Innovation and Networks Executive Agency

Department C - Connecting Europe Facility (CEF)

SPECIFIC AGREEMENT No INEA/CEF/TRAN/M2017/1602559 UNDER FRAMEWORK PARTNERSHIP AGREEMENT No MOVE/E2-2014-717/SESAR FPA

This Specific grant agreement (hereinafter referred to as "the Specific Agreement") is concluded between:

The **Innovation and Networks Executive Agency (INEA)** ("the Agency"), under the powers delegated by the European Commission ("the Commission"), represented for the purposes of signature of this Specific Agreement by the Director of the Agency, Dirk Beckers,

on the one part,

and

1. **SESAR Deployment Alliance Association Internationale Sans But Lucratif (AISBL) (SDA)**
ASSOCIATION INTERNATIONALE SANS BUT LUCRATIF
Registration No BE0678.766.507
Avenue De Cortenbergh 100
1000 Brussels
Belgium
VAT No BE0678.766.507,

hereinafter referred to as "the coordinator", represented for the purpose of signature of this Specific Agreement by General Manager, Nicolas Warinsko, by virtue of the mandates included in Annex IV of the Framework Partnership Agreement, as last amended

and the following other implementing partners:

2. Aéroports de la Côte d'Azur (Côte d'Azur) - established in France
3. Aéroports de Paris (ADP) - established in France
4. Aeroporti di Roma S.p.A. (ADR) - established in Italy
5. Airtel ATN Limited (Airtel) - established in Ireland
6. ALTYS Technologies S.A.S. (ALTYS) - established in France

7. Air Navigation Services Finland Oy (ANS Finland) - established in Finland
8. Arinc incorporated (Arinc) - established in United States
9. Österreichische Gesellschaft für Zivilluftfahrt mit beschränkter Haftung, limited liability company (Austro Control) - established in Austria
10. BELGOCONTROL (Belgocontrol) - established in Belgium
11. Boeing Research & Technology Europe S.L.U (BR&TE) - established in Spain
12. Brussels Airport Company NV/SA (BAC) - established in Belgium
13. State Enterprise "Air Traffic Services Authority" (BULATSA) - established in Bulgaria
14. Croatia Control Ltd (Croatia Control) - established in Croatia
15. Deutsche Lufthansa Aktiengesellschaft (Lufthansa) - established in Germany
16. DFS Deutsche Flugsicherung GmbH (DFS) - established in Germany
17. The French State -Ministère de la Transition écologique et solidaire, DGAC (Direction générale de l'aviation civile), DSNA (Direction des services de la navigation aérienne) (DSNA) - established in France
18. ENTIDAD PÚBLICA EMPRESARIAL ENAIRE (ENAIRE) - established in Spain
19. ENAV S.p.A. (ENAV) - established in Italy
20. European Satellite Services Provider (ESSP) - established in France
21. European Organisation For The Safety Of Air Navigation (EUROCONTROL) - established in Belgium
22. FABCE, letalske storitve, d.o.o. (FABCE, Aviation Services, Ltd.) (FABCE) - established in Slovenia
23. Flughafen Düsseldorf GmbH (FDG) - established in Germany
24. Flughafen München GmbH (FMG) - established in Germany
25. Fraport AG - Frankfurt Airport Services Worldwide (Fraport) - established in Germany
26. French Ministry of the Armies/Direction General de l'Armement (DGA) - established in France
27. Hellenic Civil Aviation Authority (HCAA) - established in Greece
28. HungaroControl Air Navigation Services Pte Ltd Co. (HungaroControl) - established in Hungary
29. INMARSAT NAVIGATION VENTURES LIMITED (Inmarsat) - established in United Kingdom
30. Irish Aviation Authority, limited liability company (IAA) - established in Ireland
31. Italian Air Force (MoD) (MoD Italy) - established in Italy
32. Københavns Lufthavne A/S (CPH) - established in Denmark
33. LEONARDO - SOCIETA' PER AZIONI (Leonardo) - established in Italy
34. Luftfartsverket, a state enterprise (LFV) - established in Sweden
35. Letové Prevádzkové Služby SR, Štátny Podnik - LPS SR, š. p. (LPS) - established in Slovakia
36. Luchtverkeersleiding Nederland (Air Traffic Control The Netherlands) (LVNL) - established in Netherlands
37. Manchester Airport PLC (MAN) - established in United Kingdom
38. Météo-France (Météo FR) - established in France
39. Navegação Aérea de Portugal – NAV Portugal, E.P.E. (NAV Portugal) - established in Portugal
40. Naviair, a state owned company (NAVIAIR) - established in Denmark
41. Polish Air Navigation Services Agency (PANSA) - established in Poland
42. PORTUGÁLIA – COMPANHIA PORTUGUESA DE TRANSPORTES AÉREOS S.A. (PORTUGÁLIA) - established in Portugal
43. Romanian Air Traffic Services Administration (ROMATSA) - established in Romania

44. Ryanair DAC (Ryanair) - established in Ireland
45. Sabre Austria GmbH (Sabre) - established in Austria
46. Società per Azioni Esercizi Aeroportuali - SEA (S.E.A.) - established in Italy
47. SITA Information Networking Computing BV (SITA) - established in Netherlands
48. Slovenia Control, Slovenian Air Navigation Services, Limited (SCL (KZPS)) - established in Slovenia
49. Serbia and Montenegro Air Traffic Services Llc. (SMATSA) - established in Serbia
50. Société Air France (Air France) - established in France
51. SPANISH AIR FORCE (ES AF) - established in Spain
52. STAL - Stansted Airport Limited (STAL) - established in United Kingdom
53. State Enterprise "Oro navigacija" (ORO NAVIGACIJA) - established in Lithuania
54. Swedavia AB (Swedavia) - established in Sweden
55. Thales LAS France SAS (Thales) - established in France
56. DAA PLC (DAA PLC) - established in Ireland
57. Flughafen Wien Aktiengesellschaft (VIE) - established in Austria
58. Paris Lodron Universität Salzburg (PLUS) - established in Austria
59. NATS (En Route) plc (NATS) - established in United Kingdom
60. British Airways plc (British Airways) - established in United Kingdom
61. easyJet Airline Company Limited (easyJet) - established in United Kingdom
62. Sesar Related Deployment Airport Operators Grouping, EEIG (SDAG) - established in Belgium

duly represented by the coordinator by virtue of the mandates included in Annex IX of the Framework Partnership Agreement,

on the other part,

The following annexes form an integral part of the Specific Agreement:

Annex I Description of the action
Annex II Estimated budget of the action

ARTICLE 1 – SUBJECT MATTER OF THE AGREEMENT

The Specific Agreement is concluded in the context of the partnership established between the parties. It is drawn up in accordance with the relevant terms of framework partnership agreement No **MOVE/E2-2