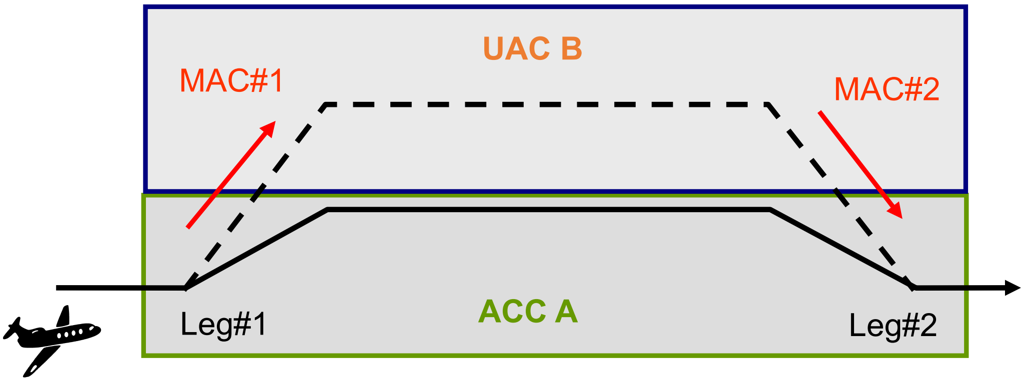


Figure 11 - Abrogation of Re-entry Fight

It is important that this MAC#2 message correctly abrogates the ACT#2 message only and not the whole coordination within ACC A. Using the message reference will help in this! These guidelines recommend the use of the message reference when sending MAC messages as foreseen by OLDI-20-M.

3.1.4 Triangle case

Some problems may appear when more than two partners are involved in the coordination process, all of them having specific bilateral conditions in place.

In Figure 1, the standard coordination is ACC A → UAC B. Once the ACT#1 message is received by UAC B and considering the short crossing time, the ACT#2 message is quickly sent from UAC B to UAC C.

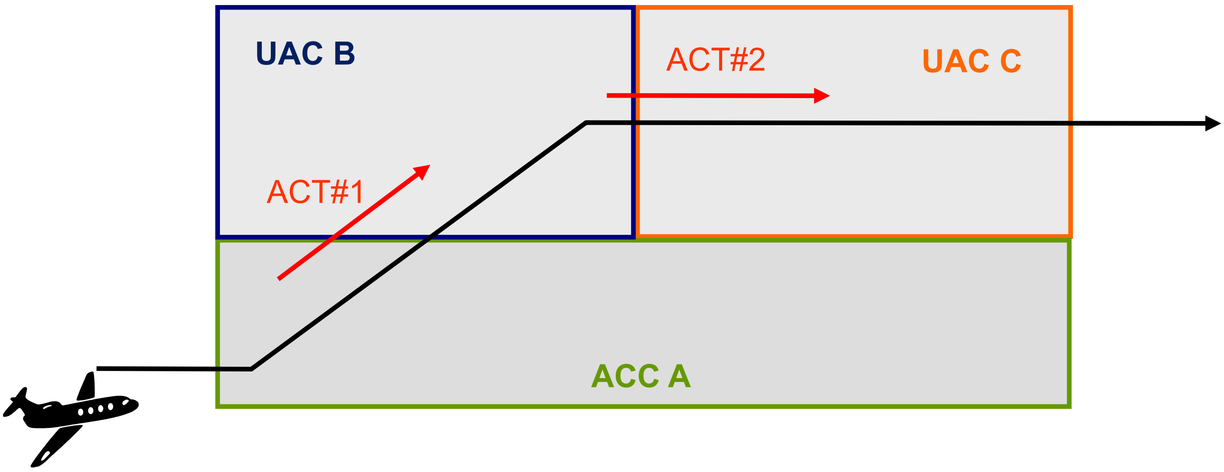


Figure 12 - Coordination Triangular Case

The aircraft cannot climb as initially expected and is re-coordinated directly ACC A → UAC C.

The MAC#1 message is sent from ACC A to UAC B, leading to an immediate transmission of the MAC#2 message from UAC B to UAC C. At the same time, ACC A has to coordinate the aircraft with UAC C. This is performed by means of the ACT#3 message.

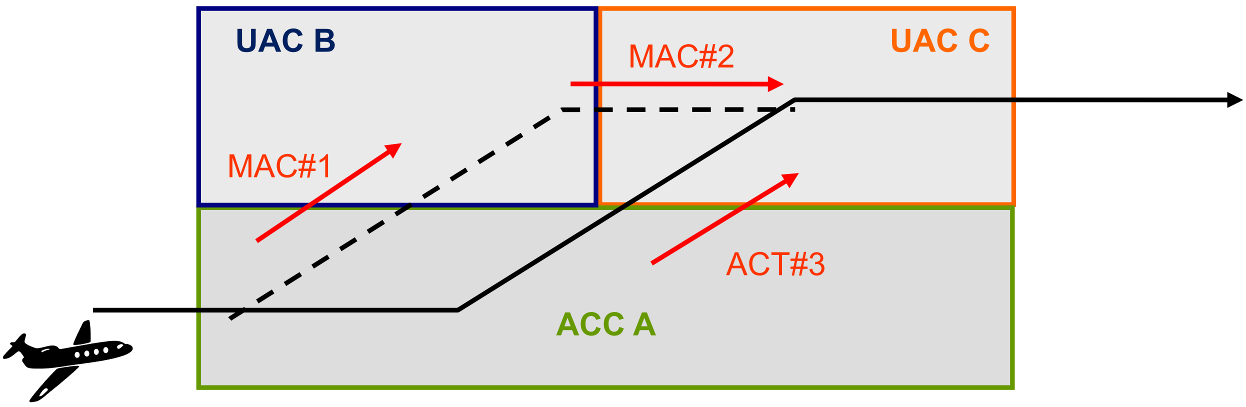


Figure 13 - Abrogation Triangular Case

In order to have a smooth coordination, it is important that the ACT#3 message arrives after the MAC#2 message, so that UAC C is ready for an incoming coordination, otherwise UAC C could consider the ACT#3 message as a “second ACT” for the same flight.

To allow this, a delay of a few seconds can be implemented by ACC A between the transmission of MAC#1 and the transmission of ACT#3 messages, allowing enough time for abrogation of the coordination between UAC B and UAC C (by means of the MAC#2 message). To do so, the transmission of the ACT#3 message could be withheld until at least the LAM message corresponding to MAC#1 is received. To increase the likelihood that abrogation has been fully processed by UAC C, an additional small delay (of e.g. 2 seconds) could be applied, i.e. “LAM back + 2 seconds”.

Such an implementation may result in the ACT#3 message to be sent a little bit later than in normal circumstances, but it really increases the likelihood of a smooth processing of the “triangle case”. With the speed at which data is exchanged, and under normal circumstances, all this can be achieved within seconds.

Note: Another use case is where the initial coordination takes place from ACC A to UAC C, and then the flight is re-coordinated directly from ACC A to UAC B (e.g. if climbing is better than expected). UAC C is still in the sequence and receives the traffic from UAC B. Should the ACT UAC B → UAC C be received before the MAC ACC A → UAC C, then UAC C might have an issue in processing the “second ACT”.

These guidelines recommend that operational stakeholders confronted by such triangle cases consider reviewing the timing parameters when re-initiating coordination following abrogation.

3.1.5 MAC In – MAC Out

Requirement OLDI-MAC-30-M mandates that a MAC message is to be transmitted to a downstream unit with which co-ordination for a flight has been established when a MAC is received from the upstream unit in respect to that flight.

In Figure 14, there is a sequence of ATC units, all controlling the aircraft for a short period of time during the climb to UAC D. Applying the requirement would mean that if UAC C receives a MAC from ACC A it has to transmit a MAC message to UAC D. This use case can occur if the aircraft climbs better than expected and is re-coordinated directly ACC A → UAC B).

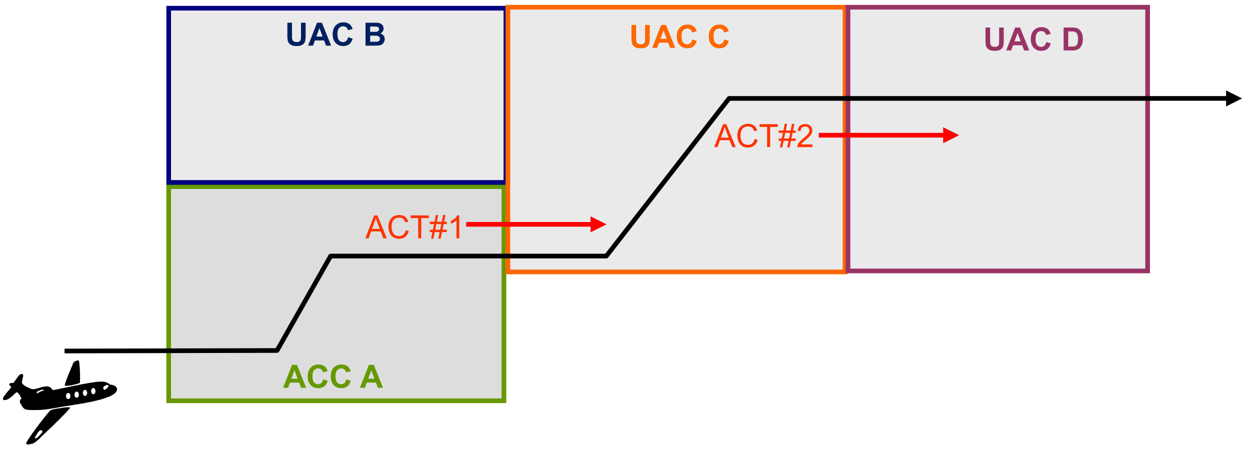


Figure 14 - MAC In - MAC Out Case

However, the reception of such a MAC message by UAC C could have absolutely no impact on the coordination between UAC C and UAC D, meaning that the new ACT#X message (shown in Figure 15) from UAC C to UAC D will have exactly the same parameters as the previously sent ACT#2 message (shown in Figure 14), abrogated by the MAC#2 message.

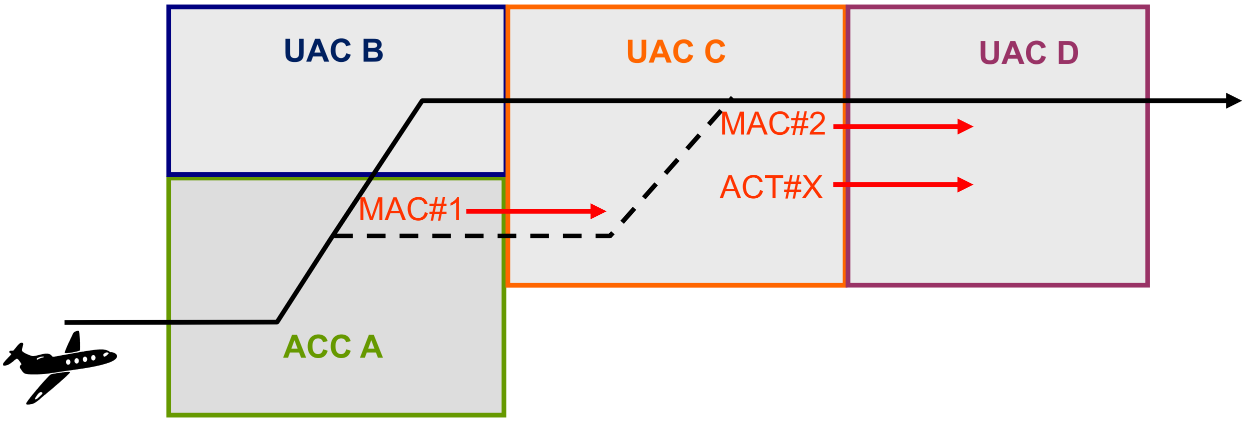


Figure 15 - Abrogation of the MAC IN - MAC OUT Case

The recurrent "ACT-MAC-ACT" situation might create confusion within UAC D, observing coordination data being received, then disappearing, before being received again with the same entry level and COP (the ETO on the COP might be slightly different).

As a result, it might be wise to not automatically send the MAC#2 if the local/bilateral methods of operations would be such that this situation would occur on a frequent basis. One condition to send the MAC message could be a manual input from the ATCO, e.g. cancelling the flight plan in the system.

3.2. CDN message intent, purpose and operational use

3.2.1 Introduction

This section provides guidance on the use of CDN messages. In particular, it addresses the case where the FIR performing the CDN input removes itself from the control sequence.

3.2.2 Objective

The desired outcome is that the flight plan remains within the system and is highlighted in a specific way:

- Coupling should be retained
- The flight may be displayed in a particular way

3.2.3 Guidance

The CDN message intent and purpose is to satisfy the following operational requirements:

- to forward a counter proposal from the accepting controller to the transferring controller as a reply to an ACT, RAP, REV or RRV message;
- to initiate a proposed modification to agreed transfer conditions by the accepting controller to the transferring controller.

In the event that a proposal sent using a CDN message would remove the sending unit from the list of concerned units, then the acceptance of this proposal should not erase basic flight plan data. Following acceptance of the CDN proposal, the upstream unit will send a MAC message for abrogation of the coordination.

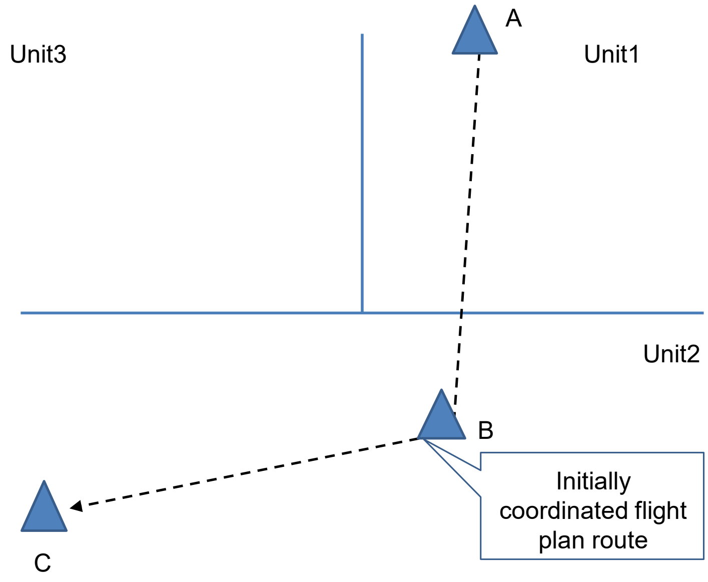
A flight plan which no longer crosses the concerned unit, which sends the CDN (due to acceptance of a CDN message proposal), should be retained within the system until the later of:

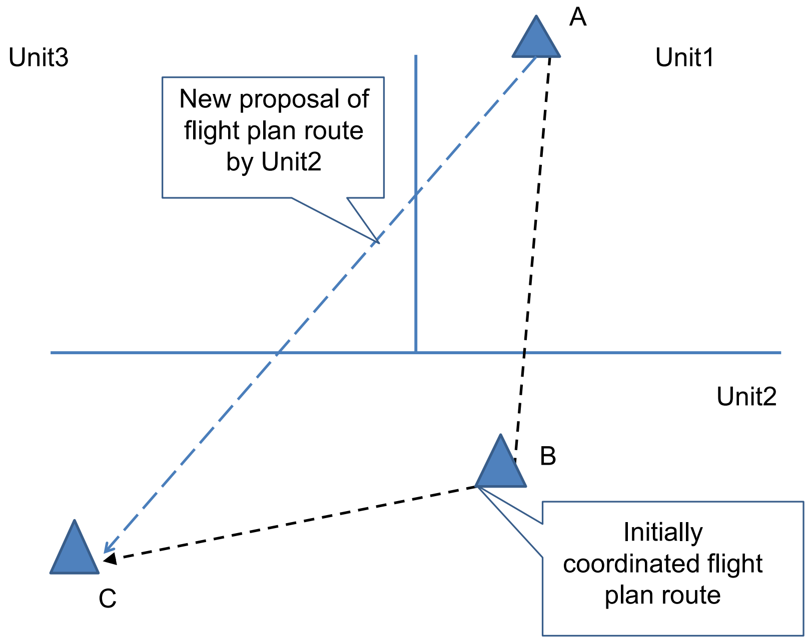
- If the flight remains correlated: until correlation is lost, plus an off-line defined time,
- If correlation is lost, until the previous time the flight was calculated to leave the concerned unit, plus an off-line defined time.

A flight plan, which no longer crosses the concerned unit (due to acceptance of a CDN message proposal), could be displayed with a particular indication, so that it is understood that the original intention was to cross the concerned unit. If the flight plan is subsequently re-coordinated to cross the concerned unit later, then this indication should be removed.

These guidelines recommend that basic flight data is to be kept by an ATSU for a given period when a received CDN message removes it from the coordination sequence; this may be accompanied by specific graphical presentation on the controller position.

3.2.4 Example scenario





The example scenario is expected to develop as follows:

- Initial state: Flight is under the control of Unit1.
- Unit1 sends an ACT message to Unit2 with initial flight plan route (Point A, Point B and Point C).
- Unit2 sends a CDN message to Unit1, proposing new flight plan route, direct from Point A to Point C.
- Unit1 sends an ACP message to Unit2, to accept the proposal.
- Unit1 sends a MAC message to Unit2, to abrogate the coordination.
- Unit1 sends an ACT message to Unit3, to coordinate the flight entry.

- Unit3 sends an ACT message to Unit2, to coordinate the flight entry.

3.3. SDM message intent, purpose and operational use

3.3.1 Purpose

The OLDI Supplementary Data Message (SDM) is a very simple message that can efficiently support Operational Concepts being currently developed / implemented throughout Europe (mainly extended AMAN and FRA).

It is part of the "Dialogue Procedure – Transfer of Communication in the OLDI Specification [RD 1], with the following purpose:

> "The primary purpose of the SDM is to transmit control data and changes thereto from the transferring unit to the accepting unit.
>
> The SDM message may also be used by the accepting unit to notify the transferring unit of the radio telephony frequency to which the flight is to be transferred."

In order to provide the downstream unit with the most up to date data, the COF message can also be used to transmit the Assigned Speed.

Some modern concepts will benefit from the implementation of the SDM by increasing situational awareness, the quality of the data in the ATM systems and by reducing verbal coordination as described hereunder.

3.3.2 Extended AMAN

From an ATC perspective, the local methods of operations often require that ATCOs in the downstream unit be provided in real time with the (planned) speed constraint imposed by upstream units.

This can be true between two UACs (for planning reasons and also to avoid that the receiving ATCO tries to further reduce an aircraft already close to the minimum clean speed), or from a UAC to the local ACC, where it may be interesting to know if a speed constraint "on conversion" has been given by the UAC. Because of the impact on the workload, it is not realistic to ask ATCOs to provide verbal feedback on extended AMAN actions that have or have not been performed.

The SDM is beneficial for situational awareness as:

- It contains the speed constraint assigned by the ATCO in control of the flight.

  Note: should the speed be assigned before ACT transmission, there could be no need to send an SDM message with that speed. It is recommended to also use the COF message, so that the latest Assigned Speed, if any, is sent at transfer.

- When bi-laterally agreed, it may also contain Route information, which may be interesting in case the Arrival Management process is also based on Route Advisory.
- It can be sent until transfer of communications and automatically updates the ATM system of the receiving unit, decreasing the need for verbal coordination.
- Route information in SDM message will significantly help to give a more accurate calculated arrival sequence.

3.3.3 FRA

Together with the implementation of dynamic COPs, the use of the SDM provides operational benefits for the implementation of the Free Route Airspace with regard to the automatic exchange of tactical route updates, hence reducing the workload for the Planner Controller while increasing situational awareness.

The SDM complements the mechanisms of ACT and REV message exchanges. It can be used to provide the route changes that do not require coordination since it can be sent up to the transfer of communications (while the transmission of the REV is often limited to the 5 minutes before the transfer).

Not specifically linked to FRA, the SDM also supports concepts linked to dynamic sectorisation and/or tactical assignment of flights to a specific sector since it allows the accepting unit to automatically provide the transferring unit with the frequency and the identification of the entry sector that will be in charge of the flight. In case of re-sectorisation of accepting unit, the revised SDM may provide the transferring unit with the new sector identifier and relevant frequency.

3.4. PNT message intent, purpose and operational use

3.4.1 Background

ATM systems developed and implemented in 1990’s supported a full electronic presentation of surveillance and flight plan data. The Controller Working Position (CWP) used a modern Human Machine Interface (HMI) based on ATC objects supported by X –windows products. These modern HMI allowed the electronic communication between different CWPs.

During this period, this type of rudimentary communication was required due the limited capabilities for detection and notification of risks, conflicts, non-conformances or exceptional situations related to a specific flight.

The graphical inter-consoles markers have been developed in order to support electronic communication between different CWP located in the same OPS room. The system provided the controller with the capability to highlight traffic positions on the screen of other controllers by means of an Inter-Console Marker. In most cases, a pop-up menu was used for entering the target unit/sector designator. This highlight functionality was developed in support of controller verbal coordination of traffic.

A pointer symbol was presented on both the transmitting and receiving CWP linked with the track position. A pointed out track was displayed with special attributes at the source (sector at which the command was entered) and destination sectors. If the range scale or offset on a “receiving” CWP is such that a received Inter-Consoles Mark symbol cannot be seen by that ATCO, the “receiving” CWP displays a notification. The CWP allowed the ATCO to acknowledge an Inter-Consoles Marker received from an ATCO of another sector. The CWP allowed an ATCO to delete the sending Inter-Consoles Marker. After the ATCO’s deletion, the CWP deleted the Inter-Consoles Mark on both “sending” and “receiving” CWPs.

This function was further extended allowing the generation of internal “point-out” messages for specific flights. The CWP was equipped with the function to input the target unit/sector designator from pre-defined selection menu. Upon receipt of a point-out message, the CWP displayed the flight with a pre-defined highlight and provided the ATCO with the capability to remove the highlight. Procedurally, these messages were required to be supplemented by verbal coordination between the controllers as the meaning of pointing out traffic from one sector to another was not contained in the highlight/message itself.

3.4.2 Context

The OLDI PNT message intends to mimic the behaviour of inter-console marker and inter-console messages (including the verbal coordination elements) extending it to allowing notification of flights to sectors outside the upstream ATS unit. Usually, the upstream ATS unit that controls the flight has more information about the flight intents. It can send the PNT message in order to notify the downstream ATS unit for the concerned flight. However, the downstream ATS unit can also send a PNT message to notify the upstream ATC unit of the need for more information. Both upstream and downstream generated PNT messages are expected to be followed up by verbal coordination. The PNT message (and highlight/notification on the interface) is a supplementary tool facilitating verbal coordination between ATC.

The PNT message is always manually triggered and the CWP needs to be equipped with pop-windows and menus to select the flight and the target sector where the PNT messages is intended to be sent. The Track label and/or flight list should include an appropriate indication that the PNT message was sent out for the concerned flight. The transferring CWP should have the capability to automatically remove the PNT indication (upon the reception of LAM) or manually acknowledge and remove the PNT indication depending on HMI customisation.

Upon the successful reception of the PNT message by the receiving sector (a returned LAM message), the system will attempt to link the message content with the track label or electronic flight strips and highlight with a predefined font-colour, back-ground colour or other visible indication to notify the ATCO. As this message mimics the behaviour of inter-console marker, there is no need for an operational response to this message. If the concerned flight is not yet correlated or the track is out of the display range, an appropriate display warning might be considered. The system should provide the capability to remove the highlight triggered by PNT message.

The events eligible for the exchange of the PNT message need to be bilaterally agreed and prescribed in the LoA.

3.4.3 Example

The airspace and flight elements used for this example illustrated by Figure 16 are fictitious. Only the departure and destination airports exist. The airspace data is depicted as:

ATS A in red with two sectors SC1 and SC2

ATS B in blue with two sectors SC1 and SC2

The flight trajectories are depicted in green and significant points in black.

Problem and Assumptions: PNT message intends to facilitate verbal co-ordination by highlighting AZA191 and AEE175 flights, which are in risk of conflict that occurs within ATS B airspace volume.

ATS A deploys an advanced MTCD that calculates the MTCD conflict and risks within its AoI. The ATS A AoI boundaries are 60 to 70 NM beyond its AoR boundaries depending on the direction and identified operational needs.

ATS B deploys basic MTCD that starts the conflict calculation only for flights that are being co-ordinated. The MTCD algorithm does not consider the notified flight (an ABI message was received).

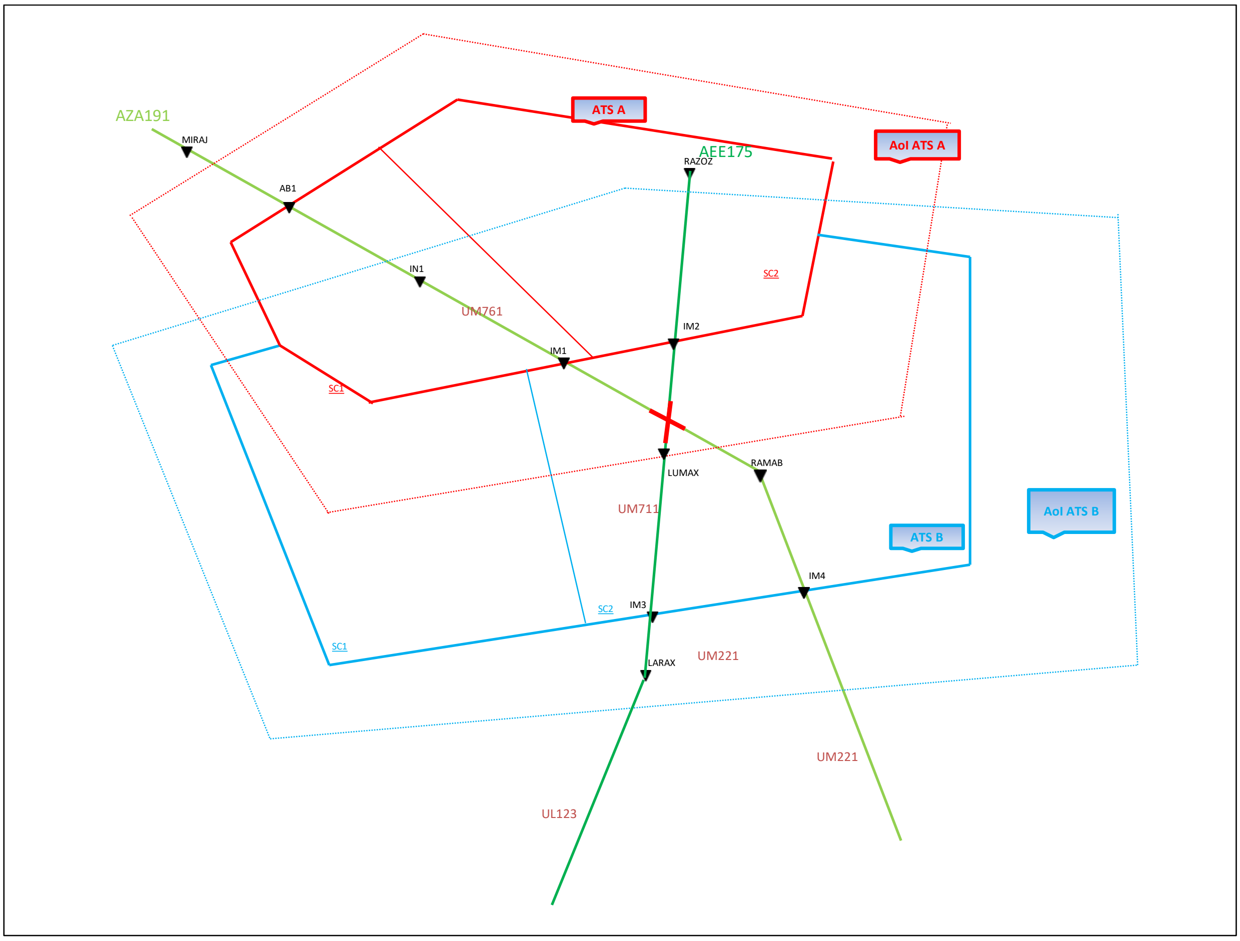


Figure 16 - Example Use of the PNT Message

The flight AZA191 departed from Rome (LIRF) at 11:30 and it is planned to land at Larnaca (LCLK). IFPS distributed the original FPL (FPL-AZA191-IS –A320/M-SRWY/C –LIRF1130 -N0420F350 MIRIJ UM761 RAMAB UM221 MILIX UM231 –LCLK0240) to ATC A and ATS B.

The flight AEE175 departed from Thessaloniki (LGTS) at 12:00 and it is planned to land at Cairo (HECA). IFPS distributed the original FPL (FPL-AEE175-IS –B737/M-SRWY/C –LGTS1200 -N0420F370 RAZOZ UM711 LARAX UL123 MINOG UB231 –HECA 0215) to ATC A and ATS B.

Flight AZA191 is controlled by ATS A SC1 maintaining FL 350 and exiting ATS A at 12:50 at point IM1.

12:25 AEE175 departs from LGTS.

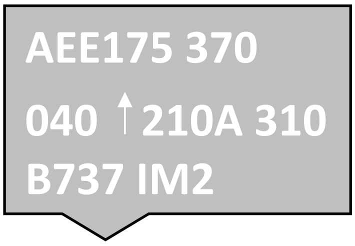
12:25 The downstream unit sends an ABI message to ATC A.

-TITLE **ABI**
-REFDATA
    -SENDER -FAC **ATCX**
    -RECVR -FAC **ATCA**
    -SEQNUM **015**
-ARCID **AEE175**
-SSRCODE **A1755**

-ADEP **LGTS**
-COORDATA
    -PTID **RAZOZ**
    -TO **1240**
    -TFL **F310**
    -SFL **F210A**
-ADES **HECA**
-ARCTYP **B737**

12:25 ATS A returns a LAM message and associates the received ABI with its corresponding flight plan data. After the receipt of the ABI message, the track and FP correlation is established.

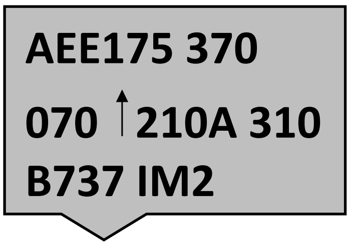
12:26 After the correlation process, the following track label is presented at ATS A SC2 for the flight AEE175 which is in the notified state.



12:29 The upstream unit sends an ACT message to ATC A.

-TITLE **ACT**
-REFDATA
    -SENDER -FAC **ATCX**
    -RECVR -FAC **ATCA**
    -SEQNUM **028**
-ARCID **AEE175**
-SSRCODE **A1755**
-ADEP **LGTS**
-COORDATA
    -PTID **RAZOZ**
    -TO **1239**
    -TFL **F310**
    -SFL **F210A**
-ADES **HECA**
-ARCTYP **B737**

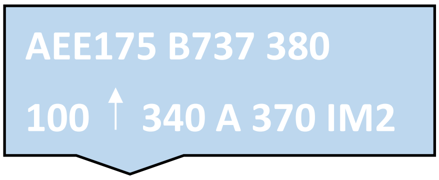
12:29 ATS A returns a LAM message and the SFPL for flight AEE175 changes to a coordinated status. The following track label is presented at ATS A SC2 for the flight AEE175 in the coordinated state.



12:32 ATC A sends an ABI message to ATC B.

-TITLE **ABI**
-REFDATA
    -SENDER -FAC **ATCA**
    -RECVR -FAC **ATCB**
    -SEQNUM **227**
-ARCID **AEE175**
-SSRCODE **A1755**
-ADEP **LGTS**
-COORDATA
    -PTID **IM2**
    -TO **1252**
    -TFL **F370**
    -SFL **F340A**
-ADES **HECA**
-ARCTYP **B737**

12:32 ATS B returns a LAM message and associates the received ABI with its corresponding flight plan data. After the receipt of the ABI message, the track and FP correlation is established. The following track label is presented at ATS B SC2 for the flight AZA191 that is in the notified state.



12:39 Flight AEE175 is transferred to ATC A and the system flight plan becomes live. The track label at ATS A SC2 is changed to the presentation corresponding to an assumed flight (green).

12:40 ATC A sends an ACT message to ATC B for flight AZA191. Upon the reception of coordination message, ATS B turns the flight AZA191 into active state making it eligible for MTCD calculation.

12:40 ATC A MTCD detects risk of conflict between AZA191 and AEE175 that will occur within the ATS B AoR. As the ATCO controlling the airspace volume of ATC A SC2 is not responsible to resolve this conflict, he decides to highlight the flight AEE175 to ATS B SC2 in order to facilitate verbal coordination. For that purpose, he manually triggers a PNT message to flight AEE175 selecting the ATS B SC2 as a recipient of the PNT message.

-TITLE **PNT**
-REFDATA
    -SENDER -FAC **ATSA**
    -RECVR -FAC **ATSB**
    -SEQNUM **423**
-ARCID **AEE175**

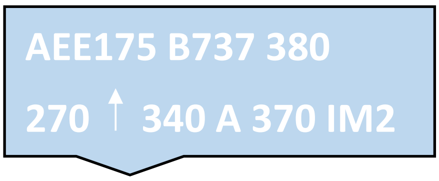
-SSRCODE **A1755**
-ADEP **LGTS**
-ADES **HECA**
-ARCTYP **B737**
-ROUTE **N0420F370 RAZOZ UM711 LARAX**
-POSITION **REF01**
-REF
    -REFID **REF01**
    -PTID **RAZOZ**
    -BRNG **190**
    -DISTNC **24**
-SECTOR **ATSA SC2**
-PNTSECTOR **ATSB SC2**

12:40 After sending the PNT message, the track label of flight AEE175 on ATC A SC2 is updated with a blue PNT indicator (highlighting that a PNT message has been sent on AEE175).

12:41 ATS B receives the PNT message and returns a LAM message. It changes the track label of AEE175 to a magenta background, as an indicator that AEE175 deserves special attention and that verbal coordination will be initiated by ATS A SC2. .

12:41 ATS B SC2 examines flight AEE175 and manually identifies the risk of conflict with AZA191. ATS B MTCD could not yet detect the conflict due to the fact that AEE175 is still in a notified state.

12:41 ATS B SC2 acknowledges the highlight and the background colour of the track label is restored.



12:41 ATS B SC2 identified that the AEE175 climbing path caused the risk of conflict with AZA191 and he decides to restrict the climb of AEE175 to CFL 340 until the LUMAX point.

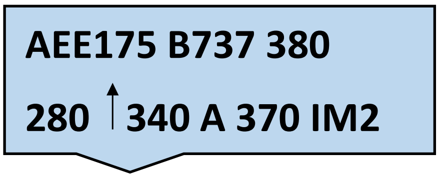
12:41 ATS B SC2 phones ATS A SC2 notifying that flight AEE175 risk of conflict is identified and CFL FL340 restriction will be applied to this flight upon the transfer to ATS B SC2.

12:42 ATS A SC2 acknowledges the resolution action decided by ATS B and removes the highlighted PNT indicator on the AEE175 track label. The track label is restored to its previous state.

12:43 ATC A sends an ACT message to ATC B.

-TITLE **ACT**
-REFDATA
    -SENDER -FAC **ATCA**
    -RECVR -FAC **ATCB**
    -SEQNUM **323**
-SEQNUM **227**
-ARCID **AEE175**
-SSRCODE **A1755**
-ADEP **LGTS**
-COORDATA
    -PTID **IM2**
    -TO **1253**
    -TFL **F370**
    -SFL **F340A**
-ADES **HECA**
-ARCTYP **B737**

12:43 ATS B returns a LAM message and the SFPL for flight AEE175 changes to a coordinated status. The following track label is presented at ATS B SC2 for the flight AZA191 in the coordinated state. AAE175 is cleared to FL 340 until LUMAX and to continue its climb to FL370 afterwards.



3.4.4 Conclusions

The PNT was designed to mimic the operational behaviour of inter-console marker and inter console messages. This message is used to support verbal coordination in case of special conditions of a given flight (risk, conflict, non-conformance, special events). As such, this message does not require any operational response, the acknowledgment that the message is received (LAM) is deemed sufficient.

The most important aspects when implementing the PNT message are HMI related: presentation, acknowledgement and removal the PNT highlight.

These guidelines recommend that the list of ATC events that can manually initiate the transmission of PNT messages are bilaterally agreed between the adjacent ATS units and contained in LoA or its corresponding Annexes.

3.5. AMA message clarifications

3.5.1 Background

The European Union Common Project One (CP1) Regulation [RD 6] requires the extension of Arrival Management in the en-route airspace. The extended AMAN en-route needs to be implemented by the en-route ATS units feeding the traffic to the 25 busiest airports in Europe. As a result, the AMAN horizon needs to be extended to 180-200 NM from the arrival airport. This extension of the AMAN horizon to 180 NM for the 25 CP1 airports means that more than 40 en-route ATS units need to deploy some form of extended AMAN advisor. The CP1 Regulation does not specify how the extended AMAN should be implemented. One way to implement the extended AMAN is through the exchange of the OLDI AMA message, which is suitable for exchanging AMAN, constrains (e.g. Time to Lose or Gain and Speed Advice). Another method is via SWIM Yellow Profile exchanges of extended AMAN data.
Only OLDI AMA message exchanges in the context of an extended AMAN horizon are addressed by this document. The SWIM based arrival sequencing services is addressed by EUROCAE standard ED-254.

3.5.2 Arrival sequence number

Requirement OLDI-AMA-10-M states that 'Arrival sequence number' can be used in AMA messages based on bilateral agreement; however, there are no requirements, notes, or recommendations for their use. Section 11.6.3.3 of the OLDI Specification [RD 1] contains the 'Criteria for Message Transmission' but in fact only covers the criteria for the transmission of the initial AMA message and does not include any requirements relating to the transmission of subsequent AMA messages. In particular, OLDI-AMA-80-M states that additional AMA messages shall be sent when the time over the metering fix has changed by a value greater than that agreed in the LoA.

A flights arrival sequence number will necessarily change, every time a preceding flight lands at the airport or diverts to another airport. If the arrival sequence number field is used in AMA messages this must be taken into account, however the current OLDI Specification text does not allow for this. The result is an incorrect (and possibly misleading) display of the arrival sequence numbers for ATCOs.

Another issue that has been seen with the use of the arrival sequence numbers is where a busy airport has multiple different ACCs / sectors all feeding traffic into it. If we consider Amsterdam Airport (EHAM) for example, there are two different MUAC sectors, along with other ACCs, all feeding traffic into the EHAM APP; so the use of arrival sequence numbers in these feeder ACCs / sectors is pointless as none of them have the complete traffic picture of EHAM arrivals. The result is seemingly random sequence numbers that may not have an apparent link to each other.

AMAN implementation experience has shown that even if arrival sequence numbers are permitted in OLDI AMA messages, there is currently no operational use case covering the use of arrival sequence numbers.

3.5.3 AMA message sending cut-off time

Arrival management systems are not always fully integrated with the main FDP systems. As a consequence, this can lead to different system states in the Arrival Manager and FDP systems, which may not be compatible when the Arrival Manager is calculating the sequences and delays and the FDP is responsible for OLDI message sending.
Operational experience has shown that there can be a mismatch between 'Arrival Management States' (used to generate AMA messages to upstream AORs) and 'Flight Plan States' used to generate and process most other OLDI messages. This is understandable as the arrival management states can be based on metering fixes or time to run to touchdown rather than COPs, whereas almost all other OLDI messages are triggered based on a time/distance prior to a COP.

A consequence of this is that sometimes AMA messages are sent too late to the upstream AoR to be processed and used. For example, when the upstream AoR is in the process of transferring the flight, the received AMA message would be rejected to the flight data queue for deletion.

Currently there are no provisions in the OLDI Specification with regard to a cut-off time/distance for AMA message transmission. Different options such as adding new recommended (or even optional) requirements to OLDI (stating that AMA messages should no longer be sent once the flight has reached a time or distance prior to the COP), a note to the OLDI requirements, or information in the OLDI Guidelines can be envisaged. However, the appropriate option is subject to further analysis.

It should be noted that any AMA message sending cut-off parameter(s) implemented should be tuned with bilateral agreement per AMAN airport taking the Concept of Operations for that airport into account. For example if the AMA message triggers tactical speed inputs in cruise or descent, then it might be appropriate to receive them right up until the transfer phase or perhaps 1 minute prior to it. If the AMA message is for an en-route, Mach Number speed change then there may be no point processing a message received less than 10 minutes before the transfer point.

3.5.4 AMA triggering events

The OLDI specification clearly specifies (requirements OLDI-AMA-40-M and OLDI-AMA-130-M) that AMA messages do not need to be sent for all flights that are part of an arrival management process, but only for the flights which are eligible for delay absorption or time adjustment.

An AMA message needs to be sent out if:

- The arrival management function calculates the updated time over the metering fix for a specific flight, which leads to an updated time over the COP (AMAN time) and/or Total Time to Gain/Loose (TTG/TTG);
- The ATS unit operating arrival management at a specific airport manually requests speed adjustment for a specific flight;

If the time over the metering fix is not changed, an AMA message is not sent out to the upstream unit.

If for specific reasons, the arrival management function provides AMA messages for all flights arriving at the specific airport, the sending or receiving unit should filter these messages, permitting only those with real operational content to be presented to the relevant controller of the upstream ATS unit.

3.5.5 AMA updates

The OLDI specification clearly specifies (requirement OLDI-AMA-80-M) that an updated AMA message should be sent if the time at the metering fix is changed by a value greater than a system parameter threshold (as agreed in the LoA). The AMAN optimised sequence is volatile as many events (manual insertion, flight swapping, change of landing rate, removal from sequence, rerouting) trigger the automatic sequence calculation and change of time over metering fix for certain flights.

In order to avoid further propagation of AMAN sequence volatility, it is advisable not to provide an updated AMA message if the delta between the time contained in already exchanged AMAN messages and the new recalculation is below an agreed threshold. This filter is recommended to avoid a continuous change of extended AMAN data presentation in the upstream sectors. In case of extended AMAN involving several upstream ATS units, the necessity of a proper update by AMA message is even more important, in order to avoid the recalculation of delay apportionment and volatility of data presented in the track label/electronic flight strips of upstream ATS units.

3.5.6 AMA forward function

Requirement OLDI-AMA-70-M specifies that if bilaterally agreed the received AMA message is forwarded to the upstream ATS unit. In the context of the CP1 Regulation [RD 6] and extended AMAN horizon of 180-200 NM, this requirement might be considered as the required tool for the propagation of delay further up-stream, as in some cases 3-4 ATS units might be involved in the extended AMAN operations. Furthermore, it does not specify whether the AMA forward function should be automatic or manual. In the context of several ATS units involved the arrival sequencing; more sophisticated method for forwarding of received AMA message from the unit operating the arrival sequencing might be needed.

Therefore, a slight adaptation of the AMA specification might be considered as:

- AMA messages could be sent to the upstream ATS units if bilaterally agreed.
- AMA messages, if bilateral agreed, may be automatic forwarded to the upstream ATS units.
- The forwarded AMA messages could contain the total time to lose/gain by all ATS units and AMAN time/COP for the concerned ATS unit.
- The apportionment of delay between the ATS units involved in the extended AMAN for a particular airport should be defined the Letter of Agreement and further elaborated as the OLDI adaptation data parameters.

3.5.6.1 Apportionment of Delay (examples for LTBA)

The arrival flights to LTBA are governing the application of the arrival management procedure. The arrival management is extended further en-route and besides the ATC unit providing the arrival management service for LTBA (ATS A), it involves three additional ATS en-route units (ATS B, ATS C, ATS D) that are used for the following examples. The Letters of Agreement between the extended AMAN participating units indicate that:

- If the requested arrival management delay contained in AMA messages (TTL) is less than 2 minutes, the delay will be solely absorbed by the first upstream ATS unit.
- If the requested arrival management delay contained in AMA messages (TTL) is more than 2 minutes, the requested delay will be apportion as:
    - ATS B will absorb 25% of TTL

    - ATS C will absorb 25% of TTL
    - ATS D will absorb 50% of TTL
- The provisions of LoAs between these ATS units concerning the extended arrival management for LTBA are translated into the OLDI adaptation data parameters.

ATS B and ATS C support an automatic forwarding of received AMA messages.

In Figure 17, the airspace data is depicted as:

- ATS A in purple;
- ATS B in blue;
- ATS C in red;
- ATS D in orange.

The flight trajectories are depicted in green and coordination points in black.

3.5.6.2 Apportionment of Delay - Example 1

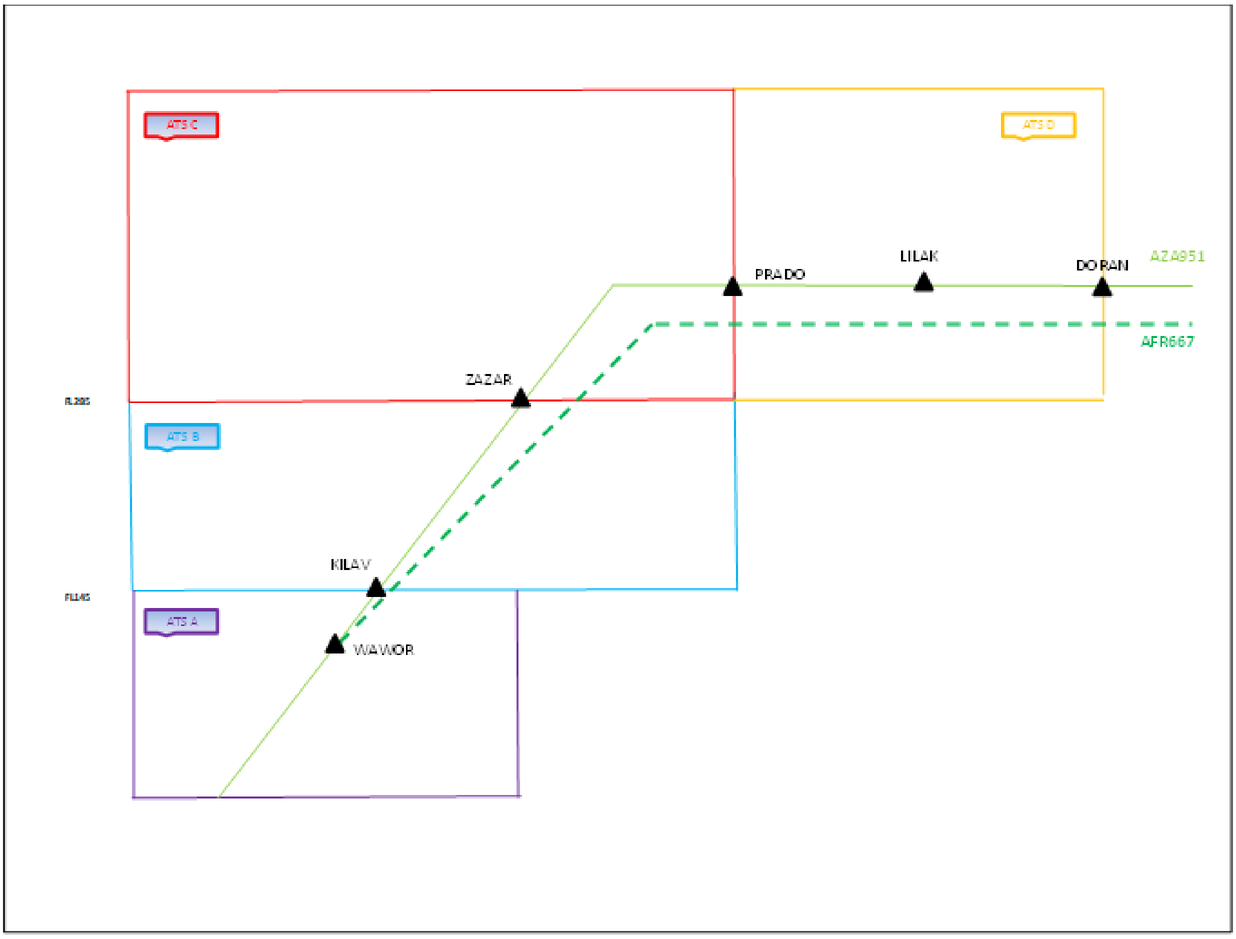


Figure 17 - Apportionment of Delay - Example 1

The IFPS distributed the original FPL (FPL-AZA951-IS –B737/M-SRWY/C –LIRF1000 -N0420F340 RAXAD UM761 LIRIM UG333 PRADO UL908 KILAV DCT WAWOR –LTBA0130) to ATS A, ATS B, ATC C and ATS D.

ATS A extracts the following 4-D trajectory for flight AZA951 within its AoI as:

Horizontal position	PRADO	ZAZAR	KILAV	WAWOR	LTBA

FL	340	285	145	115	000
Time	1035	1041	1047	1049	1055

ATS B calculates the following 4-D trajectory for flight AZA951 within its AoI as:

Horizontal position	PRADO	ZAZAR	KILAV	WAWOR
FL	340	285	145	115
Time	1035	1041	1047	1049

ATS C calculates the following 4-D trajectory for flight AZA951 within its AoI as:

Horizontal position	LILAK	PRADO	ZAZAR	KILAV
FL	340	340	285	145
Time	1031	1035	1041	1047

ATS D calculates the following 4-D trajectory for flight AZA951 within its AoI as:

Horizontal position	…	DORAN	LILAK	PRADO	ZAZAR
FL	…	340	340	340	285
Time	…	1027	1031	1035	1041

10:15 ATS D sends an ABI message to ATS C for the flight AZA951.

-TITLE **ABI**
-REFDATA
    -SENDER -FAC **ATSD**
    -RECVR -FAC **ATSC**
    -SEQNUM **021**
-ARCID **AZA951**
-SSRCODE **A1165**
-ADEP **LIRF**
-COORDATA
    -PTID **PRADO**
    -TO **1035**
    -TFL **F340**
-ADES **LTBA**
-ARCTYP **B737**
-ROUTE **N0420F340 …. DORAN DCT LILAK DCT PRADO DCT ZAZAR**

Flight AZA951 is subject to the arrival management process at Istanbul (LTBA), which calculates that an optimum time for the flight to leave the metering fix (WAWOR) within the vertical limits of ATS A is 10:57 (8 minutes delay). As ATS A cannot absorb any delay for this flight, the total delay is passed further upstream with a resulting time at KILAV of 10:55.

10:18 ATS A sends an AMA message to ATS B.

-TITLE **AMA**
-REFDATA
    -SENDER –FAC **ATSA**
    -RECVR -FAC **ATSB**
    -SEQNUM **722**
-ARCID **AZA951**
-ADEP **LIRF**
-COP **KILAV**
-AMANTIME **105500**
-ADES **LTBA**
-MFX **WAWOR**
-TOM **105700**
-TTL **0800**

ATS B receives the AMA message and returns a LAM message. In accordance with Letter of Agreement, concerning the arrivals to LTBA subject to the arrival management process, if the delay is more than 2 minutes the AMA message is forwarded to the next upstream unit. ATS B can absorb 25 % of the delay (2 minutes). ATS B automatically composes a new AMA message to be sent to ATS C shifting the time at point ZAZAR for the delay to be absorbed further upstream (6 minutes delay at ZAZAR as 2 minutes of delay will absorbed by ATS B). Therefore, the AMA message to be sent by ATS B proposes a 6-minute delay within ATS C lateral and vertical limits with a resulting time at ZAZAR of 10:47. The reception of AMA message by ATS B does not change the flight status for AZA951. The flight AZA951 is not correlated as the reception of ABI from the upstream unit remains as correlation trigger.

The updated time at the COP (KILAV 10:55) is presented in the relevant flight list with a specific indication, while the TTL is not presented as the total delay will be absorbed by ATS units further upstream. As the flight is still not yet correlated, there is no presentation of AMAN delay in the track label. The trajectory is not updated.

10:18 ATS B sends an AMA message to ATS C.

-TITLE **AMA**
-REFDATA
    -SENDER –FAC **ATSB**
    -RECVR -FAC **ATSC**
    -SEQNUM **036**
-ARCID **AZA951**
-ADEP **LIRF**
-COP **ZAZAR**
-AMANTIME **104700**
-ADES **LTBA**
-MFX **WAWOR**
-TOM **105900**
-TTL **0800**

ATS C receives the AMA message and returns a LAM message. In accordance with the Letter of Agreement concerning the arrivals to LTBA subject to the arrival management process, if the delay is more than 2 minutes the AMA message is forwarded to the next upstream unit. ATS C can absorb 25 % of the delay (2 minutes). ATS C automatically composes a new AMA message to be sent to ATS D shifting the time at PRADO point for the delay to be absorbed further upstream (4 minutes delay at PRADO as 4 minutes of delay will be absorbed by ATS B and ATS C). Therefore, the AMA message to be sent by ATS D proposes 4-minute delay within ATS D with a resulting time at PRADO of 10:39. As ATC C already received an ABI message for AZA951 from the ATS D, the flight will remain in pre-activation state, correlated with the track.

The updated time at the COP (ZAZAR 10:47) is presented in the track label and relevant flight list with a specific indication, while the TTL is not presented as the total delay will be absorbed by ATS units further upstream. The trajectory is not updated.

10:19 ATS C sends an AMA message to ATS D.

-TITLE **AMA**
-REFDATA
    -SENDER –FAC **ATSC**
    -RECVR -FAC **ATSD**
    -SEQNUM **688**
-ARCID **AZA951**
-ADEP **LIRF**
-COP **PRADO**
-AMANTIME **103900**
-ADES **LTBA**
-MFX **WAWOR**
-TOM **105900**
-TTL **0800**

ATS D receives the AMA message and returns a LAM message. The updated time at the COP (PRADO 10:39) is presented in the track label and relevant flight lists with a specific indication, while the TTL is not presented as the total delay as it does not correspond to the delay to be absorbed by ATS D. The trajectory is not updated.

The Flight AZA951 is handed over to ATS D by the preceding ATS unit in the trajectory, ATS D intends to apply vectoring to AZA951 (closed heading re-joining the original trajectory at PRADO). After the application of the closed heading instruction, the trajectory is updated and a revised ABI message with a new time over PRADO is sent.

10:21 ATS D sends revised ABI to ATS C.

-TITLE **ABI**
-REFDATA
    -SENDER -FAC **ATSD**
    -RECVR -FAC **ATSC**
    -SEQNUM **035**
-ARCID **AZA951**
-SSRCODE **A1165**
-ADEP **LIRF**
-COORDATA
    -PTID **PRADO**
    -TO **1039**
    -TFL **F340**
-ADES **LTBA**
-ARCTYP **B737**
-ROUTE **N0420F340 …. DORAN DCT 4207N02278E DCT PRADO**

10:22 ATS C sends a LAM message to ATS D, correlates the received ABI with its corresponding flight plan data and attempts to align the AZA951 trajectory with the ABI message route information. The DORAN point is disregarded due to its distance from the inbound COP, the LILAK point is deleted as it is no longer part of the trajectory, the GEO1 point is inserted and the new time over PRADO is applied, the remaining part of the trajectory is not altered but it is shifted in time. The updated trajectory is:

Horizontal position	GEO1 (4207N02278E)	PRADO	ZAZAR	KILAV
FL	340	340	285	145
Time	1033	1039	1045	1051

10:25 ATS C sends ABI to ATS B.

-TITLE **ABI**
-REFDATA
    -SENDER -FAC **ATSC**
    -RECVR -FAC **ATSB**
    -SEQNUM **723**
-ARCID **AZA951**
-SSRCODE **A1165**
-ADEP **LIRF**
-COORDATA
    -PTID **ZAZAR**
    -TO **1045**
    -TFL **F285**
-ADES **LTBA**
-ARCTYP **B737**
-ROUTE **N0420F340 …. 4207N02278E DCT 4207N02278E DCT PRADO DCT ZAZAR DCT KILAV**

10:25 ATS B sends a LAM message to ATS C, correlates the received ABI with its corresponding flight plan data. As the flight is correlated, the AMAN delay (the updated time at the COP KILAV 10:55) is presented in the track label and relevant flight list with a specific indication, while the TTL is not presented. ATS C attempts to align the AZA951 trajectory with the ABI message route information. The GEO1 point is disregarded due to its distance from the inbound COP, PRADO point is kept, the new time over ZAZAR is applied, the remaining part of the trajectory is not altered but it is shifted in time. The updated trajectory is:

Horizontal position	PRADO	ZAZAR	KILAV	WAWOR
FL	340	285	145	115
Time	1039	1045	1051	1053

The subsequent ABI and ACT message exchanges will update the AZA951 trajectory within ATS B and ATS A.

3.5.6.3 Apportionment of Delay - Example 2

The IFPS distributed the original FPL (FPL-AFR667-IS –B737/M-SRWY/C –LFPO1900 -N0410F330 MILOR UG166 MOMAG UG887 PRADO UL908 KILAV DCT WAWOR –LTBA0300) to ATS A, ATS B, ATC C and ATS D.

ATS A extracted the following 4-D trajectory for flight AFR667 within its AoI as:

Horizontal position	PRADO	ZAZAR	KILAV	WAWOR	LTBA
FL	330	285	145	115	000
Time	2146	2151	2157	2159	2205

The flight AFR667 is subject to the arrival management process at LTBA that calculates a 90 seconds delay at the metering fix (WAWOR). As ATS A cannot absorb any delay for this flight, the total delay is passed further upstream.

ATS A sends the AMA message to ATS B.

-TITLE **AMA**
-REFDATA
    -SENDER –FAC **ATSA**
    -RECVR -FAC **ATSB**
    -SEQNUM **075**
-ARCID **AFR667**
-ADEP **LFPO**
-COP **KILAV**
-AMANTIME **215830**
-ADES **LTBA**
-MFX **WAWOR**
-TOM **220030**
-TTL **0130**

ATS B receives the AMA message and returns a LAM message. In accordance with the Letter of Agreement concerning arrivals to LTBA subject to the arrival management process, if the delay is less than 2 minutes, the delay is solely absorbed by ATS B and an AMA message is not forwarded upstream.

The updated time at the COP (KILAV 21:58) is presented in the track label with a specific indication and the TTL is also appropriately presented in the track label/electronic flight strip. The trajectory is not updated.

3.5.7 Use of data item “Assigned Speed”

Arrival Management can be performed by the use of speed requests. In case of bunching to e.g. the Initial Approach Fix (IAF), the local APP or ACC unit may request the upstream unit to put (some) aircraft on a certain speed (e.g. “speed 260”) in order to absorb time and/or ensure (pre) sequencing.

ATCOs in the local APP or ACC units often initiate this kind of request by phone, hence causing additional workload in both the accepting and the transferring units. By implementing the item of data “Assigned Speed” of the AMA message, it is possible to alleviate the workload of the ATCOs since the speed request can be triggered by an input from the local ATCO and be displayed on the HMI of the upstream ATCO. When several aircraft converge to the IAF or COP, it may also provide the transferring ATCO with an idea of the sequence that is aimed for by the accepting ATCO (e.g. three different aircraft receiving “speed 270”, “speed 260” and “speed 250” gives a very good idea of which one has to go first).

For the cases where the aircraft is flying above the conversion altitude at the time of reception of an assigned speed in knots (e.g. still with the upstream UAC), the working method would be that the UAC ATCO will instruct the aircrew to fly that assigned speed “upon conversion”.

Communicating this information even prior to the top of descent allows them planning for it hence meeting the restriction more effectively).

As for other cases of Arrival Management, the application of speed constraint for the purpose of Arrival Management must remain based on “best effort”. When there is a need to coordinate tactical requests using speed, the RTI message shall be used since it allows accepting or rejecting the request.

The use of assigned speed by the units handling the traffic towards the IAF might be a useful tool to complement (Extended) Arrival Management concepts using TTL/TTG or Time over COP.

3.5.8 AMA operational reply

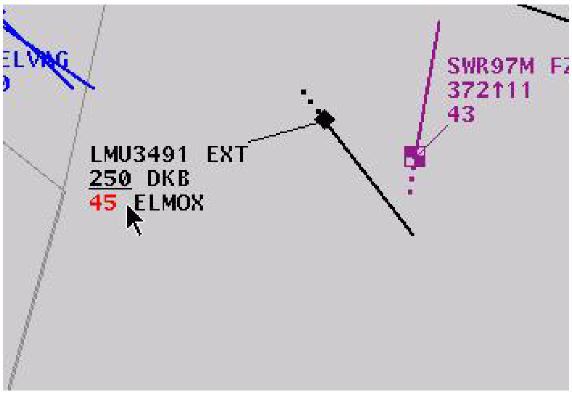
The OLDI specification does not require an operational reply to a received AMA message. It is assumed that the upstream ATS unit would make best effort to accommodate the constraints contained in the AMA message, but without a guarantee of full compliance, as no ACP message or similar type of response is provided back.

It seems that for TTL/TTG and AMAN time this logic is appropriate based on the assumption of best effort to meet the AMAN constraint. However, in the case of an AMA message that contains assigned speed and the application point from which the speed reduction applies, a complete absence of operational reply might be deemed inappropriate. The ATS unit that operates arrival sequencing for the concerned airport should be aware whether the required speed reduction would be applied in order to conceive the remedial actions in case that the upstream unit is unable to comply. In this particular case, a provision of ACP/RJC messages or other operational response mechanism (SDM) needs to be considered. This will also require the update of OLDI Specification, which does not address this issue.

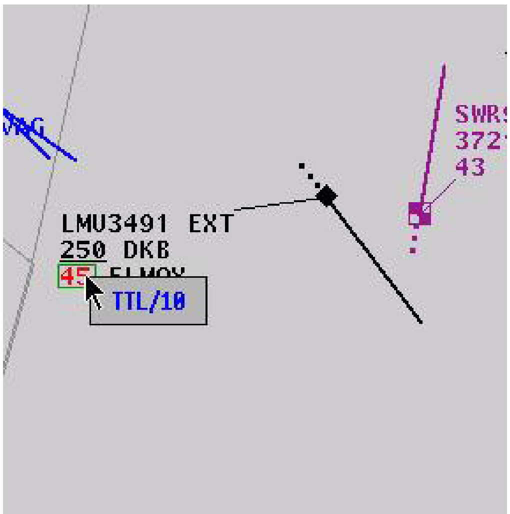
3.5.9 Example AMA presentation in the receiving unit

The AMA message does not need to be presented to the relevant working position, but the AMA message content (notifications and advisories) needs to be presented in the track label, electronic flight strips or relevant flight list, depending on the AMA operational content and operational needs for the follow-up action.

The below picture shows how AMA message content can be presented. The display of GS (Ground Speed) in red indicates that there is an AMA message for this flight.



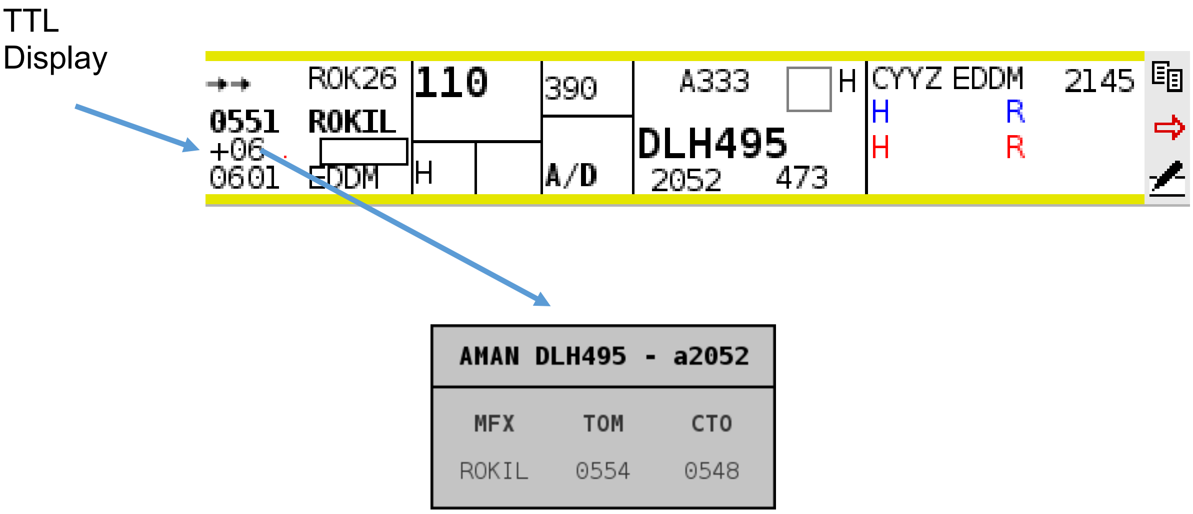
The AMAN time constraint and relevant coordination point should be presented in the track label/electronic strip (preferable as an updated route info) with a clear indication (specific symbol or colour change) that the time over COP was received via AMA message. If an AMA message contains TTL/TTG, the advisory needs to be included in the track label/electronic strips, preferably in relation with the received AMAN/COP, only in the case where the total delay will be absorbed by one ATS unit.



This particular HMI presentation of TTL is done by moving the mouse over the Ground Speed (GS) display. The mouse click on GS field triggers the ACK button. An additional click on the ACK button acknowledges the AMA message content and turns GS in black again.

In case of delay propagation further upstream and apportionment of delay, the presentation of TTL is not very useful, as TTL contains the total time to be lost.

As in most cases the metering fix is within TMA boundaries, there is no operational need to present the metering fix and relevant time over to the upstream en-route sectors. However, the metering fix could be the TMA/ACC boundary point, which may justify the presentation of time over metring fix to the en-route sector.



The picture above indicates the presentation of TTL within the electronic strip field; TTG might be presented as -06. A click on TTL field opens a pop-up window with MFX (Metering Fix) and AMAN planning times:

- TOM = Time over Metering Fix
- CTO = Controlled Time over COP

The speed restriction, if contained in an AMA message should be clearly presented in the track label, preferably in the assigned speed track label field with an indication (colour or symbol) that it was received via AMA message. If an AMA message contains the speed restriction application point, this information needs to be presented but the presentation in the track label/electronic strips might not be the most appropriate. The application point of speed adjustment might be highlighted when the track label of a particular flight is selected.

The below picture indicates the presentation of TTL/TTG values within the label and flight plan lists. The TTL/TTG contents of AMA messages is displayed in the label and flight plan list as ‘Lxx’ or ‘Gxx’ (for ‘Lose’ and ‘Gain’ where xx is minutes) for aircraft that are subject to AMA messages. In the picture, the AMA messages for NAX4157 has been received and the flight has to lose 1 minute whereas SAS2111 is not subject to AMAN flow control. Further details like Feeder Fix, the STA over the Feeder Fix and the TTL/TTG applicable for that flight are contained in the flight list, as optional fields that can be selected by the ATCO if desired – an example of one of these lists is also in the picture.

The presentation of ground speed is indicated in the below pictures. The first picture presents the normal track label and the orange ‘S’ shows that a speed constraint has been received from the downstream ATCO (internal or external). The second picture presents the magnified track label (by moving the mouse over the track label), the ATCO sees the new speed that has been requested.

"NORMAL" Label. The orange S shows that a speed constraint has been received from the downstream ATCO (internal or external).

"MAGNIFIED" Label. When mousing over the track label, the ATCO sees the speed that has been requested.

The arrival sequence number should not be presented the in track label/electronic strip as it is meaningless for the en-route sectors.

3.5.9.1 The Evolution of AMA Presentation before/after Operational Implementation

The purpose of this Section is to describe the change of AMA HMI presentation during the operational deployment of the AMA message. This particular implementation considers the following AMA items as:

- TTL/TTG;
- MFX;
- TOM;

The AMA data was presented at ACC Executive Controller screen as:

- Main object – track label –TTL-TTG in line 0, left
- Supporting object – AMAN window showing MFX/TOM

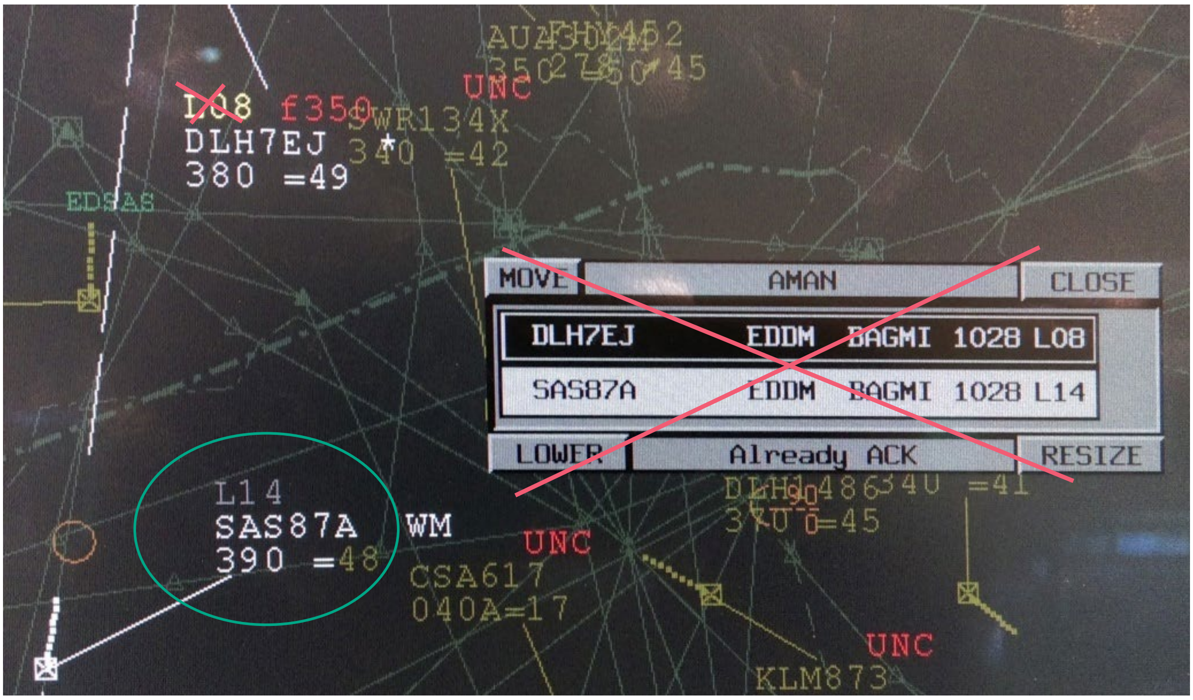
Before the operational use of AMA message, the following features had been foreseen:

- New/updated TTL/TTG value was displayed in yellow, mouse action – change to grey (operational meaning – info was passed to the pilot)
- TTL/TTG was displayed at all sectors, all TTL/TTG values, there was threshold when change would be presented to the controller

The following modifications were done after the AMA exchanges became operational (required by ACC after having first operational experience):

- TTL/TTG is always displayed in grey colour (less attractive), non-sensitive field
- TTL/TTG displayed at last sector only
- Threshold TTL/TTG value when initial/change TTL/TTG is displayed, might be specific per partner
- Only values higher that TTL 10 minutes are displayed to the controller (last sector)
- No need for a specific AMA window;
- The following operational procedures (see table below) were agreed and contained in the relevant LoA as:

TTL (based on Metering Fix, in minutes)	**ACC's Speed Reduction**
< 10	No action
10 – 15	IAS max 270 knots
15+	IAS max 250 knots



3.5.10 Extended AMAN and the current AMA message specification

It is not completely clear that the current specification for the AMA message also allows the use of Extended AMAN – that is, AMA message transmissions forwarded to multiple upstream AoRs for a longer arrival sequence look ahead time. As Extended AMAN is also being looked at in the context of SESAR, it is also worth highlighting in these guidelines.

It should be noted that all the 'General' AMA message requirements in Section 11.6.3.1 of the OLDI Specification [RD 1], with the exception of OLDI-AMA-60-M, can be applied across multiple upstream AoRs according to bilateral agreement. Furthermore, the content of the AMA messages can also be tuned for use with multiple upstream AoRs under the framework of OLDI-AMA-10-M as there to be 'bilaterally agreed'.

Another approach that could be considered for implementing Extended AMAN operations across multiple ACCs is outside the scope of the OLDI Specification – it would be to use B2B/SWIM like messages over the PENS network between participating units. However as this is outside the scope of the OLDI Specification, this concept is not addressed by this document.

3.6. LOF upgrade to cater for ATNB2 needs

3.6.1 Background

The OLDI specification includes provisions to support the air/ground data link exchanges between adjacent ATS units, namely the LOF and NAN messages which fulfil the logon forward and next authority notified processes of Regulation (EC) No. 30/2009. The LOF message contains the data item “ATN Logon Parameters” which identifies the CPDLC application type and version. LOF supports the exchange of ATN B1 logon information for the purpose Regulation (EC) No. 29/2009 and has been amended to support ATS B2 logon information for the ATS B2 CPDLC and ADS-C applications. Indeed, even though the current European ATN B1 air-ground exchanges use CPDLC version 1, there is a need to update the LOF message to allow the ground systems support a mixed ATN B1 and ATS B2 environment using different versions of CPDLC and ADS-C. A fleet of aircraft supporting ATN B1 and/or ATS B2 will be gradually deployed in the coming years. Indeed, the Common Project 1 (CP1) Implementing Rule [RD 6] mandates that aircraft operating as GAT above FL285 with a certificate of airworthiness first issued on or after 31 December 2027 have the capability to downlink the ADS-C Extended Project Profile (EPP) defined by the ATS B2 standards.

3.6.2 Operational Scenario

The operational scenario is illustrated in Figure 18. It presents a situation where three ACC’s have to exchange LOF messages: ACC1 and ACC3 do not support ATN B2 whereas ACC2 is ATN B1 and B2 compatible. The figure indicates the cases when the LOF message needs to include ATN B2 application entries (the optional field “ATNLOGONB2”). The ATNLOGONB2 field is only required in case the downstream ATS unit is capable of supporting ATN B2 application (CPDLC V2 and ADS-C V1) at the same time as ATN B1 application. In that case, the ACC1 needs to provide LOF with mandatory primary field ATNLOGON and optional primary field ATNLOGONB2.

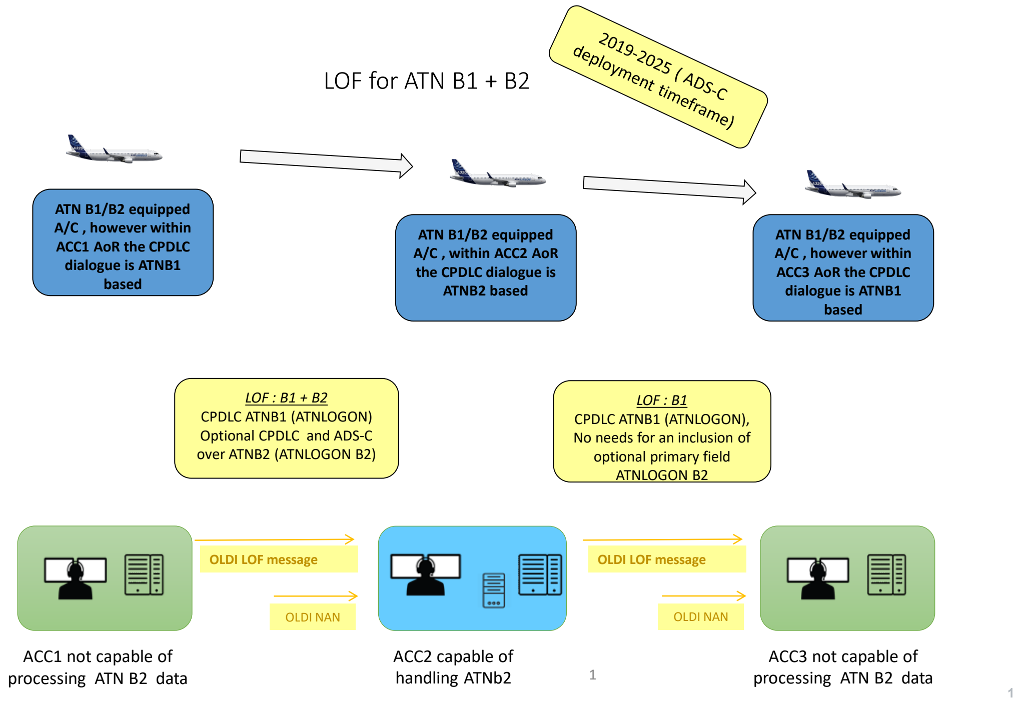


Figure 18 - ATN B1 / B2 Mixed Environment Scenario

As ACC3 does not support ATN B2, the LOF message between ACC2/ACC3 needs to include only the ATNLOGON primary field (the optional field ATNLOGONB2 is not required).

3.6.3 LOF message process and generation

The handing and content of incoming and outgoing LOF messages in different configuration modes (ATN B1, ATNB1+ATNB2, ATNB2) is summarised in the below table.

The names of the different fields are listed in section 3.6.5.

	Aircraft	ATN B1	ATN B1+B2	ATN B2
		Nominal	Nominal	Nominal
INCOMING LOF	**LOF (incoming)**			
	ATN LOGON			
	ADS-C	V0 / 00	V0 / 00	V1 / 01
	CPDLC	V1	V1	V2 / 02
	ATN LOGONB2			
	ADS-C	absent	V1	Not required
	CPDLC	absent	V2	Not required
REACTION	Status of the LOF	ACCEPTED (if the nominal conditions for ATN LOGON are met)	ACCEPTED (if the nominal conditions for ATN LOGON are met)	ACCEPTED (if the nominal conditions for ATN LOGON are met)
	SEND LAM to the sender	YES	YES	YES
OUTGOING LOF	LOF sent to the NDA that is ATN B2			
	ATN LOGON			
	ADS-C	V0 / 00	V0 / 00	V1 / 01
	CPDLC	V1	V1	V2 / 02
	ATN LOGONB2			
	ADS-C	absent	V1	Not required
	CPDLC	absent	V2	Not required
	LOF sent to the NDA that is ATN B1			
	ATN LOGON			
	ADS-C	V0 / 00	V0 / 00	NO LOF CAN BE SENT
	CPDLC	V1	V1	Use CM CONTACT
	ATN LOGONB2			
	ADS-C	absent	absent	NO LOF CAN BE SENT
	CPDLC	absent	absent	Use CM CONTACT

3.6.4 LOF message examples for the different possible scenarios

a) LOF example aircraft ATN B1 only

-TITLE **LOF**
-REFDATA
    -SENDER -FAC **LWSS**
    -RECVR -FAC **LBSR**
    -SEQNUM **047**
-ARCID **WZZ178**
-ADEP **LIRF**
-ADES **LTBA**
-AF **ATN**
-ARCADDR **ABC123**
-ATNLOGON
    -CMLTSP **8183657500A49CD70001000047473133011111**
    -ADSQVLTSP
        -AGAPPQUALIFIER **0**
        -AGAPPVERSION **00**
    -CPCQVLTSP
        -AGAPPQUALIFIER **22**
        -AGAPPVERSION **01**
        -CPDLCADDRESS **8183657500A49CD700010000474731330AAAA**

    -ATIQV
    -AGAPPQUALIFIER **3**
    -AGAPPVERSION **00**

b) LOF example aircraft ATN B1 and B2

Note: The below outlined part of the message is an example of the proposed Specification updates described in Sections 3.6.4 and 3.6.5 to be subject to wide stakeholder consultation.

-TITLE **LOF**
-REFDATA
    -SENDER -FAC **LWSS**
    -RECVR -FAC **LBSR**
    -SEQNUM **047**
-ARCID **WZZ178**
-ADEP **LIRF**
-ADES **LTBA**
-AF **ATN**
-ARCADDR **ABC123**
-ATNLOGON
    -CMLTSP **8183657500A49CD70001000047473133011111**
    -ADSQVLTSP
        -AGAPPQUALIFIER **0**
        -AGAPPVERSION **00**
    -CPCQVLTSP
        -AGAPPQUALIFIER **22**
        -AGAPPVERSION **01**
        -CPDLCADDRESS **8183657500A49CD700010000474731330AAAA**
    -ATIQV
    -AGAPPQUALIFIER 3
    -AGAPPVERSION 00

```
-ATNLOGONB2
        -ADSQVLTSP
                -AGAPPQUALIFIER 0
                -AGAPPVERSION 01
                -ADSADDRESS 8183657500A49CD7000100004747313301111
        -CPCQVLTSP
                -AGAPPQUALIFIER 22
                -AGAPPVERSION 02
                -CPDLCADDRESS 8183657500A49CD700010000474731330AAAA
```

c) LOF example aircraft ATN B2 only

Note: The below outlined part of the message is an example of the proposed Specification updates described in Sections 3.6.4 and 3.6.5 to be subject to wide stakeholder consultation.

```
-TITLE LOF
-REFDATA
        -SENDER -FAC LWSS
        -RECVR -FAC LBSR
        -SEQNUM 047
-ARCID WZZ178
-ADEP LIRF
-ADES LTBA
-AF ATN
-ARCADDR ABC123
-ATNLOGON
        -CMLTSP 8183657500A49CD7000100004747313301111
        -ADSQVLTSP
                -AGAPPQUALIFIER 0
                -AGAPPVERSION 01
```

```
                -ADSADDRESS 8183657500A49CD7000100004747313301111
        -CPCQVLTSP
                -AGAPPQUALIFIER 22
                -AGAPPVERSION 02
                -CPDLCADDRESS 8183657500A49CD700010000474731330AAAA
```

```
-ATIQV
        -AGAPPQUALIFIER 3
        -AGAPPVERSION 00
```

3.7. Operational scenario of flight transfer data exchanges in the context of CPDLC exchanges

3.7.1 Scenario

The ground-ground coordination (OLDI) is not coupled with the air-ground message exchanges. It is however recommended to follow a well-defined sequence (agreed by adjacent ATS units), between the ground-ground (ATC system) messages and the air-ground (data link) messages.

For this scenario, flight ETD44A is an A388 on route from KJFK to OMAA that will be transferred by Lima ACC to Mike UAC. Both centres perform CPDLC operations and use the LOF and NAN messages as well as the COF and MAS messages. ETD44A is connected to the ground data link system of Lima ACC.

40 minutes prior to the COP, Lima ACC ATC system sends an ABI message to Mike UAC ATC system. The Mike ATC system acknowledges its receipt by sending back a LAM message.

The next message to be sent is the LOF message. Depending on the local implementation and the needs of the downstream unit, it is sent at any time between the moment of the LAM message is received on the ABI and a few minutes/seconds before sending an ACT message. The LOF message sent by Lima ACC ATC system to Mike UAC ATC system is also acknowledged by a LAM message.

Note: In case the sent LOF message is not acknowledged by a LAM message, the transferring ATSU sends a CPDLC Next Data Authority message and a CM-CONTACT message to the aircraft to trigger an automatic CM-LOGON from the aircraft to the R-ATSU. Even if the CPDLC uplink message fails, the CM-CONTACT must be sent as detailed in Regulation (EC) No. 30/2009**.** When the Transferring Unit is not CDA and the LOF mesage is not acknowledged, the sending of NDA message to the aircraft could be delayed until the Transferring Unit becomes CDA.

3 minutes later, coordination is effected by sending an ACT message, which is successfully acknowledged by the receipt of a LAM message.

- The Lima ACC ground data link system sends a “Next Data Authority” (NDA – UM160) request to flight ETD44A (aircraft). This request is replied to by a LACK message. Another implementation modality allows that a NDA request is sent to the aircraft at the same time as the LOF message is sent to the downstream unit (not after the ACT message as in this scenario).

  Note: There are no specific requirements in case the LACK message is not received. Mike UAC does not send a NAN in that case.

- After, Lima ACC ATC system sends a NAN message to inform Mike UAC that they become Next Data Authority for the flight. Depending on local implementations, and the needs of the downstream unit, the NAN message is sent at any time between the moment of the LACK is received on the NDA (UM160) request and a few minutes/seconds after the ACT message transmission. The NAN from Lima ACC is replied to by a LAM message from the Mike UAC ATC system. Another implementation modality allows that the NAN message sending event is completely unrelated to the ACT message sending message (i.e. it occurs once the LACK acknowledging the NDA request is received from the aircraft).

Mike UAC ground data link system initiates a “CPDLC start request” with flight ETD44A (aircraft), which is replied to by a “CPDLC start confirm” received from the aircraft.

We are now at 11 minutes before the COP, which is also the Transfer of Control Point.

Based on the LoA provisions, any change to the agreed transfer conditions less than 5 minutes before transfer is subject to an approval request. This is translated in the ATC systems as the start of the transfer phase.

Note: At this stage, in view of the variety of potential TIM and ROF message exchanges, this scenario does not take them into account as they have no impact on the CPDLC message exchange.

- A couple of minutes before the aircraft reaches the Transfer of Communication Point, Lima ACC ATCO instructs flight ETD44A via data link to contact Mike UAC and makes a “transfer” input in the ATC system. Internally Lima ACC, the ground data link system sends a “CPDLC end request” and a “Contact instruction” to flight ETD44A (aircrew/aircraft). Flight ETD44A (aircraft) sends a LACK back to Lima ACC ground data link system and the aircrew sends a WILCO to the Lima ACC ground data link system. This also triggers the “CPDLC end – response” to the Lima ACC ground data link system. Another implementation modality allows that the transfer is not done independently to the aircraft and to the downstream unit– for a CPDLC connected aircraft when the ATCO selects ‘Transfer’ the system sends simultaneously TIM and COF messages to the downstream unit and a VCI (Voice Change Instruction) to the aircraft.
- Lima ACC ATC system sends at the same time a COF message to Mike UAC ATC system. It is replied to by a LAM message.

  Note: Waiting for the WILCO from the aircrew before sending the COF to the accepting unit may help reducing the likelihood that a COF message be received by the accepting unit and the aircraft does not call on the frequency (due to an incorrect processing of the “Contact instruction”). Another implementation modality allows that the WILCO and COF are unrelated due to the fact the flight is not assumed until it has made contact with the ground unit.

Flight ETD44A (aircraft) sends a Current Data Authority (CDA – DM99) message to Mike UAC ground data link system, which replies with a LACK. The message “Current ATC Unit” is sent by the Mike UAC ground data link system to the aircrew when the aircraft is assumed by the ATCO in the ATC system.

Flight ETD44A (aircrew) contacts Mike UAC ATCO who assumes the flight in the ATC system. A MAS message is sent by Mike UAC ATC system to Lima ACC ATC system, which acknowledges with a LAM.

Note: The use of the MAS message should not change anything to the application rules of the “Current ATC Unit” message.

3.8. Transfer Phase data exchanges

This section describes an operational scenario highlighting the operational tasks in having to handle uncoupled processes for ground-ground coordination (OLDI) and air-ground (CPDLC).
Flight BAW16 is a B77W from WSSS to EGLL that will be transferred by Kilo UAC to Mike UAC via the agreed COP GARLU. Both units have implemented FRA but the COPs are still used as reference points for ATCO situational awareness and for OLDI messaging. Co-ordination has been successfully performed.

3 minutes before transfer, the Kilo UAC system automatically sends a TIM message to the Mike UAC system, signifying the end of the coordination phase and the start of the transfer phase. The TIM message also contains the Route assigned to the flight by the Kilo UAC ATCO (executive control data bilaterally agreed). This information is used by the Mike UAC system to update its system route. The TIM is replied to by a LAM message from the Mike UAC system.

On top of FRA, Mike UAC uses a Variable Division Flight Level at the interface with Kilo UAC. To support this, an SDM message is sent by the Mike UAC system (as accepting unit) to the Kilo UAC system (as transferring unit), for every incoming traffic, with the frequency and sector ID to which the flight has to be transferred. The SDM message is transmitted automatically based on the updated system route and sector sequence in the Mike UAC system. It is replied to by a LAM message from the Kilo UAC system. The frequency and Sector ID are displayed on the HMI of the Kilo UAC ATCO. An SDM message can be sent by the Mike UAC system until a COF message has been received from the Kilo UAC system.

Shortly prior the Transfer of Control point, the Kilo UAC ATCO puts the aircraft on a heading to ensure separation. He/she wants to refer this to the Mike UAC ATCO and transfer the aircraft (in case there is no operational need to refer this to the Mike UAC ATCO, an SDM message can be used). Following the input made on his/her HMI, a HOP message is sent by the Kilo UAC system that is replied to by a LAM message from the Mike UAC system (alternatively an ACP message may be used if bilaterally agreed).

The Mike UAC ATCO accepts the transfer conditions and makes the corresponding input on the HMI. This triggers the transmission of a ROF message from the Mike UAC system. Should the proposed transfer conditions be unacceptable, the Mike UAC ATCO shall initiate verbal coordination with the Kilo UAC ATCO.

The Kilo UAC ATCO transfers by voice BAW16 to Mike UAC, but performs a “cancel-assume” input by accident for BAW106 instead which is 10 NM behind BAW16 on course to the same COP and destination aerodrome (and for which a TIM message has also been sent). Doing so, a COF message is sent by the Kilo UAC system to the Mike UAC system for BAW106.

On the Mike UAC HMI, the ATCO sees that BAW16 is still under control of Kilo UAC but the aircraft is already on his/her frequency. Conversely, he/she sees that the BAW106 should be on the frequency but is actually not.

The LoA procedures mention that this kind of situation has to be resolved by verbal coordination, since several cases can lead to a “wrong” transfer, e.g. mistake from the transferring controller or callsign confusion. Once the situation is clarified and the transfer completed in the system (“cancel-assume” of the right aircraft), the Mike UAC ATCO assumes BAW16 and BAW106 and a MAS message is sent by Mike UAC system to Kilo UAC system, that is replied to by a LAM message from Kilo UAC system.

A different possible issue could be that BAW16 is correctly transferred and “cancel-assumed” by the Kilo UAC ATCO (meaning that a COF message is sent), but the Mike UAC ATCO “assumes” by accident BAW106 which is 10 NM behind. Doing so, and since COF and MAS messages can be operated independently, the Mike UAC system sends a MAS message to the Kilo UAC system. The Kilo UAC ATCO sees on his/her HMI that the Mike UAC ATCO has assumed the flight. Here as well, the LoA procedures mention that this kind of situation has to be resolved by verbal coordination.

3.9. Change of downstream ATSU with CPDLC transfer

When a flight is re-routed and the downstream ATS unit changes after the original downstream ATS Unit has already received the aircraft's ATN Logon parameters through a LOF message, the following message sequence ensures that the new downstream ATS unit will be able to successfully establish a CPDLC connection with the flight:

A configurable parameter time (to allow time for message correction in the new receiving ATSU) after the new ATSU has been notified of the flight (through either ABI or ACT), a LOF message is sent to the new ATSU. A MAC is sent to the old ATSU to indicate that no further data link communication management processing should be performed for this flight within the old ATSU.

After a CPDLC NDA message has been successfully sent to the aircraft identifying the new receiving ATSU, a NAN is sent to the new receiving ATSU. NDA-timing is up to local implementation.

In case the old receiving ATSU has already established a CPDLC connection with the aircraft, the new NDA received by the aircraft will lead to a CPDLC user-abort of this connection. After that, the aircraft is ready to accept a CPDLC connection from the new downstream ATSU.

After the new receiving ATSU receives the NAN message, it starts a CPDLC connection with the aircraft.

4 OLDI Relationship with Other Methods for Flight Data Exchanges

4.1. IFPS data exchanges impacting OLDI

4.1.1 Background

In order to improve traffic predictability and ensure the distribution of accurate flight plan information, IFPS developed the mechanism for provision of ATC flight plan updates and their distribution via IFPS to all concerned ATS units. This mechanism is in place since 2001 and consists of following elements:

- ATC Flight plan Proposal message (AFP)
- ATC flight plan message (APL)
- ATC flight plan change message (ACH)

The primary aim of these data exchanges is to improve the traffic situation awareness at network and local level as well as the reduction of workload and disruption caused by last minute flight data updates.

These messages have been developed several years after the initial deployment of OLDI messages and their impact on local systems in correlation with the OLDI updates is still not fully elaborated in terms of content and timing.

Although these messages should be deployed by all concerned actors initially by 2005, it should be noted that in 2018 less than half of ECAC ANSPs provided the Network Manager with AFP messages for predefined events. This prevents NM from providing APL and ACH messages for a substantial portion of traffic, this reducing the overall network predictability.

4.1.2 AFP purpose

The AFP message is provided by ATC to IFPS if certain parameters of flights have been changed or in cases of missing flight plan. After the reception of an AFP message, the IFPS creates or updates the flight plan information and distributes the updates to the downstream units via APL and ACH messages.

4.1.3 APL/ACH purpose

An APL message is sent by the IFPS whenever information is received from an ATC Unit via the AFP message, concerning a flight that does not exist in the IFPS; or does exist but as a result of the information received i.e. change of route, the flight plan details need to be sent to an ATS centre which did not receive the original FPL. This info is sent to all ATS units situated downstream.

An ACH message is output by the IFPS whenever information is received via the AFP message concerning a modification to a flight. IFPS distributes an ACH message to all ATC centres concerned by the flight that have already received flight plan information and that are situated downstream of the estimate point received in the incoming AFP message but not to the ATS unit from which the message was originated.

4.1.4 Summary of messages

There are three ADEXP messages that can be sent. They are detailed in the ADEXP Specification [RD 2], are all within the Flight Progress class and shall be submitted/exchanged in ADEXP format. (Note: ICAO AFP is accepted according to the Flight Progress Messages document [RD 4]).

AFP – ATC Flight Proposal. This message can be used by ATC to:

- insert a missing plan;
- change a route/divert a flight
- amend aircraft type
- amend cruising level
- amend flight rules, flight type or equipment.

Note: This message is an IAFP message in ADEXP format.

AFP messages submitted to IFPS generate transmission of either an APL or ACH in response.

APL – ATC Flight Plan. This message is generated by IFPS if an AFP cannot correlate to an existing FPL.
Note: This message is an IAPL message in ADEXP format.

ACH – ATC Flight Plan Change. Generated when an AFP causes a change to an existing FPL.
Note: This message is the IACH in ADEXP format.

4.1.4.1 Key assumptions

The elaboration of IFPS/ OLDI data exchanges takes in account that:

- Automation systems generate and display flight plan, control and coordination data in a timely, accurate and easily recognisable manner and in accordance with human factors principles.
- The key factor in using these messages is the introduction of accurate data that links the FPL data in the ATC environment and on the flight deck.

4.1.4.2 AFP dissemination guidance

The generation of AFP messages is important and provides significant benefit. These guidelines recommend the following best practice for units intending to use AFP.

- The creation of an AFP message should be triggered automatically in the system where possible to minimise controller workload.
- Any downstream ATSU will need to ensure that they send AFP messages for any changes to the flight data for a flight that is operating with an ATC Flight Plan Proposal.
- The IFPS user manual updates (November 2018) indicates that the ATC unit will stop transmitting AFP messages from the moment that the OLDI ACT message has been sent.

4.1.5 IFPS/OLDI data exchanges

The paragraphs below intend to elaborate the cases of APL and ACH data interaction with OLDI messages and system flight plan in case of AFP provision for missing flight plan, diversion and change of route.

The ACH dissemination concerning the AFP triggers for change of aircraft type and equipment and flight rules/type are not elaborated in details as some general rules might be applied.

The delay between the AFP reception and APL/ACH dissemination is random and it is only due to the operator intervention, as there is no computational delay.

4.1.6 Scenario 1 - IFPS/OLDI data exchanges for missing flight plan

The airspace and flight elements used for the cases of this scenario illustrated by Figure 19 are fictitious. Only the departure and destination airports exist. The airspace data is depicted as:

- ATS A in red with three sectors SC1, SC2 and SC3
- ATS B in blue with four sectors SC1, SC2, SC3 and SC4
- ATS C in purple with four sectors SC1, SC2, SC3 and SC4

The airways are depicted in green and significant points in black.

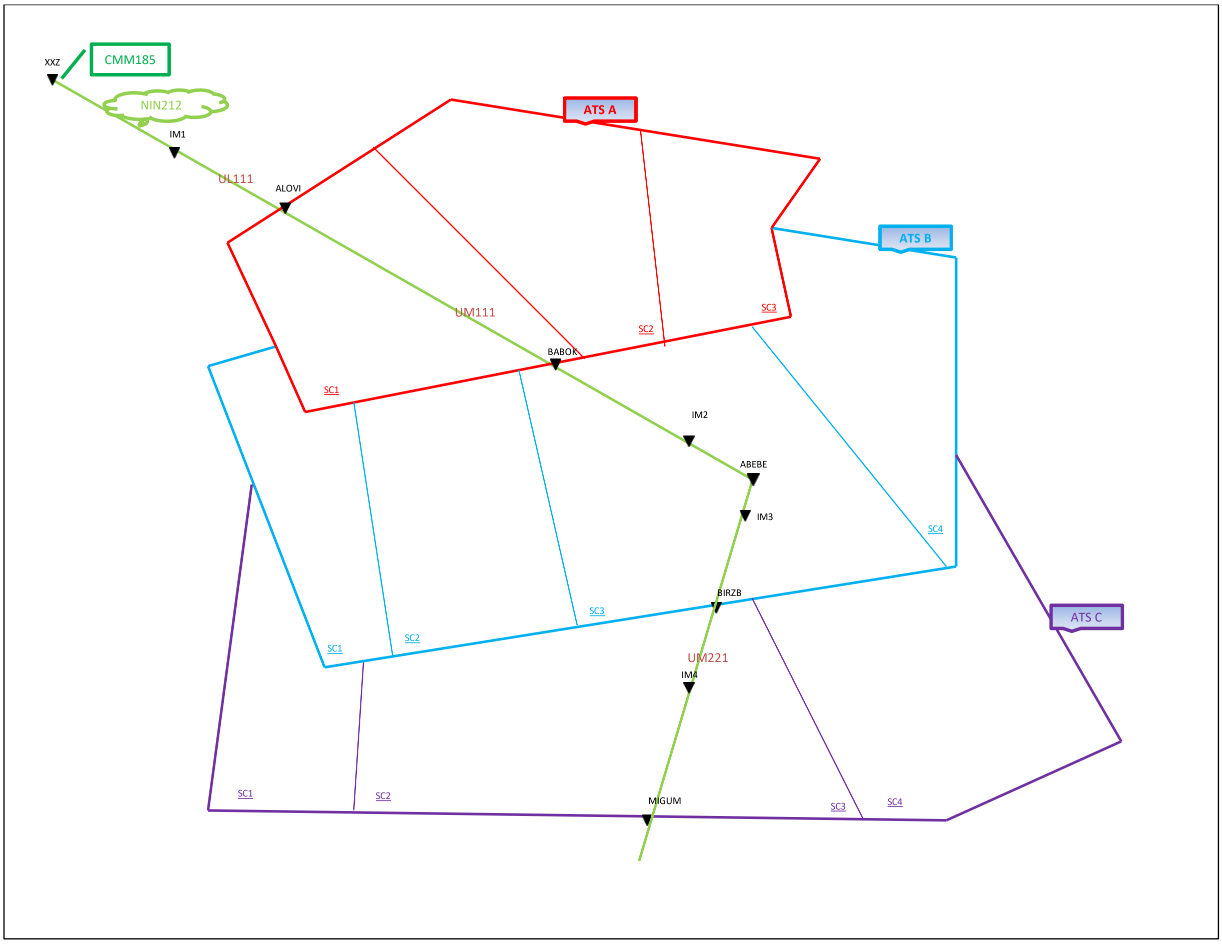


Figure 19 - Missing Flight Plan

4.1.6.1 Case1: Air Mali flight from Bamako to Lille

12:24 Flight CMM185 contacts ATS A, no system flight plan can be retrieved.

12:25 The ATCO on sector ATS A SC1 introduces a mini-flight plan for flight CMM185. ATS A tries to build the system flight plan based on the entry point and the departure/destination airport, but the correctness of this systems flight plan is very low, as ATS A has limited information about the downstream route structure.

12:25 ATS A sends an AFP message to IFPS.

(AFP-CMM185-A330-GABS-ALOVI/1224F330-LFQQ)

Or in ADEXP:

-TITLE **IAFP**
-ARCID **CMM185**
-ARCTYP **A330**
-ADEP **GABS**
-ESTDATA
    -PTID **ALOVI**
    -ETO **180129122400**
    -FL **F330**
-ADES **LFQQ**

IFPS tries to build the route of the flight using “the propose route” function and validation by the operator or the route is manually built from departure to destination.

An APL message is assembled by the IFPS after the route has been constructed by the IFPS staff to connect the last point given, in this case ALOVI, to the destination.

12:30 An APL message is sent to all downstream units including ATS B and ATS C.

(APL-CMM185-A330—GABS0911-ALOVI/1224F330 -N0430F330 ………..XTZ UG111 XXZ UL111 ALOVI UM111 ABEBE UM221…………–LFQQ1420 - DOF/180129 ORGN/ATCA SRC/AFP)

12:30 ATS B and ATS C receive the APL message for the flight CMM185 and build a system flight plan based on the APL message for flight CMM185.

12:33 ATS A sends an ABI message ATS B, route information depending on the LoA between ATS A and ATS B, might be omitted.

-TITLE **ABI**
-REFDATA
    -SENDER -FAC **ATSA**
    -RECVR -FAC **ATSB**
    -SEQNUM **015**
-ARCID **CMM185**
-SSRCODE **A1576**
-ADEP **GABS**
-COORDATA
    -PTID **BABOK**
    -TO **1253**
    -TFL **F330**
-ADES **LFQQ**
-ARCTYP **A330**

-ROUTE **ALOVI UM111 BABOK UM111 IM2**

If the route information contained in the ABI message does not correlate against the route information of the FDPS SFPL created from the APL, these guidelines recommended that this message might be referred to the operator at the downstream/receiving ATSU. The ATC route can be corrected/updated to ensure the flight deck and ATC are aligned.

12:41 ATS A sends an ACT message to ATS B, route information depending on the LoA between ATS A and ATS B might be omitted.

-TITLE **ACT**
-REFDATA
  -SENDER -FAC **ATSA**
  -RECVR -FAC **ATSB**
  -SEQNUM **033**
-ARCID **CMM185**
-SSRCODE **A1576**
-ADEP **GABS**
-COORDATA
  -PTID **BABOK**
  -TO **1251**
  -TFL **F330**
-ADES **LFQQ**
-ARCTYP **A330**
-ROUTE **ALOVI UM111 BABOK UM111 IM2**

These guidelines recommend not acknowledging any ACT message for a flight where the FDP element has been created from an APL and the data in the ACT message cannot be correlated with the data in the FDP system of the receiving ATSU.

If the route information contained in ACT does not correlate against the route information in FDPS created from an APL, it is recommended that this message is referred to the operator at the downstream/receiving ATSU. Alternatively, it may be considered that in this condition the LAM for the ACT is not sent. Although this increases the workload, it does ensure that all downstream data is corrected.

4.1.6.2 Case2: Niger airlines flight from Niamey to Beauvais

15:00 Flight NIN212 contacts ATS A, no system flight plan can be retrieved.

15:02 The ATCO on sector ATS A SC1 introduces a mini-flight plan for flight NIN212. ATS A tries to build the system flight plan based on the entry point and the departure/destination airport, but the correctness of this systems flight plan is very low, as ATS A has limited information about the downstream route structure.

15:02 ATS A sends an AFP message to IFPS.

(AFP-NIN212-B757-DRRN-ALOVI/1500F370-LFOB)

Or in ADEXP:

-TITLE **IAFP**
-ARCID **NIN212**

-ARCTYP **B757**
-ADEP **DRRN**
-ESTDATA
    -PTID **ALOVI**
    -ETO **180129150000**
    -FL **F370**
-ADES **LFOB**

IFPS tries to build the route of the flight using the “propose route” function and validation by the operator or the route is manually built from departure to destination However, ATS A sends the ABI message to ATS B before the IFPS can disseminate the APL message.

15:07 ATS A sends an ABI message to ATS B without route information as the further route is unknown.

-TITLE **ABI**
-REFDATA
    -SENDER -FAC **ATSA**
    -RECVR -FAC **ATSB**
    -SEQNUM **028**
-ARCID **NIN212**
-SSRCODE **A7321**
-ADEP **DRRN**
-COORDATA
    -PTID **BABOK**
    -TO **1527**
    -TFL **F370**
-ADES **LFOB**
-ARCTYP **B757**

15:07 ATS B builds a new system flight plan based on the ABI message for the flight NIN212. The system flight plan may contain very limited route information as the FDP tries to build the route based on the entry point and the departure/destination airport.

An APL message is assembled by the IFPS after a route has been constructed to connect the last point given, in this case ALOVI, to the destination.

15:10 The APL message is sent to all downstream units including ATS B and ATS C.

(APL-NIN212-B757--GABS1122-ALOVI/1500F370 -N0450F370 ………XTZ UM111 XXZ UL111 ALOVI UP111 ABEBE UL123 ………..–LFOB1810 - DOF/180129 ORGN/ATCA SRC/AFP)

Or in ADEXP format:

-TITLE **IAPL**
-BEGIN ADDR
    -FAC **ATCB**
    -FAC **ATCC**
    -FAC **ATCD**
    -….
    -….
    -FAC **ATCM**
-END ADDR
-ADEP **DRRN**
-ADES **LEOB**

-ARCID **NIN212**
-ARCTYP **B757**
-EOBD **180129**
-EOBT **1122**
-IFPLID **AB49255011**
-ORGNID **ATCA**
-SSRCODE **A7321**
-SRC **AFP**
-TTLEET **0648**
-RFL **F370**
-SPEED **N0450**
-FLTRUL **I**
-FLTTYP **S**
-ROUTE **……XTZ UM111 XXZ UL111 ALOVI UP111 ABEBE UL123 ……**
-ESTDATA
    -PTID **ALOVI**
    -ETO **180129150000**
    -FL **F380**
-ATSRT ……
…..
…..
-ATSRT **UM111 AXTZ XXZ**
-ATSRT **UL111 XXZ XXY**
-ATSRT ……

15:11 ATS B and ATS C receive the APL message for the flight NIN212. ATS B updates the system flight plan with the APL message content (mostly route information) or builds a new object. In case of building new flight plan, ATS B might have potentially two objects, one from an APL and one from an ABI. It is recommended that in this case the affected flight is flagged to FDO for repair/resolution.

ATS C builds the system flight plan based on APL for the flight NIN212.

15:15 ATS A sends an ACT message to ATS B.

-TITLE **ACT**
-REFDATA
    -SENDER -FAC **ATSA**
    -RECVR -FAC **ATSB**
    -SEQNUM **086**
-ARCID **NIN212**
-SSRCODE **A7321**
-ADEP **DRRN**
-COORDATA
    -PTID **BABOK**
    -TO **1525**
    -TFL **F370**
-ADES **LFOB**
-ARCTYP **B757**
-ROUTE **ALOVI UM111 BABOK UM111 IM2**

As with Case 1, the recommendation here is not to acknowledge any ACT message for a flight where the FDP SFPL has been created from an APL message and the data in the ACT message cannot be correlated with the data in the FDP system of the receiving ATSU.

4.1.7 Scenario 2 - IFPS/OLDI data exchanges for missing flight plan, different routings

The airspace and flight elements used for scenario 2 illustrated by Figure 20 are fictitious. Only the departure and destination airports exist. The airspace data is depicted as:

- ATS A in red with three sectors SC1, SC2 and SC3
- ATS B in blue with two sectors SC1 and SC2
- ATS C in purple with two sectors SC3 and SC4
- ATS D in orange with two sectors SC1 and SC2
- ATS E in grey with two sectors SC1 and SC2

The airways are depicted in green and significant points in black.

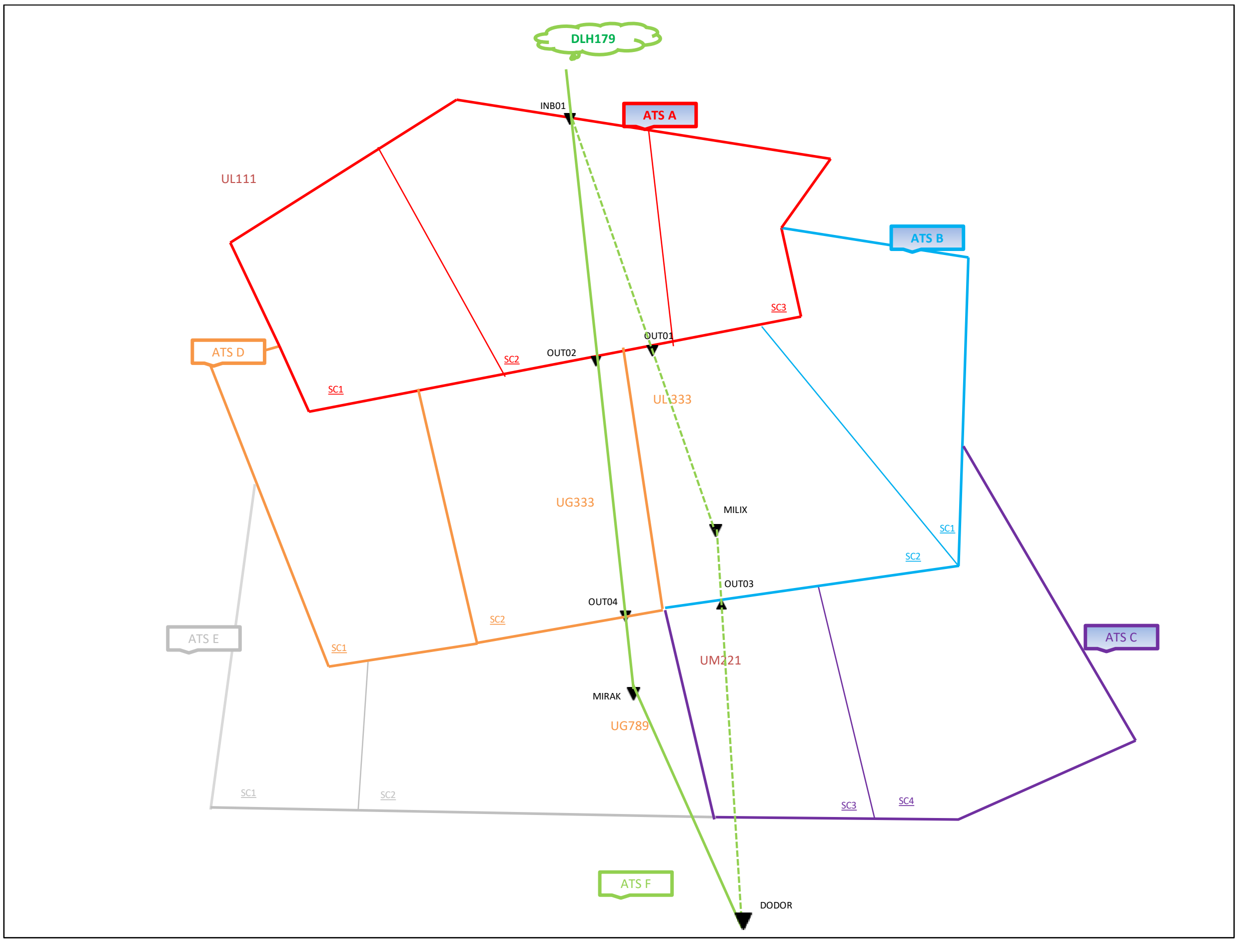


Figure 20 - Missing Flight Plan and Different Routings

4.1.7.1 Case1: Lufthansa flight from Mombasa to Frankfurt.

13:44 Flight DLH179 contacts ATS A, no system flight plan can be retrieved.

13:45 The ATCO on sector ATS A SC2 introduces a mini-flight plan for flight DLH179. ATS A tries to build the system flight plan based on the entry point and the departure/destination airport, but the correctness of this systems flight plan is very low, as ATS A has limited information about the downstream route structure.

13:45 ATS A sends an AFP message to IFPS (AFP#1).

(AFP-DLH179-A330-HKMO-INB01/1344F330-EDDF)

Or in ADEXP:

-TITLE **IAFP**
-ARCID **DLH179**
-ARCTYP **A330**
-ADEP **HKMO**
-ESTDATA
    -PTID **INB01**
    -ETO **180129134400**
    -FL **F330**
-ADES **EDDF**

13:45 IFPS tries to build the route of the flight using the “propose route” function and validation by the operator or the route is manually built from departure to destination. An APL message is assembled by the IFPS after the route has been constructed by the IFPS staff to connect the last point given, in this case INB01, to the destination.

13:47 The APL message is sent to all downstream units including ATS B and ATS C.

(APL-DLH179-A330-HKMO0930-INB01/1224F330 -N0430F330 ………..XX1 UM222 XX2 UG111 INB01 UL333 MILIX UM221 DODOR UP111 ………….–EDDF1540 - DOF/180129 ORGN/ATCA SRC/AFP)

Or in ADEXP:

-TITLE **IAPL**
-BEGIN ADDR
    -FAC **ATCB**
    -FAC **ATCC**
    -FAC **ATCF**
    ……
    -FAC **ATCX**
-END ADDR
-ADEP **HKMO**
-ADES **EDDF**
-ARCID **DLH179**
-ARCTYP **A330**
-EOBD **180129**
-EOBT **0930**
-IFPLID **AB49277011**
-ORGNID **ATCA**
-SSRCODE **A6551**
-SRC **AFP**
-TTLEET **0648**
-RFL **F330**
-SPEED **N0430**

-FLTRUL **I**
-FLTTYP **S**
-ROUTE **…XX1 UM222 XX2 UG111 INB01 UL333 MILIX UM221 DODOR UP111…**
-ESTDATA
    -PTID **INB01**
    -ETO **180129134500**
    -FL **F330**

13:47 ATS B and ATS C receive the APL message for the flight DLH179 and build a system flight plan based on the APL message for the flight DLH179.

13:48 The ATCO on sector ATS A SC2 gives a clearance to flight DLH179 to proceed direct to OUT02. ATS A has no knowledge about the route planned by IFPS and cleared the flight to exit at OUT02 (this coordination point belongs to ATS A /ATS D interface). The system trajectory is updated by ATCO's manual input.

13:48 The DLH179 trajectory update triggers the transmission of an AFP message (AFP#2) from ATS A to IFPS for the route change as:

-TITLE **IAFP**
-ARCID **DLH179**
-ADEP **HKMO**
-ESTDATA
    -PTID **OUT02**
    -ETO **180127141000**
    -FL **F330**
-ROUTE **N0420F350 INB01 UG333 OUT02**
-ADES **EDDF**

13:50 IFPS tries to update the route of the flight using the data contained in the AFP#2 message by connecting AFP data with the destination airport. Based on these inputs, the old route (UG111 INB01 UL333 MILIX UM221 DODOR UP111) that penetrates ATS A, ATS B and ATS C is updated and replaced by a new route. IFPS proposes a new route (UG111 INB01 UG333 OUT02 UG333 MIRAK UG789 DODOR UP111) that will penetrate ATS A, ATS D and ATS E. The updated route is validated by the operator. The route change will trigger the dissemination of APLs towards ATS D and ATS E, as they were not in the previous list of concerned ATS units. However, it should be noted that ATS B and ATS C will not be notified of the route change.

(APL-DLH179-A330-HKMO0930-OUT02/1413F330 -N0430F330 ………..XX1 UM222 XX2 UG111 INB01 UG333 MIRAK UG789 DODOR UP111 ………….–EDDF1540 - DOF/180129 ORGN/ATCA SRC/AFP)

Or in ADEXP:

-TITLE **IAPL**
-BEGIN ADDR
    -FAC **ATCD**
    -FAC **ATCE**
    -FAC **ATCF**
    ……
    -FAC **ATCX**
-END ADDR
-ADEP **HKMO**
-ADES **EDDF**

-ARCID **DLH179**
-ARCTYP **A330**
-EOBD **180129**
-EOBT **0930**
-IFPLID **AB49277011**
-ORGNID **ATCA**
-SSRCODE **A6551**
-SRC AFP
-TTLEET **0648**
-RFL **F330**
-SPEED **N0430**
-FLTRUL **I**
-FLTTYP **S**
-ROUTE **…XX1 UM222 XX2 UG111 INB01 UG333 MIRAK UG789 DODOR UP111 …**
-ESTDATA
    -PTID **OUT02**
    -ETO **180129141300**
    -FL **F330**

13:51 ATS D and ATS E receive the APL message for the flight DLH179. ATS D and ATS E build a system flight plan based on the APL message for the flight DLH179.

13:53 ATS A sends an ABI message to ATS D, route information depending on the LoA between ATS A and ATS D might be omitted.

-TITLE **ABI**
-REFDATA
    -SENDER -FAC **ATSA**
    -RECVR -FAC **ATSD**
    -SEQNUM **097**
-ARCID **DLH179**
-SSRCODE **A6651**
-ADEP **HKMO**
-COORDATA
    -PTID **OUT02**
    -TO **1413**
    -TFL **F330**
-ADES **EDDF**
-ARCTYP **A330**
-ROUTE **N0420F350 INB01 UG333 OUT02**

13:53 ATS D updates the system flight plans for the flight DLH179 using the data contained in ABI message.

14:03 ATS A sends an ACT message to ATS D, route information depending on the LoA between ATS A and ATS D might be omitted.

-TITLE **ACT**
-REFDATA
    -SENDER -FAC **ATSA**
    -RECVR -FAC **ATSD**
    -SEQNUM **187**
-ARCID **DLH179**
-SSRCODE **A6651**

-ADEP **HKMO**
-COORDATA
    -PTID **OUT02**
    -TO **1414**
    -TFL **F330**
-ADES **EDDF**
-ARCTYP **A330**
-ROUTE **N0420F350 INB01 UG333 OUT02**

14:03 ATS D updates the system flight plan for the flight DLH179 using the data contained in the ACT message.

14:05 As ATC B has not received a notification or coordination message for flight DLH179:

- ATC B may call ATC A in order to identify what happened with this flight. ATS A notifies ATS B that the flight is exiting via OUT02 and ATS B is not the next downstream unit. ATS B manually terminates the flight DLH179.
- Or alternatively, as the flight DHL179 is in some kind of initial status usually not highlighted on HMI, it remains inactivate, the SFPL is silently archived after a pre-defined time parameter.

14:25 As ATC C has not received a notification or coordination message for flight DLH179:

- ATC C may call ATC B in order or identify what happened with this flight. ATS B notifies ATS C that the flight was re-routed by ATS A and it was not transferred to ATS B. Therefore, ATS C is not the next downstream unit. ATS C manually terminates the flight DLH179.
- Or alternatively, as the flight DHL179 is in some kind of initial status usually not highlighted on HMI, it remains inactivate, the SFPL is silently archived after a predefined time parameter.

4.1.8 Scenario 3 - IFPS/OLDI data exchanges for diversion

The airspace and flight elements used for scenario 3 illustrated by Figure 21 are fictitious. Only the departure and destination airports exist. The airspace data is depicted as:

- ATS A in red with three sectors SC1, SC2 and SC3
- ATS B in blue with three sectors SC1, SC2 and SC3
- ATS C in purple with two sectors SC3 and SC4
- ATS D in orange with one sector SC1
- ATS E in grey with two sectors SC1 and SC2

The airways are depicted in green and significant points in black.

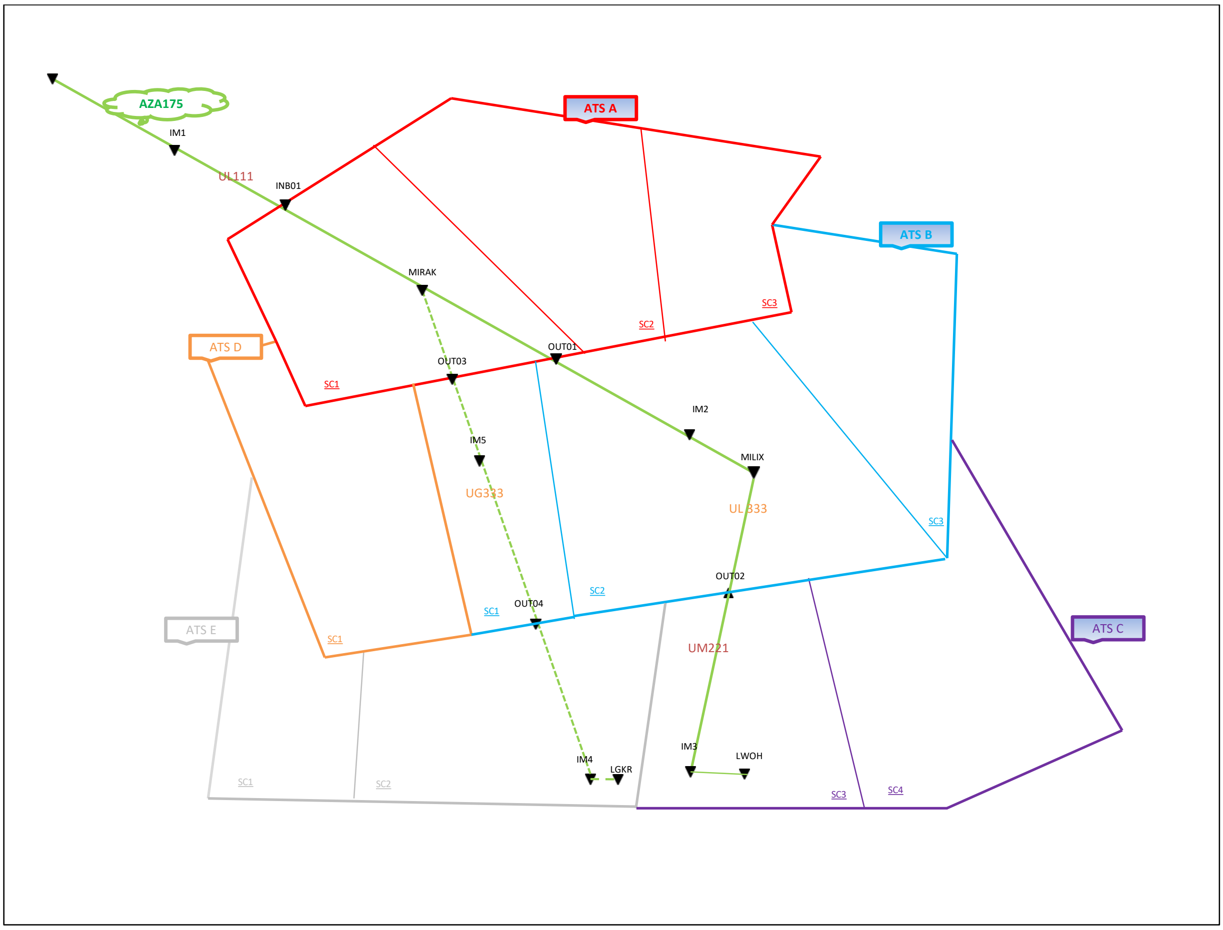


Figure 21 - IFPS/OLDI Messaging for Diversions

The flight AZA175 departed from LIPH at 12:30 and it is planned to land at LWOH.

IFPS distributed the original FPL (FPL-AZA175-IS –A320/M-SRWY/C –LIPH1230 -N0420F350 KOBAN UM999 BXX UL111 MILIX UL333 IM3 –LWOH0200 ZZZZ -DOF/180127 ALTN/LGKR) to ATC A, ATS B and ATS C.

13:15 Flight AZA175 is transferred to ATS A, the ATCO on sector ATS A SC1 assumes the flight.

13:19 ATS A sends an ABI Message to ATS B.

-TITLE **ABI**
-REFDATA
    -SENDER -FAC **ATSA**
    -RECVR -FAC **ATSB**
    -SEQNUM **035**
-ARCID **AZA175**
-SSRCODE **A5567**
-ADEP **LIPH**
-COORDATA
    -PTID **OUT01**
    -TO **1339**
    -TFL **F350**
-ADES **LWOH**
-ARCTYP **A320**

-ROUTE **IM1 UL111 OUT01 UL111 IM2**

13:19 ATS B acknowledges the ABI by sending a LAM message to ATS A, and puts flight AZA175 into the notified state, the inbound COP is OUT01.

13:20 The pilot receives a notification from the Flight Operating Centre (FOC) that LWOH is closed due to fog and that flight AZA175 is diverted to land at the alternate aerodrome (LGKR) as specified in the submitted FPL.

13:21 ATS A SC1 re-routes the flight to exit ATS A via the point OUT03.

13:21 ATS A sends a revised ABI to ATS B.

-TITLE **ABI**
-REFDATA
    -SENDER -FAC **ATSA**
    -RECVR -FAC **ATSB**
    -SEQNUM **047**
-ARCID **AZA175**
-SSRCODE **A5567**
-ADEP **LIPH**
-COORDATA
    -PTID **OUT03**
    -TO **1337**
    -TFL **F350**
-ADES **LGKR**
-ADESOLD **LWOH**
-ARCTYP **A320**
-ROUTE **IM1 UL111 MIRAK UG333 IM5**

13:21 ATS B acknowledges the ABI by sending a LAM message and keeps flight AZA175 in the notified state, the inbound COP is OUT03.

13:21 ATS A sends an AFP message to IFPS.

-TITLE **IAFP**
-ARCID **AZA175**
-ADEP **LIPH**
-ESTDATA
    -PTID **MIRAK**
    -ETO **180127132100**
    -FL **F350**
-ROUTE **N0420F350 IM1 UL111 MIRAK UG333 IM5**
-ADES **LGKR**
-ADESOLD **LWOH**

IFPS tries to build the route of the flight using the propose route function and validation by the operator or the route is manually built from departure to destination. However, ATS A sends the revised ABI to ATS B before IFPS disseminates the ACH message.

APL/ACH messages are assembled by the IFPS after a route has been constructed by the IFPS staff from the last reported point (MILAK) to the alternate airport.

13:23 An ACH message is sent to ATS B, the 2-minute delay between AFP reception and ACH transmission is due to the operator intervention.

(ACH-AZA175/A5567-LIPH1230-LWOH-14/MIRAK/1321F350-15/N0420F350 MIRAK UG333 IM4 16/LGKR-18/DOF/180127 SRC/DIV LGKR ORGN/ ATSA)

Or in ADEXP:

-TITLE **IACH**
-BEGIN ADDR
    -FAC **ATCB**
-END ADDR
-ADEP **LIPH**
-ADES **LGKR**
-ADESOLD **LWOH**
-ARCID **AZA175**
-ARCTYP **A320**
-EOBD **180127**
-EOBT **1230**
-IFPLID **BX441510011**
-ORGNID **ATCA**
-WKTRC **M**
-SRC DIV **LWOH**
-SSRCODE **A5567**
-SRC **AFP**
-TTLEET **0200**
-RFL **F350**
-SPEED **N0420**
-FLTRUL **I**
-FLTTYP **S**
-ROUTE **N0420F350 KOBAN UM999 BXX UL111 MIRAK UG333 IM4**
-ESTDATA
    -PTID **MIRAK**
    -ETO **180127132100**
    -FL **F350**

13:23 An APL message is sent to ATS E, the 4-minute delay between AFP reception and APL transmission is due to the operator intervention.

(APL-AZA175/A5567-IS –A320/M-SRWY/C - LIPH1230 - MIRAK/1321F350 - N0420F350 MIRAK UG333 IM4 - LGKR0200 -DOF/180127 SRC/DIV LGKR ORGN/ATSA)

Or in ADEXP:

-TITLE **IAPL**
-BEGIN **ADDR**
    -FAC **ATCE**
-END **ADDR**
-ADEP **LIPH**
-ADES **LWOH**
-ARCID **AZA175**
-ARCTYP **A320**
-EOBD **180127**
-EOBT **1230**
-IFPLID **BX441510011**

-ORGNID **ATCA**
-WKTRC **M**
-SRC DIV **LWOH**
-SSRCODE **A5567**
-SRC **AFP**
-TTLEET **0200**
-RFL **F350**
-SPEED **N0420**
-FLTRUL **I**
-FLTTYP **S**
-ROUTE **N0420F350 KOBAN UM999 BXX UL111 MIRAK UG333 IM4**
-ESTDATA
    -PTID **MIRAK**
    -ETO **180127132100**
    -FL **F350**

13:24 ATS B receives the ACH message from IFPS. As the flight AZA175 is already in the notified state and a revised ABI message for the diversion had been received, the ACH message is disregarded for the update of system flight plan.

13:24 ATS E receives and accepts the APL message for the flight AZA175. ATS E builds a system flight plan based on the APL message content for flight AZA175.

13:28 ATS A sends an ACT message to ATS B.

-TITLE **ACT**
-REFDATA
    -SENDER -FAC **ATSA**
    -RECVR -FAC **ATSB**
    -SEQNUM **117**
-ARCID **AZA175**
-SSRCODE **A5567**
-ADEP **LIPH**
-COORDATA
    -PTID **OUT03**
    -TO **1338**
    -TFL **F350**
-ADES **LGKR**
-ARCTYP **A320**
-ROUTE **IM1 UL111 MIRAK UG333 IM5**

4.1.9 Scenario 4 - IFPS/OLDI data exchanges for change of route

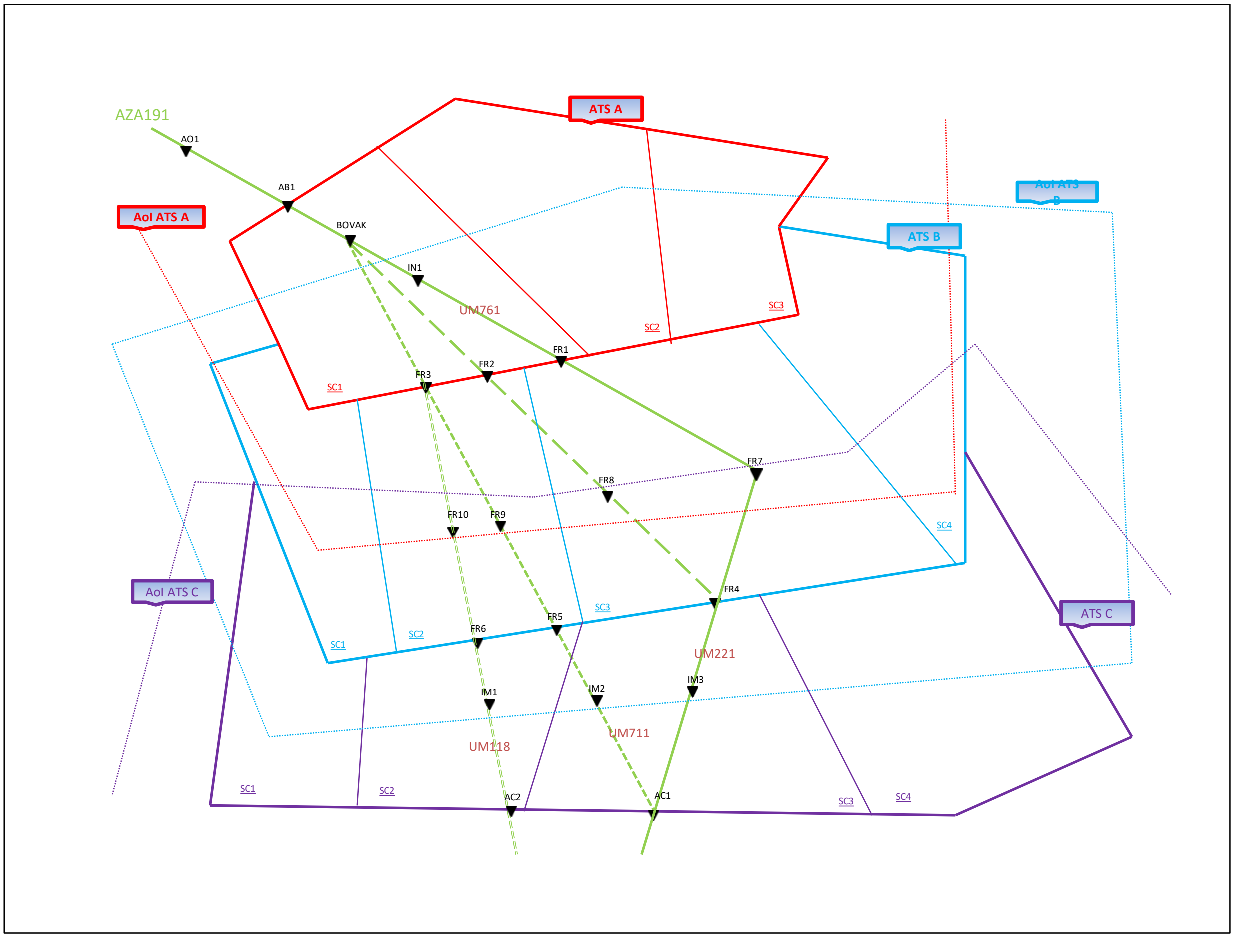


Figure 22 - IFPS/OLDI Messaging for Route Changes

The airspace and flight elements used for scenario 4 illustrated by Figure 22 are fictitious. Only the departure and destination airports exist. The airspace data is depicted as:

ATS A in red with three sectors SC1, SC2 and SC3

ATS B in blue with four sectors SC1, SC2, S3 and SC4

ATS C in purple with four sectors SC1, SC2, S3 and SC4

The airways are depicted in green and significant points in black.

ATS B is Free Route Airspace (FRA), with FRA entry, exit and intermediate points. There is no published route network in the airspace of ATS B. ATS A and ATS C are non-FRA environments with published ATS network.

The flight AZA191 departed from LIRF at 11:00 and it is planned to land at LCPH.

IFPS distributed the original FPL (FPL-AZA191-IS –A330/H-SRWY/C –LIRF1100 -N0420F370 MIDOX UM888 BYY UM761 FR1 DCT FR7 DCT FR4 UM221 LAMAX UM377 KHIRO UM111 JATOR–LCPH0330 -DOF/180129) to ATC A, ATS B and ATS C

This scenario describes the current ANSPs capability to provide an AFP message to IFPS in case there is a change of exit conditions before the transferring a flight to the downstream ATS unit. It should be noted that according to the IFPS Users Manual [RD 5] , an AFP message is not supposed to be sent to IFPS after the ACT message has already been sent to the downstream unit. However, this example highlights the conditions that the ATS A FDP has not been updated yet in line with in the updated IFPS requirements. Therefore, the provision of AFP after REV message is elaborated.

12:20 Flight AZA191 is transferred to ATS A; the ATCO on sector ATS A SC1 assumes the flight.

12:22 ABI from ATS A to ATS B

-TITLE **ABI**
-REFDATA
    -SENDER -FAC **ATSA**
    -RECVR -FAC **ATSB**
    -SEQNUM **054**
-ARCID **AZA191**
-SSRCODE **A6645**
-ADEP **LIRF**
-COORDATA
    -PTID **FR1**
    -TO **1242**
    -TFL **F370**
-ADES **LCPH**
-ARCTYP **A330**
-ROUTE **AO1 UM761 FR1 DCT FR7**

12:27 The ATCO on sector ATS A SC1 performs a re-routing of flight AZA191 from the BOVAK point to FR8, the exit point changes to FR2.

12:27 ATS A sends a revised ABI message to ATS B.

-TITLE **ABI**
-REFDATA
    -SENDER -FAC **ATSA**
    -RECVR -FAC **ATSB**
    -SEQNUM **059**
-ARCID **AZA191**
-SSRCODE **A6645**
-ADEP **LIRF**
-COORDATA
    -PTID **FR2**
    -TO **1239**
    -TFL **F370**
-ADES **LCPH**
-ARCTYP **A330**
-ROUTE **AO1 UM761 BOVAK DCT FR2 DCT FR8**

12:27 ATS A sends an AFP message to IFPS for the change of route.

-TITLE **IAFP**
-ARCID **AZA191**
-ADEP **LIRF**
-ESTDATA
    -PTID **BOVAK**
    -ETO **180129122700**
    -FL **F370**
-ROUTE **N0420F370 AO1 UM761 BOVAK DCT FR2 DCT FR8**
-ADES **LCPH**

12:29 IFPS adapts the original route of the flight with the AFP message data. The ACH message is provided by IFPS to ATS B as the entry point is modified. The ACH message for ATS C is inhibited, as the entry point remains the same, only a small time shift at ATS C entry point is expected. The ACH message is only triggered if the time difference is more than 10 minutes, which is not the case, so no ACH message is sent to ATS C.

(ACH-AZA191/A6645-LIRF1230-LCPH-14/BOVAK/1227F370-15/N0420F370 BOVAK DCT FR2 DCT FR8 UM221 LAMAX UM377 KHIRO UM111 JATOR -16/LCPH-18/DOF/180129 SRC/AFP ORGN/ ATSA)

12:29 ATS B receives the ACH messages from IFPS after the revised ABI message sent by ATS A. The flight AZA175 is already in the notified state after receiving the revised ABI message so the ACH message is disregarded.

12:30 ATS A sends an ACT message to ATS B

-TITLE **ACT**
-REFDATA
    -SENDER -FAC **ATSA**
    -RECVR -FAC **ATSB**
    -SEQNUM **123**
-ARCID **AZA191**
-SSRCODE **A6645**
-ADEP **LIRF**
-COORDATA
    -PTID **FR2**
    -TO **1240**
    -TFL **F370**
-ADES **LCPH**
-ARCTYP **A330**
-ROUTE **AO1 UM761 BOVAK DCT FR2 DCT FR8**

12:32 ATS A receives a phone call from ATS B SC2, requesting re-routing due to the overload of ATS B SC3. A new coordination point and transfer conditions are agreed (FR3, TFL 370 ETO 12:38).

12:33 The ATCO on sector ATS A SC1 performs rerouting from the BOVAK point, the exit point changes to FR3.

12:33 ATS A sends a REV message to ATS B.

-TITLE **REV**
-REFDATA
-SENDER –FAC **ATSA**
-RECVR -FAC **ATSB**
-SEQNUM **251**
-ARCID **AZA191**
-ADEP **LIRF**
-COORDATA
-PTID **FR3**
-TO **1238**
-TFL **F370**
-ADES **LCPH**
-ROUTE **N0420F370 AO1 UM761 BOVAK DCT FR3 DCT FR9**

12:33 ATS A sends an AFP message to IFPS for change of route.

-TITLE **IAFP**
-ARCID **AZA191**
-ADEP **LIRF**
-ESTDATA
-PTID **BOVAK**
-ETO **180129123300**
-FL **F370**
-ROUTE **N0420F370 AO1 UM761 BOVAK DCT FR3 DCT FR9**
-ADES **LCPH**

IFPS adapts the route of flight AZA191 with the AFP message data.

12:35 The ACH message is provided by IFPS to ATS B as the entry point is modified (FR3 instead of FR2). The ACH message is also provided to ATS C as the entry point is modified (FR5 instead of FR4).

(ACH-AZA191/A6645-LIRF1230-LCPH-14/BOVAK/1233F370-15/N0420F370 BOVAK DCT FR3 DCT FR9 DCT FR5 UM711 LAMAX UM377 KHIRO UM111 JATOR -16/LCPH-18/DOF/180129 SRC/AFP ORGN/ ATSA)

ATS B receives the ACH message but disregards it as the flight AZA191 is already in the coordinated state.

ATS C receives and accepts the ACH message for flight AZA191. ATS C updates the entry conditions and routing based on the ACH message content.

12:36 ATS B sends an ABI message to ATS C.

-TITLE **ABI**
-REFDATA
-SENDER -FAC **ATSB**
-RECVR -FAC **ATSC**
-SEQNUM **021**
-ARCID **AZA191**
-SSRCODE **A6645**
-ADEP **LIRF**
-COORDATA
-PTID **FR5**
-TO **1256**

-TFL **F370**
-ADES **LCPH**
-ARCTYP **A330**
-ROUTE **FR3 DCT FR9 DCT FR5 UM711 LAMAX**

12:39 ATS A transfers the flight to ATS B.

12:40 The pilot of flight AZA191 requests a re-routing via data link message DM22 (REQUEST DIRECT TO VINCO).

12:40 From the current aircraft position, the ATCO on sector ATS B SC2 performs the re-routing, the exit point changes to FR6.

12:40 ATS B sends a revised ABI message to ATS C.

-TITLE **ABI**
-REFDATA
-SENDER -FAC **ATSB**
-RECVR -FAC **ATSC**
-SEQNUM **075**
-ARCID **AZA191**
-SSRCODE **A6645**
-ADEP **LIRF**
-COORDATA
-PTID **FR6**
-TO **1254**
-TFL **F370**
-ADES **LCPH**
-ARCTYP **A330**
-ROUTE **FR3 DCT FR10 DCT FR6 UM118 VINCO**

12:40 ATS B sends an AFP message to IFPS for change of route.

-TITLE **IAFP**
-ARCID **AZA191**
-ADEP **LIRF**
-ESTDATA
-PTID **FR3**
-ETO **180129124000**
-FL **F370**
-ROUTE **N0420F370 FR3 DCT FR10 DCT FR6 UM118 VINCO**
-ADES **LCPH**

IFPS adapts the route of flight AZA191 with the AFP message data.

12:41 The ACH message is provided to ATS C as the entry point is modified (FR6 instead of FR5).

(ACH-AZA191/A6645-LIRF1230-LCPH-14/FR3/1240F370-15/N0420F370 FR3 DCT FR10 DCT FR6 UM118 KHIRO UM111 JATOR -16/LCPH-18/DOF/180129 SRC/AFP ORGN/ ATSB)

ATS C receives the ACH message but disregards it as the flight is already in notified state.

4.1.10 Scenario 5 - IFPS/OLDI data exchanges for re-routings involving different ATS units involved

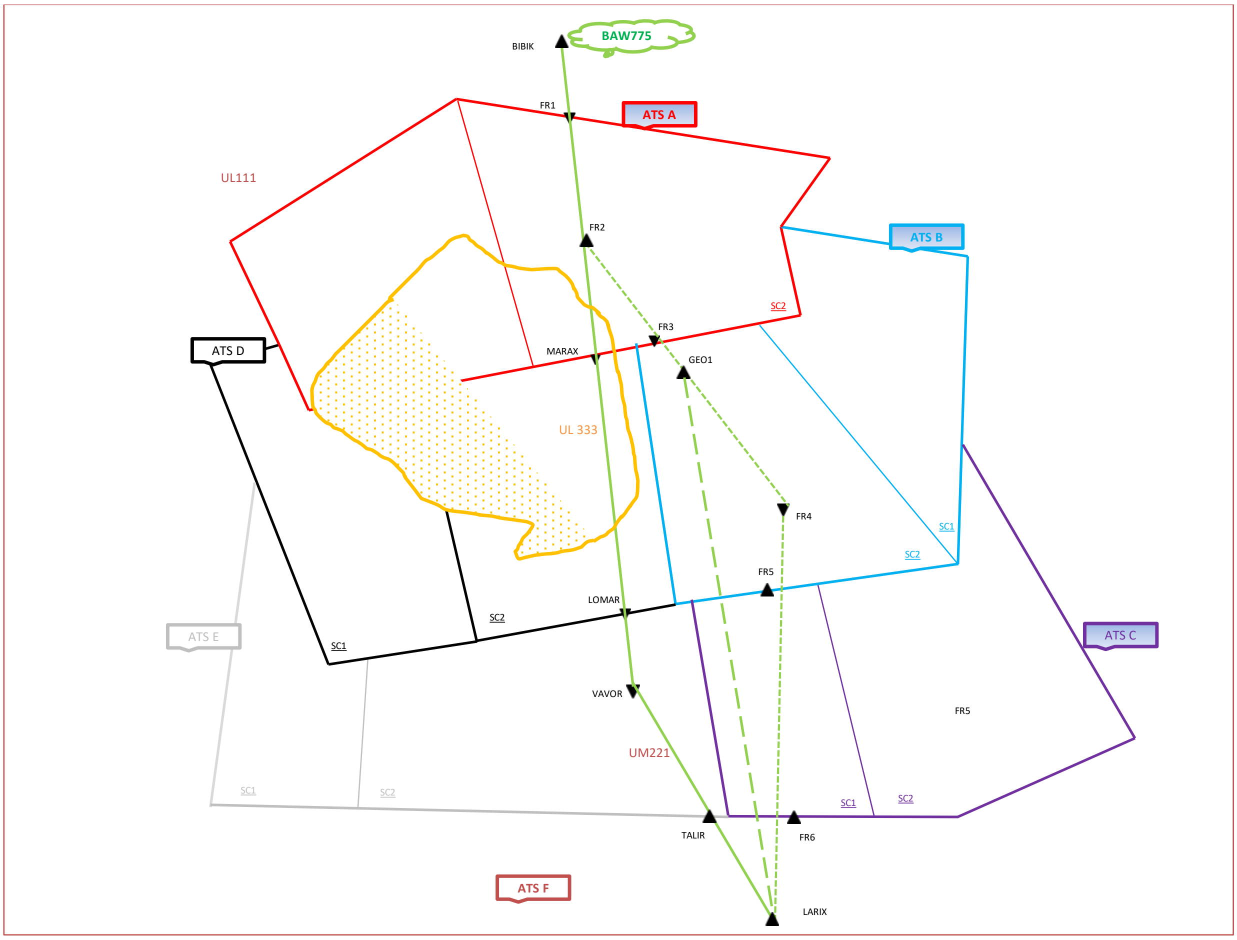


Figure 23 - IFPS/OLDI Messaging for Re-routing

The airspace and flight elements used for scenario 5 illustrated by Figure 23 are fictitious. Only the departure and destination airports exist. The airspace data is depicted as:

ATS A in red with two sectors SC1 and SC2

ATS B in blue with two sectors SC1 and SC2

ATS C in purple with two sectors SC1 and SC2

ATS D in black with two sectors SC1 and SC2

ATS E in grey with two sectors SC1 and SC2

ATS F as a contextual unit

The airways are depicted in green and significant points in black. ATS A, ATS D and ATS E have deployed FRA with intermediate points, while ATS B and ATS C maintain the fixed route network. The ATS units that have deployed FRA retain the relevant static airspace data of the neighbouring ATS units.

The flight BAW775 departed from London Heathrow (EGLL) at 05:30 and it is planned to land at Dubai Airport (OMDB).

IFPS distributed the original FPL (FPL-BAW775-IS –B737/M-SRWY/C –EGLL0530 -N0440F370 KOBAN UM999 BXX UL111 BIBIK FR1 DCT FR2 DCT MARAX UL333 VAVOR UM221 LARIX UG669 MILIX UL933 IM3 –OMDB0600 ZZZZ -DOF/180127 ALTN/OMDW) to ATC A, ATS D and ATS E.

Severe weather has developed before the BAW775 departure within the airspace of ATS A and ATS B, the weather contours are indicated in orange.

07:20 Flight BAW775 is transferred to ATS A, the ATCO on sector ATS A SC2 assumes the flight.

07:22 ATS A sends an ABI message to ATS D.

-TITLE **ABI**
-REFDATA
    -SENDER -FAC **ATSA**
    -RECVR -FAC **ATSD**
    -SEQNUM **077**
-ARCID **BAW775**
-SSRCODE **A0556**
-ADEP **EGLL**
-COORDATA
    -PTID **MARAX**
    -TO **0742**
    -TFL **F370**
-ADES **OMDB**
-ARCTYP **B737**
-ROUTE **BIBIK DCT FR1 DCT FR2 DCT MARAX UL333 LOMAR**

07:29 As severe weather conditions develop in south-east part of ATS A, the pilot requests weather avoidance re-routing.

07:30 ATS A clears the flight BAW775 from the FRA intermediate point (FR2) direct to FR4. By clearing the flight directly to FR4, the downstream unit and exit points change. The flight is re-routed to ATS B and the exit point is a dynamic COP, with a reference to FR3.

07:30 ATS A sends a MAC message to the previous downstream unit (ATS D).

-TITLE **MAC**
-REFDATA
    -SENDER -FAC **ATSA**
    -RECVR -FAC **ATSD**
    -SEQNUM **098**
-ARCID **BAW775**
-COP **MARAX**
-ADEP **EGLL**
-MSGREF
    -SENDER -FAC **ATSA**
    -RECVR -FAC **ATSD**
    -SEQNUM **077**

-CSTAT
-STATID **INI**
-STATREASON **ROUTE**

07:30 ATS A sends an ABI message to ATS B, the new downstream unit.

-TITLE **ABI**
-REFDATA
-SENDER -FAC **ATSA**
-RECVR -FAC **ATSB**
-SEQNUM **448**
-ARCID **BAW775**
-SSRCODE **A0556**
-ADEP **EGLL**
-COORDATA
-PTID **FR3**
-TO **0744**
-TFL **F370**
-ADES **OMDB**
-ARCTYP **B737**
-ROUTE **BIBIK DCT FR1 DCT FR2 DCT FR4**

07:30 ATS A sends an AFP message to IFPS for change of route (AFP#1).

-TITLE **IAFP**
-ARCID **BAW775**
-ADEP **EGLL**
-ESTDATA
-PTID **FR2**
-ETO **180129073200**
-FL **F370**
-ROUTE **N0440F370 BIBIK DCT FR1 DCT FR2 DCT FR4**
-ADES **OMDB**

07:30 ATS D receives the MAC message from ATS A and terminates the coordination for flight BAW775.

07:30 ATS B receives the ABI message from ATS A for the flight BAW775 and builds a new system flight plan based on the ABI message content. The system flight plan contains very limited route information as the FDP tries to build the route based on the entry point and the departure/destination airport.

07:31 ATS B sends an AFP to IFPS concerning the missing flight plan (AFP#2). Indeed, as the SFPL for BAW775 was created from the ABI message, ATS units should notify IFPS of all missing flight plans by sending an AFP message. The content is almost identical with the AFP#1 content, the ESTDATA includes FR3 as contained in the ABI message.

-TITLE **IAFP**
-ARCID **BAW775**
-ADEP **EGLL**
-ESTDATA
-PTID **FR3**
-ETO **180129074400**

-FL **F370**
-ROUTE **BIBIK DCT FR1 DCT FR2 DCT FR4**
-ADES **OMDB**

07:31 IFPS receives message AFP#1. IFPS tries to update the route of the flight using the data contained in AFP#1 by joining the AFP#1 route data with that of the previous route. The old route (KOBAN UM999 BXX UL111 BIBIK FR1 DCT FR2 DCT MARAX UL333 VAVOR UM221 LARIX UG669 MILIX UL933 IM3) that penetrates ATS A, ATS D and ATS E is updated. IFPS proposes a new route that will re-join the old one at the LARIX point and that will penetrate ATS A, ATS B and ATS C (KOBAN UM999 BXX UL111 BIBIK FR1 DCT FR2 DCT FR4 DCT LARIX UG669 MILIX UL933 IM3). The route change will trigger the dissemination of APL messages to ATS B and ATS C, as they were not in the previous list of concerned ATS units. The route change will trigger the dissemination of an ACH message to ATS F that needs to be used for updating the system flight plan with the additional flight plan data .However, it should be noted that ATS D and ATS E will not be notified of the route change.

IFPS may receive message AFP#2 before or after disseminating the APL messages for flight BAW775.

- If AFP#2 is received before disseminating the APL message, it is referred to the IFPS operator for further action. As AFP#2 is almost identical to AFP#1, only one APL will be disseminated to the concerned ATS units.
- If AFP#2 is received after the disseminating the APL message, IFPS identifies that the flight plan for BAW775 does exist and that no additional information (change of route) needs to be sent to the downstream ATS units. In this case, AFP#2 is rejected and a corresponding APL is not disseminated.

07:31 An APL message is sent to the downstream units including ATS B and ATS C.

-TITLE **IAPL**
-BEGIN ADDR
-FAC **ATCB**
-FAC **ATCC**
-END ADDR
-ADEP **EGLL**
-ADES **OMDB**
-ARCID **BAW775**
-ARCTYP **B737**
-EOBD **180129**
-EOBT **0530**
-IFPLID **AT49277011**
-ORGNID **ATCA**
-SSRCODE **A0556**
-SRC **AFP**
-TTLEET **0648**
-RFL **F370**
-SPEED **N0440**
-FLTRUL **I**
-FLTTYP **S**
-ROUTE **KOBAN UM999 BXX UL111 BIBIK FR1 DCT FR2 DCT FR4 DCT LARIX UG669 MILIX UL933 IM3**
-ESTDATA

-PTID **FR3**
-ETO **1801290074400**
-FL **F370**

07:31 An ACH message is sent to the downstream unit ATS F, due to the change of entry point.

-TITLE **IACH**
-BEGIN ADDR
-FAC **ATCF**
-END ADDR
-ADEP **EGLL**
-ADES **OMDB**
-ARCID **BAW775**
-ARCTYP **B737**
-EOBD **180129**
-EOBT **0530**
-IFPLID **AT49277011**
-ORGNID **ATCA**
-SSRCODE **A0556**
-SRC **AFP**
-TTLEET **0648**
-RFL **F370**
-SPEED **N0440**
-FLTRUL **I**
-FLTTYP **S**
-ROUTE **KOBAN UM999 BXX UL111 BIBIK FR1 DCT FR2 DCT FR4 DCT LARIX UG669 MILIX UL933 IM3**
-ESTDATA
-PTID **FR3**
-ETO **1801290074400**
-FL **F370**

07:31 ATS B receives the APL message for the flight BAW775. As ATS B created the system flight plan from the received ABI message data with very limited information, the APL may be used to update the system flight plan with additional flight plan data, despite the fact the system flight plan is in the notified state.

07:31 ATS C receives the APL message for the flight BAW775 and builds the system flight plan based on the APL message content.

07:31 ATS F receives the ACH message for the flight BAW775 and updates the system flight plan with additional flight plan data.

07:34 ATS A sends an ACT message to ATS B and as bilaterally agreed without route information.

-TITLE **ACT**
-REFDATA
-SENDER -FAC **ATSA**
-RECVR -FAC **ATSB**
-SEQNUM **499**
-ARCID **BAW775**
-SSRCODE **A0556**
-ADEP **EGLL**

-COORDATA
    -PTID **FR3**
    -TO **0744**
    -TFL **F370**
-ADES **OMDB**
-ARCTYP **B737**

07:42 ATS B sends an ABI message to ATS C.

-TITLE **ABI**
-REFDATA
    -SENDER -FAC **ATSB**
    -RECVR -FAC **ATSC**
    -SEQNUM **021**
-ARCID **BAW775**
-SSRCODE **A0556**
-ADEP **EGLL**
-COORDATA
    -PTID **REF01**
    -TO **0802**
    -TFL **F370**
-ADES **OMDB**
-ARCTYP **B737**
-REF
    -REFID **REF01**
    -PTID **FR5**
    -BRNG **022**
    -DISTNC **005**
-ROUTE **FR2 DCT FR3 DCT FR4 DCT LARIX**

07:44 Flight BAW775 is transferred from ATS A to ATS B.

07:47 Close after the boundary (GEO1 point), ATS B SC2 clears BAW775 direct to LARIX.

07:47 ATS B sends a revised ABI message to ATS C.

-TITLE **ABI**
-REFDATA
    -SENDER -FAC **ATSB**
    -RECVR -FAC **ATSC**
    -SEQNUM **045**
-ARCID **BAW775**
-SSRCODE **A0556**
-ADEP **EGLL**
-COORDATA
    -PTID **REF02**
    -TO **0759**
    -TFL **F370**
-ADES **OMDB**
-ARCTYP **B737**
-REF
    -REFID **REF02**
    -PTID **FR5**
    -BRNG **195**

-DISTNC **017**
-ROUTE **FR2 DCT FR3 DCT 4207N05301E DCT LARIX**

07:47 ATS B sends an AFP message to IFPS for change of route (AFP#3).

-TITLE **IAFP**
-ARCID **BAW775**
-ADEP **EGLL**
-ESTDATA
-PTID **REF02**
-ETO **180129075900**
-FL **F370**
-REF
-REFID **REF02**
-PTID **FR5**
-BRNG **195**
-DISTNC **017**
-ROUTE **FR2 DCT FR3 DCT 4207N05301E DCT LARIX**
-ADES **OMDB**

07:48 IFPS receives the AFP#3 message. IFPS tries to update the route of the flight using the data contained in AFP#3 by joining the AFP#3 route data with the previous route. IFPS creates a new route (route change starts at GEO1 point and joins the previous route at the LARIX point). The new route does not change the sequence of downstream ATS units. The route change will trigger the dissemination of an ACH message to ATS C and ATS F.

07:48 IFPS disseminates an ACH message to ATS C and ATS F.

-TITLE **IACH**
-BEGIN ADDR
-FAC **ATCC**
-FAC **ATCF**
-END ADDR
-ADEP **EGLL**
-ADES **OMDB**
-ARCID **BAW775**
-ARCTYP **B737**
-EOBD **180129**
-EOBT **0530**
-IFPLID **BX49277078**
-ORGNID **ATCB**
-SSRCODE **A0556**
-SRC **AFP**
-TTLEET **0648**
-RFL **F370**
-SPEED **N0440**
-FLTRUL **I**
-FLTTYP **S**
-ROUTE **KOBAN UM999 BXX UL111 BIBIK FR1 DCT FR3 DCT 4207N05301E DCT LARIX UG669 MILIX UL933 IM3**
-REF
-REFID **REF02**
-PTID **FR5**
-BRNG **195**

-DISTNC **017**
-ESTDATA
-PTID **REF02**
-ETO **1801290075900**
-FL **F370**

07:48 ATS C receives the ACH message and disregards it as the flight is already in notified state and the ACH message does not contain any new content compared with the revised ABI message. ATS F receives the ACH message and updates the system flight plan with the additional flight plan data.

07:49 ATS B sends an ACT message to ATS C and as bilaterally agreed without any route information.

-TITLE **ACT**
-REFDATA
-SENDER -FAC **ATSB**
-RECVR -FAC **ATSC**
-SEQNUM **069**
-ARCID **BAW775**
-SSRCODE **A0556**
-ADEP **EGLL**
-COORDATA
-PTID **REF02**
-TO **0759**
-TFL **F370**
-ADES **OMDB**
-ARCTYP **A330**
-REF
-REFID **REF02**
-PTID **FR5**
-BRNG **195**
-DISTNC **017**

4.1.11 Conclusions

4.1.11.1 Use cases summary

These guidelines recommend that APL messages created as a result of missing flight plans or diversion should be accepted and processed by all downstream ATS units as they contain useful information, which was not previously available, even in the cases that the first downstream unit already received notification for the missing flight plan.

ACH messages should not be considered for updating of system flight plan by the first downstream ATS unit, as the notification messages from the upstream units contain the most recent flight plan information. These messages arrived in most of the cases before the IFPS messages due to the different procedures and communication mechanisms applied.

ACH messages, should be accepted and processed by all downstream ATS units except the first one, as they are supposed to arrive before any OLDI message and thus improving the traffic predictability and awareness with the concerned ATS units.

4.1.11.2 Handling of ACH for other triggers

IFPS disseminated ACH messages as a result of a received AFP message for:

- change of aircraft type
- change of flight rules
- change of flight type
- change of aircraft equipment

should be ignored by the first downstream unit, as ABI/ACT messages most likely contain the same information. However, these ACH messages need to be processed by the subsequent downstream ATS units in order to obtain the AFP change info in due time.

4.2. OLDI Flight Object content mapping

4.2.1 Background

Flight Objects (FO) were considered as an evolution of OLDI point-to-point exchanges. The work on FO started before SESAR and it was taken as being one of the main elements of SESAR 1. However, the SESAR1 attempts to validate the FO in terms of operational, technical and standardisation lead to multiple issues. Remedial actions have been taken at end of SESAR 1 to re-engineer the whole standard, based on re-assessment of operational needs. SESAR 1 was not able to deliver a mature IOP solution.

The FO work was continued within SESAR2020 wave 1 by the solution “Flight Object interoperability” (PJ.18-02b) with an expectation to reach the V3 maturity by the end of SESAR2020 wave1. The official SESAR IOP Specification is planned for the end of 2020, which has triggered the update of Flight Object Interoperability Specification (ED-133).

The FO have been removed from the CP1 implemenation planning, therefore OLDI will remain a mechanism for ATSU tactical data exchanges for quite some years.

The traceability between FO’s use cases messages and OLDI messages is contained in a separate document “FO use cases assessment”.

5 OLDI Situational awareness messages

5.1. Runway Configuration Message (RCM)

5.1.1 Background

A working draft of EUROCONTROL Guidelines for On-Line Environment Data Interchange has been developed in 2007 and described three messages for the exchange of environmental data via OLDI.

- Runways in use and availability (RCM messages)
- Airspace available for direct Routing (GAM messages)
- Status of temporary restricted area (TSM messages)

These messages were never part of any approved OLDI Specification. Their use has been re-assessed

As these messages were conceived more than 10 years ago, they refer to the mechanism of peer-to-peer exchanges of static and dynamic aeronautical data. With the implementation of new airspace concepts like Direct Routing and Free Route Airspace as well as with the Airspace Management Tools that enables dynamic exchanges of airspace reservations and activations, the GAM and TSM messages exchanges are deemed as obsolete.

5.1.2 Context

The exchange of runway in use information is planned to be part of Airport Operation Plan (AOP) and the integration of AOP with Network Operation Plan (NOP). These data exchanges and AOP/NOP integration are requirements stemming from the Common Project One (CP1) Implementing Rule [RD 6] ; they should be deployed by 2023 by 25 biggest European airports. These 25 airports should include 'runways in use' information in their AOP, this data should be exchanged with NM, allowing NM systems improve traffic prediction in the planning phase, providing to the NOP portal for viewing purpose and exchanged with operational Stakeholders via NM B2B interfaces.

The AOP/NOP integration will be extended beyond the 25 airports from 2023 onwards. However, some small and medium sized airports may not need to develop AOP and provide data for runways in use information to other interested parties. The OLDI group considers that the RCM message should be kept within OLDI guidance material, due to the fact that some ANSPs already implemented this message or plan to deploy it in the coming years. As the RCM message was deployed on a tactical basis, the operational objective of this message has been extended to provide the tactical updates of static aerodrome data to be applied immediately after its receipt.

Note - The below sections describe the RCM message and are purely informational.

5.1.3 Runway Configuration Message (RCM)

The Runway Configuration Message serves the following purposes:

- Notification of planned or current runway in use and availability, between adjacent TWR and ACC units, respectively between adjacent APP and ACC units where these are established as different ATC units;
- Notification of current runway configurations to interested neighbouring ATC Units and other interested parties.

5.1.4 Message contents

The RCM message contains the following items of data:

- Message Type;
- Message Number;
- Aerodrome Designator;
- Runways Identification and Availability;
- Start Time of Applicability. (Optional item);
- End time of applicability (Optional Item)

The following ADEXP primary fields could be used for exchange of RCM message data items as:

- Primary field "*title*" for message type;
- Primary field "*refdata*" for message number;
- Primary fields "*ades*" or “*ad*” for the aerodrome designator;
- Primary field "*rwylist*" contains the list of runaway data for exchanges;
- Subfield “*rwyinfo*” for configuration data of specific runway;
- Subfield “*rwyid*” as runway identifier;
- Subfield “*rwyavail*” or similar to indicate the opening/closure of runway for arrivals/departures;
- Primary fields “*starttime*”and “*endtime*” for start and time of applicability.

If the RCM message intends to provide the tactical updates of runway configuration, the start time/end time data items are not required. If the RCM message intends to provide the future planned runway configuration changes, the start time and/or end time of applicability data item might be useful. The ‘Runways Identification and Availability’ item contains the list of runway data used for the runway configuration exchange and includes information for all published runways irrespective of the availability. If bilaterally agreed the RCM message contains:

- ILS Category and Status.

5.1.5 Transmitting unit

An RCM message is sent to the receiving unit for every change in the Runways Identification and Availability data. The RCM message may be transmitted, as bilaterally agreed, sufficiently in advance to allow the receiving unit to process the runway configuration data. In case of tactical runway configuration updates, the RCM message can be automatically or manually triggered whenever the runway configurations are modified.

If the ‘ILS Category and Status’ item is used based on bilateral agreement, a new RCM message needs to be sent for every change in these items.

The manual update of the runway configuration data from a relevant working position results in the automatic generation and transmission of the RCM message.

On bilateral agreement, a received RCM message can be automatically forwarded to other unit(s).

5.1.6 Receiving unit

The ATS unit receiving an RCM message is to check the syntax and semantic of the received message.
If no syntax nor semantic error is present in the message, a LAM message should be returned.

5.1.7 Acknowledgement of RCM

The RCM is acknowledged by the generation and transmission of a LAM.

5.1.8 No acknowledgement cases

If no LAM is received within a specified parameter time, it is recommended that a warning is displayed at the appropriate working position.

If no LAM is received within a specified parameter time, the transmitting ATS unit may attempt to retransmit the RCM message.

5.1.9 Examples

5.1.9.1 Tactical RCM

-TITLE **RCM**
-REFDATA
-SENDER -FAC **LROP**
-RECVR -FAC **LBSR**
-SEQNUM **078**
-ADEP **LROP**
-BEGIN RWYLIST
-RWYINFO –RWYID **08R** -RWYAVAIL **D** –ILSCAT **IIIb**
-RWYINFO –RWYID **26L** -RWYAVAIL **D** –ILSCAT **II**
-RWYINFO –RWYID **08L** -RWYAVAIL **C** –ILSCAT **IIIa**
-RWYINFO –RWYID **26R** -RWYAVAIL **A** –ILSCAT **II**
-END RWYLIST

5.1.9.2 Planning RCM

-TITLE **RCM**
-REFDATA
-SENDER -FAC **LROP**
-RECVR –FAC **LBSR**
-SEQNUM **527**
-ADEP **LROP**
-BEGIN RWYLIST
-RWYINFO –RWYID **08R** -RWYAVAIL **B** –ILSCAT **IIIb**
-RWYINFO –RWYID **08L** -RWYAVAIL **C** –ILSCAT **IIIa**
-RWYINFO –RWYID **26L** -RWYAVAIL **C** –ILSCAT **II**
-RWYINFO –RWYID **26R** -RWYAVAIL **A** –ILSCAT **II**
-END RWYLIST
-STARTTIME **072200**
-ENDTIME **072330**

5.1.10 Current implementations

As RCM message was never part of any OLDI specification, but was included in the EUROCONTROL working draft guidance material for the exchange of aeronautical data, different stakeholders deployed the runway configuration exchanges that slightly differ from

ADEXP specification. For example, ANS CR confirmed that the RCM message has been deployed as described in the EUROCONTROL working draft guidance document.

However, it has been reported that some deployments are not fully aligned with the ADEXP Specification with regard to the runway availability information item. The examples below indicate the current deployments that differ from the ADEXP standard for the runway availability information. The permissible values for RWYAVAIL are defined in ADEXP to be one character (A, B, C or D), while this particular implementation uses out of range values for the RWYAVAIL field. The discrepancies compared with ADEXP standard are indicated in blue.

-TITLE **RCM**
-AD **ESSA**
-REFDATA
    -SENDER -FAC **ESOS**
    -RECVR -FAC **ESMM**
    -SEQNUM **730**
-BEGIN RWYLIST
    -RWYINFO -RWYID **19L** -RWYAVAIL **D_ALLOCATION**
    -RWYINFO -RWYID **26** -RWYAVAIL **A_ALLOCATION**
    -RWYINFO -RWYID **01L** -RWYAVAIL **C**
    -RWYINFO -RWYID **01R** -RWYAVAIL **C**
    -RWYINFO -RWYID **19R** -RWYAVAIL **C**
    -RWYINFO -RWYID **08** -RWYAVAIL **C**
    -RWYINFO -RWYID **00** -RWYAVAIL **C**
-END RWYLIST
-STARTTIME **0911181946**

Note: Blue highlighted text does not conform to the ADEXP Specification.

-TITLE **RCM**
-AD **ESSB**
-REFDATA
    -SENDER -FAC **ESOS**
    -RECVR -FAC **ESMM**
    -SEQNUM **333**
-BEGIN RWYLIST
    -RWYINFO -RWYID **30** -RWYAVAIL **B_ALLOCATION**
    -RWYINFO -RWYID **12** -RWYAVAIL **C**
-END RWYLIST
-STARTTIME **0912180408**

-TITLE **RCM**
-AD **ESMS**
-REFDATA
    -SENDER -FAC **ESMM**
    -RECVR -FAC **EKDK**
    -SEQNUM **072**
-BEGIN RWYLIST
    -RWYINFO -RWYID **17** -RWYAVAIL **D_ALLOCATION**
    -RWYINFO -RWYID **35** -RWYAVAIL **A_ALLOCATION**
    -RWYINFO -RWYID **11** -RWYAVAIL **C**
    -RWYINFO -RWYID **29** -RWYAVAIL **C**

-END RWYLIST
-STARTTIME **0912180604**

Another implementation refers to a pseudo RCM message (named RWYMSG) that includes all RCM fields in ADEXP format. The RWYMSG message exchange is foreseen between TWR and APP/ACC Units. The message is intended for tactical updates of runway configurations. When there is a change in runway configuration, the RWYMSG message is transmitted from TWR Unit to APP/ACC Unit. The change applies to all flights after the receipt of the RWYMSG message.

5.2. OLDI data exchanges with TWR

This section addresses the LVNL approach of OLDI sharing with TWR units.

5.2.1 Detailed interface requirement

iCAS iFDP - TWR FDPS Application Messages

The following diagram details the main data flows that can be supported by the iFDP system and the TWR FDPS.

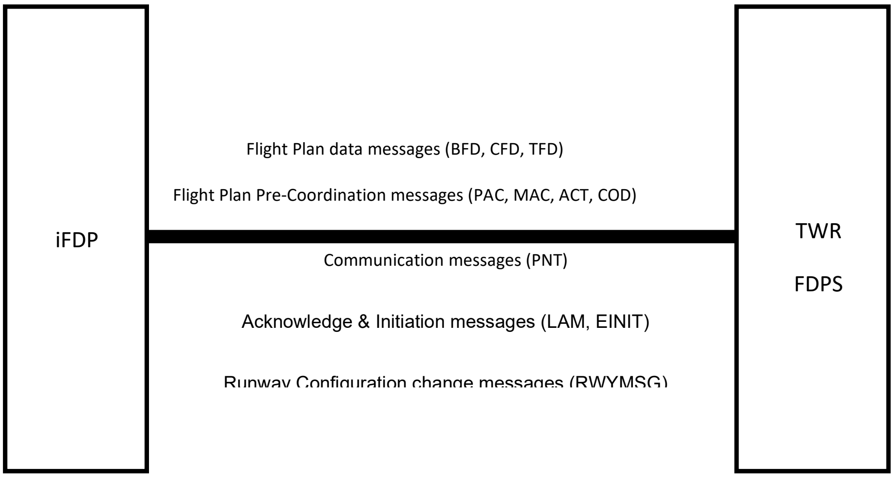


Figure 1: iCAS iFDP-TWR FDPS Dataflow Diagram

Message Description

Flight Plan data messages (BFD, CFD, TFD) are used to create, cancel and update flight plans, between Tower Systems & iFDP (without coordination intentions).

Flight Plan Pre-coordination message exchange between Tower systems FDP and iFDP (PAC, MAC, ACT, COD), includes those messages Tower systems use to notify iFDP of departing flights from the aerodrome. The messages will also be used to notify iFDP about departure sequence changes.

Communication messages (PNT) are used to exchange flight plan related free text messages and highlight label display between specific controllers on both systems.

Acknowledge (LAM) and initiation messages (EINIT) are defined system messages to support the proper message processing. It shall be configurable that initiation of flight plan sending, ends with an EINIT message (as start for the TWR pre-departure planning processing).

Runway change handling messages (RWYMSG) will communicate the change in configuration of a given runway at an aerodrome and coordinate this change with iFDP for flight plan rerouting.

5.2.2 Flight Plan Pre-Coordination OLDI Messages

iFDP receives Pre-Coordination messages from the connected TWR FDPS, to exchange relevant flight plan data, at a pre-departure stage:

- The PAC is used to exchange departure planning information and as trigger for SSR code request. The PAC message can also be used to create a Pure VFR flight plan, when relevant flight plan is not available in iCAS.
- COD message returns the assigned SSR code.
- MAC messages are used to return flight plans to a previous (pre-) coordination stage, when a flight for instance returns to gate or departure has to be cancelled. Appendix A describes the different cases for the use of the MAC message with intended iFDP processing and relevant STATREASON distinctions as processing triggers.
- The ACT is finally sent by TWR FDPS when the departure flight was detected airborne (automatically or by manual controller input according to the used TWR FDPS).

5.2.3 Flight Plan Data Messages

iCAS continuously provides the connected TWR FDPS with relevant flight plan data:

- A Basic Flight Data (BFD) message shall be sent, as first flight plan initiation message, for each arrival- or departure flight to the configured aerodrome(s) on relevant TWR FDPS interface. This BFD message will be also sent to TWR FDPS interfaces that have been configured to receive any flight plan regardless the ADEP/ADES.
- The System Flight Plans (SFPLs) distributed by taking into account the ADEP/ADES will be sent by BFD message an adapted time parameter before EOBT for departure flights and/or adapted time parameter before ETA for arrival flights. For SFPLs that are distributed regardless the ADEP/ADES, a BFD message will be sent to the configured TWR FDPS interface(s) an adapted time parameter before the EOBT.
- Abbreviated Flight Plans (ASPLs) will be sent to the configured TWR FDPS interface(s) upon creation regardless any time parameter.
- A Change Flight Data (CFD) message shall be sent to the relevant TWR FDPS, for the configured data updates of the flight plans in TWR FDPS. The CFD includes mandatory and just optional data fields which have been changed.

iCAS receives a Change Flight Data (CFD) message from TWR FDPS if the tower has updated flight plan data items.

A TFD message is sent by iCAS when it needs to terminate a flight in the relevant TWR FDPS. The TFD message is an extension of the OLDI 4.2 standard [1]. Any BFD, CFD and TFD messages shall be acknowledged by a LAM message, when it was correctly processed on the interface.

Note:

A diversion of a flight triggers in iCAS a BFD, CFD or TFD as follows:

1. For ADEP and ADES dependent message exchange adaptation

a) Diversion to a new ADES:

- The BFD to the new destination tower (new ADES).
- A TFD to the previous destination tower (old ADES).

b) Diversion to the ADEP:

- A BFD to the new destination tower (new ADES = ADEP).
- A TFD to the previous destination tower (old ADES).

If iCAS is configured to send only one BFD message for departure and arrival at the same aerodrome, then a CFD message is sent instead of the BFD message to the arrival tower:

- A CFD to the new destination tower (new ADES = ADEP).
- A TFD to the previous destination tower (old ADES).

2. For ADEP and ADES independent (All flight plan) message exchange adaptation, where always only one BFD is sent.
   - A CFD to the tower is sent with an update of the ADES.

The BFD or CFD message is sent to the new destination TWR including the new destination in the field ADES and if available the old destination in the field ADESOLD.

The TFD message is sent to the old destination TWR including the new destination in field ADES and the old destination in field ADESOLD.

5.2.4 Runway Change Message

Information relating to runway use shall be communicated between iCAS iFDP and TWR FDPS using the RWYMSG message. Each Runway Configuration Message (RWYMSG) contains the changes in runway availabilities at the relevant aerodrome. This includes runways that are open for arrivals, open for departures or for both arrivals plus departures and runways that change to a closed status.

Each RWYMSG message may also contain information about the assignment of stacks to runways and about SID preferences.

At LVNL the RWYMSG message will be sent from TWR to iFDP when departure runways and SID preferences are changed. The RWYMSG message will be sent from iFDP to TWR, when arrival runways and stack assignment are changed (in AMAN).

At DFS the RWYMSG message is currently not planned to be used. If a RWYMSG message is sent from iFDP to TWR, it will be rejected by the TWR.

The RWYMSG message exchange is also part of the interface initialization and recovery mechanism. On a resynchronization, iCAS will send the complete configuration of RWYs (Open Arrival, Departure, Both and Closed). If a RWY or a set of RWYs configuration is changed at iCAS, it only sends those changes to the TWR.

5.2.5 Communication Messages [LVNL only]

The (OLDI) PNT messages is used to exchange (flight plan related) messages between controller functions at TWR and iCAS Controller Working Position, which can trigger HMI behaviour.

5.2.6 End of Initiation Messages

It is configurable, that the iFDP sends an EINIT message, after all the BFD messages were sent to TWR at interface (re)start. The EINIT can therefore be a trigger to start the pre-departure planning processing, which can result in PAC (ETOT, RWYDEP and SID) responses from TWR to iFDP. The TWR does not strictly need to wait until the upload of BFD messages is finalized and an EINIT message is received to send messages to iCAS, but it is recommended.

5.2.7 Logical Acknowledge Messages

Both iCAS and FMTP connected TWR generate and transmit a Logical Acknowledgement message (LAM) if a message (excluding an acknowledgement) has been received and syntactic and semantic correctness of the message has been assured. If no LAM message is received within the time limit, after the complete transmission of a message (excluding a LAM), a warning shall be displayed.

6 OLDI relationship with Core FDP functions

6.1. OLDI handling of re-entrant flights

6.1.1 Objective

The re-entrant flights are those ones that leave the ATS unit Area of Responsibility (AoR), fly in the adjacent airspace and re-enter in the same ATS units. The handling of re-entrant flights is usually considered as a core FDP function. The relationship of re-entrant flight handling with the OLDI data exchanges is elaborated in this paragraph. There many real examples of re-entrant flight within the ECAC airspace due to the shapes of CTA/UTA borders. However, as the handling of re-entrant flight is not always supported by the ATM systems, these re-entrant route portions are handled by the route availability restrictions, which require Airspace Users to fly longer routes.

There are different solutions for handling re-entrant flight and a few of them with different level of complexity are described in this Section.

6.1.2 System handling of re-entrant flight (two system flight plans)

Upon receiving a flight plan with a re-entrant route, the FDP needs to flag this flight plan and divide it into two separate system flight plans. The first one will cover the route segment from the departure up to the exit point of the AoR, while the second system flight plan will cover the route segment from AoR the point of re-entry up to its destination. This approach would require a careful handling of OLDI messages received and correlating them with the correct FP segment, mostly using the COP name as additional criteria.

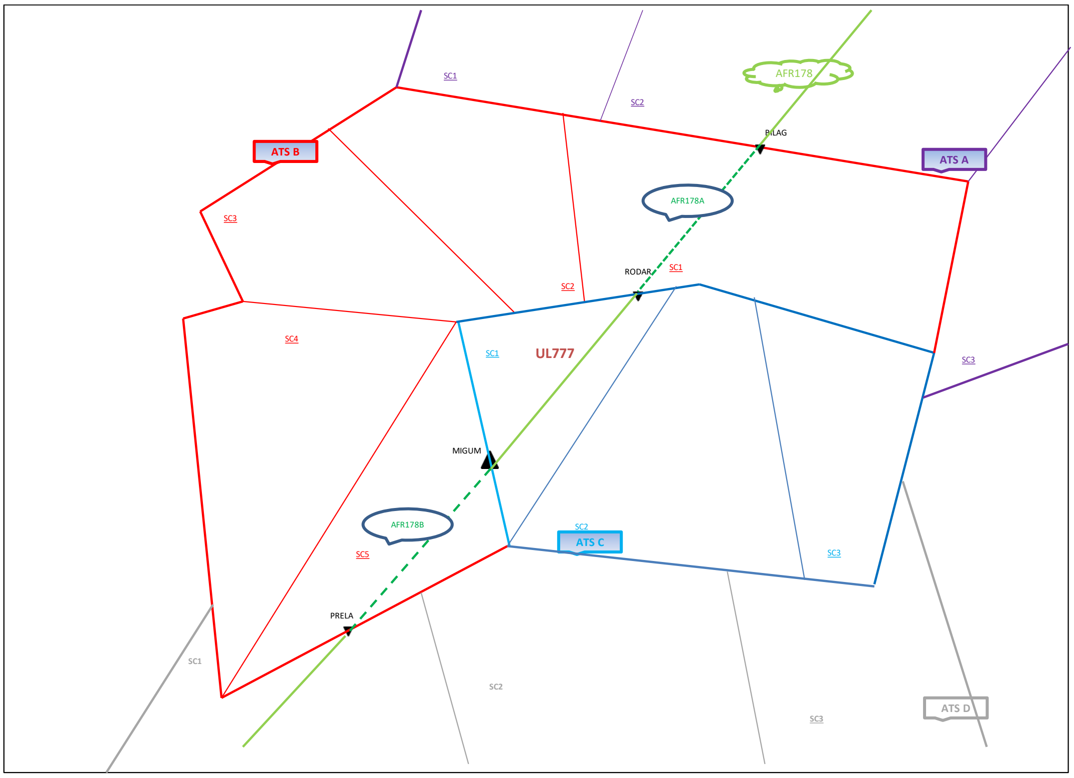


Figure 24 - Flight Re-entry Case Study 1

In addition, the OLDI messages to the downstream unit should include the original flight plan callsign as the downstream unit has no notion about splitting this flight plan in two segments.

6.1.2.1 Case study 1

This case study elaborates the capability of fictitious FDP for handling of re-entrant flight. The airspace and flight elements used for case study 1 illustrated by Figure 24 are also fictitious. Only the departure and destination airports exist. The airspace data is depicted as:

- ATS A in magenta;
- ATS B in red; (ATS unit need to handle the re-entrant flight)
- ATS C in blue;
- ATS D in grey;

The airways are depicted in green and significant points in black.

Flight AFR178 departed from Lille (LFQQ) at 13:00 and it is planned to land at Larnaca (LCLK). IFPS distributed the original FPL (FPL- AFR178 -IS –A330/H-SRWY/C –LFQQ0800 -N0430F370 VIKAW UM457 MXX UL111 LIMAM UL777 BOTOM UM457 IM3 – LCLK0400 -DOF/180125) to all concerned ATS units.

After the receiving the flight plan for AFR178, it is tagged as a re-entrant flight and the ATS B FDP creates the two system flight plans AFR178A (with route segment from VIKAW up to RODAR) and AFR178B (with route segment from MIGUM up to IM3).

13:02 The flight AFR178 departs from LFQQ.

13:22 ATS A sends an ABI message to ATS B.

-TITLE **ABI**
-REFDATA
  -SENDER -FAC **ATSA**
  -RECVR -FAC **ATSB**
  -SEQNUM **053**
-ARCID **AFR178**
-SSRCODE **A6742**
-ADEP **LFQQ**
-COORDATA
  -PTID **BILAG**
  -TO **1342**
  -TFL **F370**
-ADES **LCLK**
-ARCTYP **A330**

13:22 ATS B sends a LAM message to ATS A and tries to correlate the received ABI with its system flight plans. The FDP identifies that the AFR178A flight plan has the BILAG point in its trajectory and associated the received ABI with this system plan.

13:31 ATS A sends an ACT message to ATS B.

-TITLE **ACT**
-REFDATA
  -SENDER -FAC **ATSA**
  -RECVR -FAC **ATSB**
  -SEQNUM **077**
-ARCID **AFR178**

-SSRCODE **A6742**
-ADEP **LFQQ**
-COORDATA
    -PTID **BILAG**
    -TO **1341**
    -TFL **F370**
-ADES **LCLK**
-ARCTYP **A330**

13:31 ATS B sends a LAM message to ATS A and correlates the received ACT message with its system flight plan using the same principle as for the ABI message.

13:38 ATS B sends an ABI message to ATS C.

-TITLE **ABI**
-REFDATA
    -SENDER -FAC **ATSB**
    -RECVR -FAC **ATSC**
    -SEQNUM **015**
-ARCID **AFR178A**
-SSRCODE **A6742**
-ADEP **LFQQ**
-COORDATA
    -PTID RODAR
    -TO **1358**
    -TFL **F370**
-ADES **LCLK**
-ARCTYP **A330**

13:38 ATS C sends a LAM message to ATS B. As the ABI message cannot be correlated with any system flight plan, it is presented to operator for manual handling.

13:39 The ATS C operator phones ATS B and understands that this is a re-entrant flight modified by ATS B. The operator manually associates the received ABI message to the system flight plan for flight AFR178.

13:41 Flight AFR178 is transferred to ATS B.

13:47 ATS B sends an ACT message to ATS C.

-TITLE **ACT**
-REFDATA
    -SENDER -FAC **ATSB**
    -RECVR -FAC **ATSC**
    -SEQNUM **022**
-ARCID **AFR178A**
-SSRCODE **A6742**
-ADEP **LFQQ**
-COORDATA
    -PTID **RODAR**
    -TO **1357**
    -TFL **F370**
-ADES **LCLK**

-ARCTYP **A330**

13:48 ATS C sends a LAM message to ATS B, as the ACT message cannot be correlated with system flight plan, it is presented to operator for manual handling. The operator is aware that this is a re-entrant flight and manually associates the received ACT message with the system flight plan.

13:51 ATS C sends an ABI message to ATS B.

-TITLE **ABI**
-REFDATA
  -SENDER -FAC **ATSC**
  -RECVR -FAC **ATSB**
  -SEQNUM **118**
-ARCID **AFR178**
-SSRCODE **A6742**
-ADEP **LFQQ**
-COORDATA
  -PTID **MIGUM**
  -TO **1411**
  -TFL **F370**
-ADES **LCLK**
-ARCTYP **A330**

13:52 ATS B returns a LAM message to ATS C and tried to correlate the received ABI with system flight plans. FDP does identify that the flight plan AFR178B contains the MIGUM point in the trajectory and associates the received ABI message with this system plan.

13:57 Flight AFR178 is transferred to ATS C.

13:58 After reporting the RODAR point was overflown, the FDP of ATS B terminates the system flight plan AFR178A.

14:01 ATS C sends an ACT message to ATS B.

-TITLE **ACT**
-REFDATA
  -SENDER -FAC **ATSC**
  -RECVR -FAC **ATSB**
  -SEQNUM **231**
-ARCID **AFR178**
-SSRCODE **A6742**
-ADEP **LFQQ**
-COORDATA
  -PTID **MIGUM**
  -TO **1411**
  -TFL **F370**
-ADES **LCLK**
-ARCTYP **A330**

14:01 ATS B sends a LAM message to ATS C and correlates the received ACT message using the same principle as for the ABI message.

14:06 ATS B sends an ABI message to ATS D.

-TITLE **ABI**
-REFDATA
-SENDER -FAC **ATSB**
-RECVR -FAC **ATSD**
-SEQNUM **011**
-ARCID **AFR178B**
-SSRCODE **A6742**
-ADEP **LFQQ**
-COORDATA
-PTID **PRELA**
-TO **1426**
-TFL **F370**
-ADES **LCLK**
-ARCTYP **A330**

14:06 ATS D sends a LAM message to ATS B, as the ABI message cannot be correlated with a system flight plan, it is presented to the operator for manual handling.

14:08 The ATS D operator phones ATS B and understands that this is a re-entrant flight modified by ATS B. The operator manually associate the received ABI to the system flight plan for AFR178.

14:11 Flight AFR178 is transferred to ATS B.

14:16 ATS B sends an ACT message to ATS D.

-TITLE **ACT**
-REFDATA
-SENDER -FAC **ATSB**
-RECVR -FAC **ATSD**
-SEQNUM **077**
-ARCID **AFR178B**
-SSRCODE **A6742**
-ADEP **LFQQ**
-COORDATA
-PTID **PRELA**
-TO **1426**
-TFL **F370**
-ADES **LCLK**
-ARCTYP **A330**

14:17 ATS D sends a LAM message, as the ACT message cannot be correlated with a system flight plan it I presented to the operator for manual handling. The operator is aware that this is a re-entrant flight and manually associates the received ACT message with the system flight plan.

14:26 Flight AFR178 is transferred to ATS D.

14:27 After flight AFR178 is reported to have overflown the PRELA point, the ATS B FDP terminates the system flight plan AFR178B.

6.1.3 System handling of re-entrant flight (AoI concept)

The Area of Interest (AoI) encapsulates the Area of Responsibility Airspace plus the buffer zones around AoR, which is of particular interest for the concerned ATS unit. The FDP of concerned ATS unit recognizes and accepts re-entrant flights (i.e. flights that leave the AoR but still within

AoI and subsequently re-enter). Where the flight is re-entrant and remains within the AoI, one single system flight plan is generated for all the duration of the flight within the AoR/AoI. The FDP compiles a sequenced list of points corresponding to route elements in the flight plan that match elements defined in the AoI environment data. When a flight trajectory leaves and re-enters the AoR, the FDP establishes the sector sequence for each traversal of the AoR.

The system flight plan goes to notified state as soon as the flight exits the AoR. The FDP does not terminate the system flight plan when re-entrant flights left AoR. The system maintains the correlation when re-entrant flights leave AoR. The received notification messages (ABI, PAC) are ignored due to the fact that the system flight plan remains in notified state. Distribution of system flight plan updates continues at least until such time that the flight has left the AoR and the control of the flight is released, and coordination for re-entry to AoR has not been initiated. After the reception of an ACT message, the system flight plan assumes the coordinated status. At this stage, the system flight plans is eligible to receive/send transfer of control messages with adjacent ATS unit, which assumed the control of re-entrant flight. The system flight plan is deleted a predefined time after leaving AoI.

In the case of a short traversal (less than 10 minutes), the handling of ACT for re-entrant flight needs to be bilaterally agreed. The timing of ACT might need to be reviewed, or ACT to be sent upon the assumption of control or ACT to be ignored by ATS unit handling the re-entrant flight.

6.1.3.1 Case study 2

Figure 25 - Flight Re-entry Case Study 2

The flight DLH1751 departed from Munich (EDDM) at 12:00 and it is planned to land at Larnaca (LCLK).

This case study elaborates the trajectory of DLH1751 within:

- Sofia ACC (LBSR)
- Makedonia ACC (LGMD), uses the same FDP as LGGG for OLDI message handling
- Ankara ACC (LTAA)
- Athens ACC (LGGG)
- Nicosia ACC (LCCC)

IFPS distributed the original FPL (FPL- DLH1751 -IS –A330/H-SRWY/C –EDDM1200 -N0440F370 EBEDA UL603 LATLO DIRSA PODET UL603 ZAG UN131 VAL UL863 OKANA L863 EVIVI UN133 PEREN UN128 LMO UN127 EXELA UM601 EVENO DCT PEDER DCT GENOS UM31LCA – LCLK0400 -DOF/180110).

The flight DLH1751 trajectory with the Makedonia/Athens ACC Area of Interest includes the following data items as:

EDIKA EVIVI PEREN LMP ERES0 RIKSO IMR ULKAN SONEN DAL BIRPU BENEM EXELA EVENO PEDER

The flight DLH1751 trajectory with Ankara ACC Area of Interest (AoI) includes the following data items as:

ERESO RIKSO IMR ULKAN SONEN DAL BIRPU BENEM EXELA

Makedonia and Athens ACC are co-located and they use the same FDP. After receiving the flight plan for flight DLH1751, the FDP that serves Makedonia and Athens ACC flags the flight is being a re-entrant, not to be terminated after its first exit from AoR.

12:00 Flight DLH1751 departs from EDDM.

13:25 Sofia ACC (LBSR) sends an ABI message to Makedonia ACC (LGGG).

> -TITLE **ABI**
> -REFDATA
>   -SENDER -FAC **LBSR**
>   -RECVR -FAC **LGGG**
>   -SEQNUM **011**
> -ARCID **DLH1751**
> -SSRCODE **A6333**
> -ADEP **EDDM**
> -COORDATA
>   -PTID **EVIVI**
>   -TO **1345**
>   -TFL **F350**
> -ADES **LCLK**
> -ARCTYP **A330**

13:25 LGGG sends a LAM message to LBSR and associates the received ABI message with its system flight plans.

13:25 The Greek FDP recognises that flight DLH1751 is a re-entrant one and it is flagged not to be terminated after its first exit from AoR.

13:35 LBSR sends an ACT message to Makedonia ACC.

-TITLE **ACT**
-REFDATA
    -SENDER -FAC **LBSR**
    -RECVR -FAC **LGGG**
    -SEQNUM **052**
-ARCID **DLH1751**
-SSRCODE **A6333**
-ADEP **EDDM**
-COORDATA
    -PTID **EVIVI**
    -TO **1345**
    -TFL **F350**
-ADES **LCLK**
-ARCTYP **A330**

13:35 Makedonia ACC sends a LAM message to LBSR.

13:45 Flight DLH1751 is transferred to Makedonia ACC.

13:48 Makedonia ACC sends an ABI message to Ankara ACC (LTAA).

-TITLE **ABI**
-REFDATA
    -SENDER -FAC **LGGG**
    -RECVR -FAC **LTAA**
    -SEQNUM **122**
-ARCID **DLH1751**
-SSRCODE **A6333**
-ADEP **EDDM**
-COORDATA
    -PTID **RIKSO**
    -TO **1408**
    -TFL **F350**
-ADES **LCLK**
-ARCTYP **A330**

13:48 LTAA sends a LAM message to LGGG and the ABI message is associated with a system flight plan.

13:57 Makedonia ACC sends an ACT message to LTAA.

-TITLE **ACT**
-REFDATA
    -SENDER -FAC **LGGG**
    -RECVR -FAC **LTAA**
    -SEQNUM **234**
-ARCID **DLH1751**
-SSRCODE **A6333**
-ADEP **EDDM**
-COORDATA
    -PTID **RIKSO**
    -TO **1407**
    -TFL **F350**
-ADES **LCLK**

-ARCTYP **A330**

13:58 LTAA sends a LAM message to LGGG and the ACT message is associated with the system flight plan.

14:07 Flight DLH1751 is transferred to LTAA.

14:08 Within Makedonia/Athens ACCs FDP, after reporting that flight DLH1751 has overflown the point RIKSO, the DLH1751 system flight plan is flagged as re-entrant and is still kept in the notification state.

14:10 LTAA sends an ABI message to Athens ACC (also LGGG).

-TITLE **ABI**
-REFDATA
    -SENDER -FAC **LTAA**
    -RECVR -FAC **LGGG**
    -SEQNUM **523**
-ARCID **DLH1751**
-SSRCODE **A6333**
-ADEP **EDDM**
-COORDATA
    -PTID **BENEM**
    -TO **1430**
    -TFL **F350**
-ADES **LCLK**
-ARCTYP **A330**

14:11 The Greek FDP sends a LAM message to LTAA and associates the received ABI message with its system flight plans. As the flight plan is already in a notified state, the received ABI is disregarded.

14:15 Athens ACC sends an ABI message to Nicosia ACC (LCCC).

-TITLE **ABI**
-REFDATA
    -SENDER -FAC **LGGG**
    -RECVR -FAC **LCCC**
    -SEQNUM **012**
-ARCID **DLH1751**
-SSRCODE **A6333**
-ADEP **EDDM**
-COORDATA
    -PTID **EVENO**
    -TO **1435**
    -TFL **F350**
-ADES **LCLK**
-ARCTYP **A330**

14:15 LCCC send a LAM message to LGGG and the system flight plan is updated with the ABI message content.

14:19 LTAA sends an ACT message to Athens ACC.

-TITLE **ACT**
-REFDATA
-SENDER -FAC **LTAA**
-RECVR -FAC **LGGG**
-SEQNUM **565**
-ARCID **DLH1751**
-SSRCODE **A6333**
-ADEP **EDDM**
-COORDATA
-PTID **BENEM**
-TO **1429**
-TFL **F350**
-ADES **LCLK**
-ARCTYP **A330**

14:19 The Greek FDP sends a LAM message to LTAA and changes the system flight plan from a notified status to a coordinated status considering the content of the ACT message.

14:24 Athens ACC sends an ACT message to Nicosia ACC (LCCC).

-TITLE **ACT**
-REFDATA
-SENDER -FAC **LGGG**
-RECVR -FAC **LCCC**
-SEQNUM **589**
-ARCID **DLH1751**
-SSRCODE **A6333**
-ADEP **EDDM**
-COORDATA
-PTID **EVENO**
-TO **1434**
-TFL **F350**
-ADES **LCLK**
-ARCTYP **A330**

14:25 LCCC sends a LAM message to LGGG and the system flight plan is updated with the ACT message content.

14:29 Flight DLH1751 is transferred to Athens ACC

14:30 The system flight plan related to flight DLH1751 is terminated by the LTAA FDPS.

14:34 Flight DLH1751 is transferred to LCCC.

14:35 After reporting that flight DLH1751 has overflown the point EVENO, the Greek FDP terminates the system flight plan DLH1751.

6.1.4 System handling of re-entrant flight (Segment identification concept)

This concept is deemed to be most advanced and therefore is recommended to be used as a reference one. Some systems are capable of identifying re-entrances in the AoR independently of whether the flight exits the AoI or not. That means that an exit from the AoI will not automatically mean the end of the flight.

The FDP will be able to handle several AoI segments composed by one or more AoR segments and upon reception of a message, it will be analysed by using environmental and adapted data and also design parameters, and then applied to the right boundary. The FDP will therefore manage one single system flight plan for these cases.

As in other options, the FDP will establish the sector sequence for each AoR segment.

The system flight plan will be maintained activated, even when the flight exits the AoR, and besides it will not terminate when re-entrant flights left AoR. Only when the last segment is overflown, the flight plan can start the transition to terminated state.

Regarding correlation, the system will be informed upon changes in the system in-between, and will process them accordingly so that the correlation is kept.

6.1.4.1 Case study 3

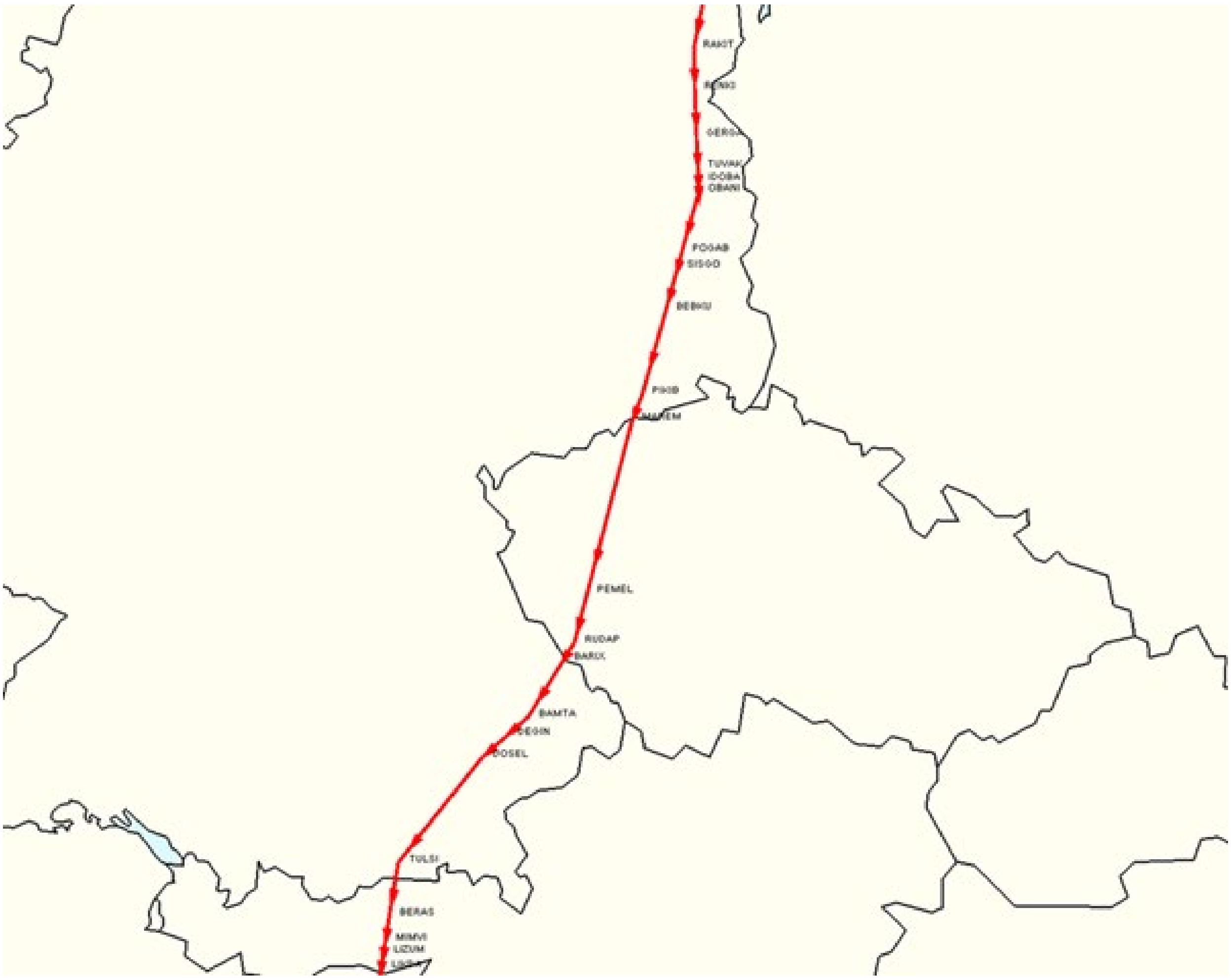


Figure 26 - Flight Re-entry Case Study 3

This case study is based on the real ATS environment (airspace and flight plan data) illustrated in Figure 26, while the sequence of OLDI messages is fictitious.

Flight DLH5523 departed from Gothenburg (ESGG) at 14:00 and is planned to land at Roma Fiumicino (LIRF).

IFPS distributed the original FPL (FPL- DLH5523 -IS –A320/M-SRWY/C –ESGG1440 -N0430F370 LALIL L996 MAXUM M736 SALLO UM44 KOGIM UM725 OBANI UZ36 MAREM P31 RADUP UP31 DOSEL UM736 LIZUM N503 VIC L12 LUMAV M726 GARVA Z806 GIKIN N737 TORLI – LIRF0240 -DOF/180110) to ATC A, ATS B and ATS C.

The flight DLH5523 trajectory concerning Karlsruhe UAC Area of Interest (AoI) includes the following data items:

BALOX SALLO ARGAD KOGIM ABES MASOR UDAXI RODEP RAKIT RENKI GERGA TUVAK IDOBA OBANI POGAB SISGO BEBKU PIKIB MAREM PEMEL RADUP BARIX BAMTA DEGIN DOSEL EBEDA MANAL TULSI BERAS MIMVI LIZUM LIKDA BAKOR

The flight DLH5523 trajectory concerning Prague ACC AoI includes the following data items:

PIKIB MAREM PEMEL RADUP BARIX BAMTA

Karlsruhe FDP calculates two segments for the flight DLH5523.

14:02 DLH5523 departs from Gothenburg (ESGG).

14:15 Malmo ACC (ESMM) sends an ABI message to Karlsruhe UAC (EDUU).

-TITLE **ABI**
-REFDATA
  -SENDER -FAC **ESMM**
  -RECVR -FAC **EDUU**
  -SEQNUM **082**
-ARCID **DLH5523**
-SSRCODE **A7421**
-ADEP **ESGG**
-COORDATA
  -PTID **SALLO**
  -TO **1435**
  -TFL **F340**
-ADES **LIRF**
-ARCTYP **A320**

14:16 EDUU sends a LAM message to ESMM and:

- Identifies that the affected segment is the first one;
- Processes the received coordination data for the affected flight plan. The first segment becomes active but it is not yet coordinated.

14:25 Malmo ACC (ESMM) sends an ACT message to Karlsruhe UAC (EDUU).

-TITLE **ACT**
-REFDATA

-SENDER -FAC **ESMM**
-RECVR -FAC **EDUU**
-SEQNUM **098**
-ARCID **DLH5523**
-SSRCODE **A7421**
-ADEP **ESGG**
-COORDATA
-PTID **SALLO**
-TO **1435**
-TFL **F340**
-ADES **LIRF**
-ARCTYP **A320**

14:25 EDUU sends a LAM message to ESMM and:

- Identifies that the affected segment is the first one;
- Processes the received coordination data for the affected flight plan. The first segment becomes coordinated.

14:36 Flight DLH5523 is transferred to EDUU.

14:41 EDUU sends an ABI message to Prague ACC (LKAA).

-TITLE **ABI**
-REFDATA
-SENDER -FAC **EDUU**
-RECVR -FAC **LKAA**
-SEQNUM **117**
-ARCID **DLH5523**
-SSRCODE **A7421**
-ADEP **ESGG**
-COORDATA
-PTID **MAREM**
-TO **1501**
-TFL **F360**
-ADES **LIRF**
-ARCTYP **A320**

14:41 LKAA send a LAM message to EDUU and the received ABI message is correlated with its system flight plan.

14:52 EDUU sends an ACT message to LKAA.

-TITLE **ACT**
-REFDATA
-SENDER -FAC **EDUU**
-RECVR -FAC **LKAA**
-SEQNUM **198**
-ARCID **DLH5523**
-SSRCODE **A7421**
-ADEP **ESGG**
-COORDATA
-PTID **MAREM**
-TO **1502**

-TFL **F360**
-ADES **LIRF**
-ARCTYP **A320**

14:52 LKAA sends a LAM message to EDUU and the ACT message is correlated with its system flight plan.

14:54 LKAA sends an ABI message to EDUU.

-TITLE **ABI**
-REFDATA
-SENDER -FAC **LKAA**
-RECVR -FAC **EDUU**
-SEQNUM **009**
-ARCID **DLH5523**
-SSRCODE **A7421**
-ADEP **ESGG**
-COORDATA
-PTID **BARIX**
-TO **1513**
-TFL **F360**
-ADES **LIRF**
-ARCTYP **A320**

14:54 EDUU sends a LAM message to LKAA and:

- Identifies that the affected segment is the second one;
- Processes the received coordination data for the affected flight plan. The second segment becomes active, not yet coordinated.

15:01 Flight DLH5523 is transferred to LKAA.

15:03 LKAA sends an ACT message to EDUU.

-TITLE **ACT**
-REFDATA
-SENDER -FAC **LKAA**
-RECVR -FAC **EDUU**
-SEQNUM **052**
-ARCID **DLH5523**
-SSRCODE **A7421**
-ADEP **ESGG**
-COORDATA
-PTID **BARIX**
-TO **1513**
-TFL **F360**
-ADES **LIRF**
-ARCTYP **A320**

15:03 EDUU sends a LAM message to LKAA and

- Identifies that the affected segment is the second one;
- Processes the received coordination data for the affected flight plan. The second segment becomes coordinated.

15:13 Flight DLH5523 is transferred to EDUU.

15:14 The system flight plan related to flight DLH5523 is terminated by the LKAA FDPS.

15:16 EDUU sends an ABI message to Padova ACC (LIPP).

-TITLE **ABI**
-REFDATA
    -SENDER -FAC **EDUU**
    -RECVR -FAC **LIPP**
    -SEQNUM **231**
-ARCID **DLH5523**
-SSRCODE **A7421**
-ADEP **ESGG**
-COORDATA
    -PTID **LIKDA**
    -TO **1536**
    -TFL **F360**
-ADES **LIRF**
-ARCTYP **A320**

15:16 LIPP sends a LAM message to EDUU and the system flight plan is updated with the ABI message content.

15:27 EDUU sends an ACT message to LIPP.

-TITLE **ACT**
-REFDATA
    -SENDER -FAC **EDUU**
    -RECVR -FAC **LIPP**
    -SEQNUM **325**
-ARCID **DLH5523**
-SSRCODE **A7421**
-ADEP **ESGG**
-COORDATA
    -PTID **LIKDA**
    -TO **1537**
    -TFL **F360**
-ADES **LIRF**
-ARCTYP **A320**

15:27 LIPP sends a LAM message to EDUU and the system flight plan is updated with the ACT message content.

15:37 Flight DLH5523 is transferred to LIMM.

15:38 An adaptable time parameter after the boundary point is overflown, EDUU FDP terminates the system flight plan for DLH5523.

7 OLDI testing and verification procedures

7.1. Background

OLDI test and validation procedures are no longer in Annex to the OLDI specification and are addressed by these OLDI Guidelines.

This section contains the requirements that are considered best practices and by no means are mandatory.

7.2. Context

The test and verification procedures for OLDI do not cover the functional and technical tests to be performed during the development of OLDI facilities from an industry point of view. These tests are normally the joint responsibility of the ANSP and the system provider and are covered by the requirements for conformity assessment. The test and verification procedures described in this section, assume that the OLDI functionality has been correctly implemented in the ATS Systems and that the manufacturer has performed the applicable conformity assessment procedure[2].

Complete functional tests cannot be performed in isolation. For the purpose of end-to-end testing (both from a technical and operational point of view) it is considered that additional test and verification procedures are required.

Because of the potential number of combinations of OLDI messages, it would be impractical for these procedures to propose an exhaustive list of detailed technical and operational tests to be conducted in different environments. The procedures detailed in this document list minimum requirements for OLDI testing and do not preclude that ANSPs complement them where deemed necessary, based on the complexity of local environment and systems.

The wide definition of OLDI message exchanges allow for a wide range of combinations of messages or options in messages. As a consequence, a structured approach for the OLDI testing including the different steps and actions to be performed is useful to ensure uniformity of results in different environments.

The following test and verification phases for OLDI have been identified:

- Identification of the need for testing;
- Definition and co-ordination of tests to be performed;
- Preparation of tests;
- Testing phase;
- Analysis of tests results;
- Reporting of results;
- Verification and approval of operational use of OLDI implementation;
- Operational implementation of the OLDI connection;
- Post implementation verification of OLDI.

[2] It is to be noted that the EASA Basic Regulation (Regulation (EU) 2018/1139) has repealed the interoperability Regulation except conformity assessment, safeguards and Community specifications for a transition period ending no later than 12th September 2023. The new EU framework for conformity assessment is being developed by EASA: https://www.easa.europa.eu/en/document-library/notices-of-proposed-amendment/npa-2023-05

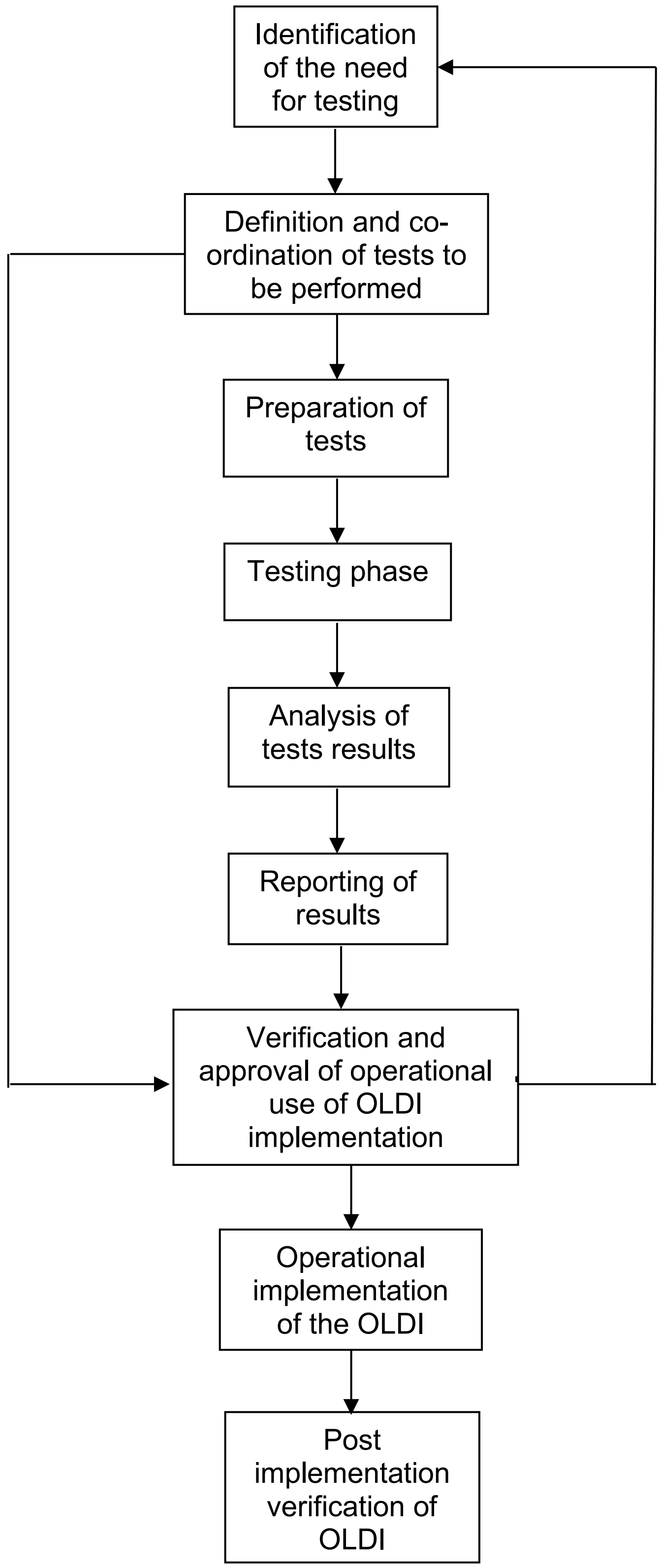


Figure 27- Schematic view of the test and verification phases

7.3. Identification of testing needs

OLDI defines the interface requirements. As a consequence, early notification of the intention to deploy or modify OLDI functionality is required. The need for testing can be identified by either of the OLDI partners. Normally the ATS Units that intend to implement or change the existing OLDI facilities will have the initiative and will start the dialogue with the adjacent ATS units. To ensure that the network effect is appropriate, testing is required for any change affecting the cross border functionality. These changes include:

- addition of new messages;
- changes of message content;
- usage of bilaterally agreed data items;
- usage of OLDI optional data items;
- changes of ATS System functionality that influence the system behaviour and the corresponding OLDI message exchanges (i.e. FPL processing that can impact on OLDI, system changes that can degrade the OLDI performance. etc.);
- changes of environment parameters (airspace structure definition, time parameters, etc.).

It is recommended that ATS Units establish agreements with all OLDI partners. These agreements will need to specify at least:

- the points of contact for discussions related to OLDI facilities including the responsible persons for each aspect (operational, technical, communications, etc.);
- the minimum period of time required for notification of intended OLDI changes.

It is recommended that in addition, each ATS Unit establishes points of contact and appropriate internal working arrangements to support and manage the OLDI related changes. This should result in a list of technical and operational staff responsible for each aspect of OLDI testing and the appointment of an OLDI lead.

It is to be noted that because of the complexity, ATS Systems require a rather long time for adaptations. Sometimes the changes required can be categorised as minor (i.e. lead time for the generation of a message). It is paramount that adjacent ATS Units are aware of the minimum required time for OLDI changes and their nature. This would enable them to have a harmonised development.

In this phase, the ATS unit initiating the change(s) has the responsibility to notify the adjacent ATS units about their intention. This notification will include:

- the OLDI facilities that will be affected (additional or changes to existing facilities);
- the reason for the change(s);
- the planned timescale for performing this(ese) change(s);
- the level of testing to be performed;

In return, the notified ATS units will need either to confirm the proposed changes or to propose counter-changes. In the case when an ATS Unit is not able to meet, the requests of an adjacent ATS unit they will need to propose an alternate course of action and justify their proposal. In this phase, the ATS units involved will need to agree on the objectives of the testing and the expected functionality, systems behaviour and roles and responsibilities.

7.4. Definition and co-ordination of tests to be performed

It should be noted that the tests will always be conducted by the two co-ordination partners. In this phase, the ATS Units involved will define and agree the actual tests to be performed. Special care should be given to level of detail of these tests. This agreement will outline at least:

- The functionality to be tested;
- The test plans including the dates and number of tests to be performed;
- The scenarios to be tested;
- The criteria for acceptance of the results (i.e. minimum number of tests, etc.);
- The acceptable results for the tests to be considered passed.

It is recommended that checklists for the OLDI messages are established in this phase. These lists should contain as a minimum checks for the following items:

- message generation;
- message transmission/reception;
- message content;
- message format;
- correct processing of received data;
- correct distribution of messages;
- correct display of operational data;
- message/data corruption;
- processing of non-standard cases (no LAM received, wrong sequence of messages);
- response times.

It is to be noted that in the OLDI context the response times need to take into account the response time up to the Controller Working Position.

In addition, the items included in the checklist should form the basis for the criteria for the acceptability of the OLDI message exchanges.

In this phase, it is expected that the ATS Units involved will pass enough information to each other to enable an efficient and objective conduct of the tests. It is clear that both partners need to fully understand each other's functionality and limitations. As a consequence, transparency and efficient exchange of information are required on both sides.

The relevant environmental data needs to be exchanged. As OLDI is heavily influenced by co-ordination points, sectors definition, lead times, etc., the environment data needs to be agreed in this phase in order to create simulated scenarios that are as close as possible to the target operational environment. It is also important to co-ordinate the traffic and environment. This reduces the need for unwanted reject messages being generated during live tests. Involvement of the operational staff is required to ensure that the scenarios are the most realistic and relevant ones for the target environment.

It is important that starting with this phase a team that includes both operational and technical people is established and involved in all the other phases of testing and verification.

Changes to time/distance parameters and Co-ordination Points for OLDI messages that are already in operations will not require the full test and verification procedure. In this case, the ATS Units might agree to move directly to the verification and approval of operational use of OLDI implementation.

For all other changes including new systems, processing rules, additional fields or new messages it is recommended that the complete test and verification procedure is applied.

7.5. Preparation of tests

This phase covers the actual development of the test platform, detailed test scenarios, establishment of appropriate communication lines and other technical and operational arrangements in order to ensure a successful conduct of the tests. In this phase, it is anticipated that the following activities will need to be performed:

- Offline test systems booked;
- Software updates developed and integration tested as required;
- System configuration file developed for external systems interface device;
- FDP system test developed, as required;
- Test simulations developed as required;
- The usage of required OLDI test tools (simulators) agreed;
- Utilisation of manual inputs (especially for SYSCO dialogue messages that requires operational reply) agreed;
- Test simulations are agreed;

If OLDI testing includes live testing with the operational platform, NM might need to be advised of testing schedule in case of any possible disruption of ATS.

Test facilities and their availability are very important. For some centres, Test Development System (TDS) are the prime facilities for live testing.

For ATS Units that do not have a Test and Development System, the live operational system might be involved in the OLDI testing. In these cases, proper attention needs to be given to the periods and extent of the testing. It is recommended that in these cases, the tests are conducted for limited periods of time during the low traffic periods in order to minimise the risk and impact on the controller workload.

Once a system has been released with the relevant adaptation and the associated configuration file has been supplied, initial tests can begin. Local functionality (manual triggering of messages, HMI behaviour, etc.) should be tested independently before the tests involving external partners. Communication lines and protocols need to be in place and tested before starting testing with partners. Whenever harmonised tools are available for independent testing (i.e. the EUROCONTROL ETIC test tool) these should be used to the extent possible before starting the testing with partners. Systems analysis recording data from these tests is then analysed and results and/or comments sent to parties concerned.

When the simulations are proven to comply with the requirements and the Flight Data Processing System (FDPS) is performing as expected live testing can be initiated.

7.6. Testing phase

During this phase, the actual live tests with the co-ordination partners are conducted. This is done in accordance with the times and the scenarios agreed in the previous phases. It is essential that engineering support is available when carrying out live testing. Experience has shown that technical problems can be overcome using their expertise, which otherwise may have meant abandoning the tests. Some stakeholders' systems include Test Development System (TDS) that can be used for OLDI testing. Where such platforms are available between peers, live tests should be conducted between the TDSs first. It is essential that during this period the system behaviour is documented. This can be done by the use of recordings, control questionnaires, etc. or a mix of these methods. This information will be required for the tests analysis.

7.7. Analysis of tests results

Following the live testing, the data collected will be analysed in this phase. The analysis will look at the technical and operational acceptability of the OLDI links. Special care needs be given to any abnormal events including errors in processing, warnings, etc.

It is recommended that during the analysis phase the ATS Units involved maintain a close cooperation. Exchange of information at this stage allows partners to identify reasons for abnormal behaviour for which the data collected locally might not be enough. It also allows the cross check of the results ensuring that the same events are treated consistently and reduces the risk of having discrepant results in the final assessments.

7.8. Reporting of results

In this phase, it is expected that each ATS unit formalises the results of the analysis conducted in the previous step. The test reports could contain at least:

- the data or the interpretation of the data obtained during the tests;
- detailed data for the abnormal events or failures;
- a summary of results;
- an overall conclusion (Passed or Failed);
- the justification for this conclusion in accordance with the criteria bilaterally agreed previously;
- a recommendation including the changes required a proposal for re-conducting the tests or the putting into operations of the OLDI link/changes.

The ATS units involved are expected to share this information in order to enable a decision on the next steps. Whenever the conclusions and recommendations differ, it is recommended that a bilateral discussion is held in order to agree on the way forward. It is recommended that the agreement between the two ATS Units is recorded and formalised.

As OLDI is an interoperability system, it is essential for the partners to communicate, share information and agree on a way forward. Although ATS Units are entitled to make their own decision based on their priorities, it is highly important that decisions regarding cross border functionality are taken in cooperation based on common understanding of each other's constraints in order to maximise the network benefit.

7.9. Verification and approval of operational use of OLDI implementations

This phase starts when both ATS units involved in an OLDI connection report that the tests were passed and the recommendation is the start of OLDI operations. In this phase, the two units will refine the parameters for the OLDI connection. Example parameters for OLDI connection can be the following:

- the list of co-ordination points;
- time/distance parameters for message generation;
- time outs;
- flight level constraints;
- list of corresponding sectors for each sector configuration.

In this phase, it is important that the operational staff (especially) of the two ATS Units are involved in the decisions as this would be the last opportunity to refine the parameters that will have an impact on the operational use and acceptability of the OLDI facilities.

During this phase, the ATS units will agree on the date for putting into operations and co-ordinate a planning for this. Proper consideration needs to be given when deciding on the planning on controller training issues, safety aspects, operational approval, etc. Formal letters of agreement (or where deemed necessary amendments to these) need to be put in place. Some of these actions might be completed in parallel with some of the previous phases. However, in this phase the ATS Units will ensure that all conditions for live operations are met.

7.10. Implementation of the OLDI connection

In this phase, the actual switch to operational use of the OLDI facilities is completed. This will be done in accordance with the previously agreed planning. Before moving to live operations, a last check of the communication infrastructure supporting OLDI message exchanges should be conducted. The start of live operations needs to be agreed by both partners. For initial operations, the ATS Units should ensure that they retain the capability to revert to the previous mode of operations in case of a failure.

7.11. Post-implementation verification of OLDI

During the first period of OLDI operations, the OLDI links need to be monitored both from a technical and operational point of view. For this, the ATS units will agree on a period for monitoring. They will establish a means for problem reporting on both technical and operational aspects. In addition, each ATS Unit needs to establish procedures for the collection and processing of the data obtained in the post implementation monitoring.

At the end of this phase, the results will be analysed. Based on this analysis the ATS Units will decide if the capability to revert to the previous mode of operations is still required.

ANNEX A - List of Abbreviations

ABI	Advance Boundary Information message
ACC	Area Control Centre
ACH	ATC flight plan change message
ACP	Accept message
ACT	Activate message
ADS-B	Automatic dependent Surveillance - Contract
ADEP	ICAO location indicator of the aerodrome of departure
ADES	The ICAO location indicator of the aerodrome of destination
ADEXP	ATS Data Exchange Presentation
AFP	ATC Flight Plan Proposal
AMA	Arrival Management message
AMAN	Arrival Manager
AoI	Area of Interest
AoR	Area of Responsibility
APL	ATC flight plan message
APP	Approach Control Unit
ASM	Airspace Management
ATC	Air Traffic Control
ATM	Air Traffic Management
ATNB1	Aeronautical Telecommunications Network Baseline 1
ATNB2	Aeronautical Telecommunications Network Baseline 2
ATS	Air Traffic Services
ATSU	Air Traffic Services Unit
B2B	Business to Business
BFD	Basic Flight Data message
CCAMS	Centralised Code Assignment and Management System
CDA	Current Data Authority
CDN	Co-ordination message
CFD	Change To Flight Data message
CFL	Cleared Flight Level
CNL	Flight Plan Cancellation
COD	SSR Code Assignment message
COF	Change Of Frequency message
COP	Co-ordination Point

CPDLC	Controller- Pilot Data Link Communications
CRP	Clearance Response message
CRQ	Clearance Request message
CTA	Control Area
CWP	Controller Working Position
ECAC	European Civil Aviation Conference
ETO	Estimated Time Over
ETOT	Estimated Take-Off Time
EUROCONTROL	European Organisation for the Safety of Air Navigation
FPL	Flight Plan Message
FO	Flight Object
FOC	Flight Operating Center
FDP	Flight Data Processing
FDPS	Flight Data Processing System
FRA	Free Route Airspace
GAT	General Air Traffic
HMI	Human Machine Interface
HOP	Hand Over Proposal message
IAF	Initial Approach Fix
ICAO	International Civil Aviation Organisation
INF	Information message
IFPS	Initial Flight Plan Processing System
LACK	Logical acknowledgement (air-ground data link)
LAM	Logical Acknowledgement message
LoA	Letter of Agreement
LOF	Log-On Forwarding message
MAC	Message for Abrogation of Co-ordination
MAS	Manual Assumption of Communication message
MFX	Metering Fix
NAN	Next Authority Notified message
NDA	Next Data Authority
NETOPS	Network Operation Team (EUROCONTROL working arrangement)
NM	Nautical Mile
NM	Network Manager
NMD	Network Manager Directorate
OCM	Oceanic Clearance message
OLDI	On-Line Data Interchange

ORCAM	Originating Region Code Assignment Method
PAC	Preliminary Activation message
PNT	Point message
R-ATSU	Receiving ATSU
RAP	Referred Activate message
RCM	Runway Configuration Message
REV	Revision message
RJC	Reject message
RLS	Release message
ROF	Request on Frequency message
RRQ	Release Request message
RRV	Referred Revision message
RTI	Request Tactical Instructions message
SBY	Stand-By message
SCO	Skip Communication message
SDM	Supplementary Data message
SFL	Supplementary Flight Level
SFPL	System Flight Plan
SID	Standard Instrumental Departure
SKC	Skip Cancellation message
SSR	Secondary Surveillance Radar
SYSCO	System Supported Co-ordination
UTA	Upper Control Area
TIM	Transfer Initiation message
TIP	Tactical Instructions Proposal message
TOM	Time Over Metering Fix
TTG	Time To Gain
TTL	Time To Loose
TWR	Aerodrome Control Tower
XAP	Crossing Alternate Proposal message
XCM	Crossing Cancellation message
XFL	Exit Flight Level
XIN	Crossing Intention Notification message

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ANNEX B - Document Update Procedures

It is necessary to periodically check this EUROCONTROL Guidelines document for consistency with referenced material, notably the forthcoming editions of the OLDI Specification. The Guidance material is also expected to evolve following real project and field experience.

The main objectives of a regular review are:

a) to improve the quality of the requirements (e.g. clarity, testability, etc.);
b) to verify that the level of detail published is adequate;
c) to make all stakeholders including industry aware of the latest developments.

The update of OLDI guidance material can be initiated by the OLDI group or NETOPS as working arrangement to whom the OLDI group reports. Stakeholders are advised to provide a change request (CR) through the OLDI Group or NETOPS. However, any stakeholder that wishes to request a change to these guidelines can submit a change request (CR) to the document editor (page ii), the generic email address: standardisation@eurocontrol.int or the OLDI group / NETOPS working arrangements.

The CR needs to provide following minimum elements:

- Originator information (name, Organisation, contact details)
- Specification title, number and edition date
- Page, chapter, section (subsection) where the issue appears
- Description of the issue and reason for change
- Specific change proposal text (incl. potential alternatives, if any).

Main steps towards a revised edition:

- OLDI group will assess each CR.
- OLDI group will classify the urgency and establish the CR impact category (major, minor or editorial).
- OLDI group and EUROCONTROL/NM will then prepare resolution proposal(s) and, if needed, discuss those with the originator.
- Agreed changes will be integrated into a revised edition “Proposed Issue” including a summarised list of changes.
- All changes need consultation at NETOPS level.

Note: Identified errors which may cause potential problems when implementing, may be corrected directly via separate “Corrigendum”.

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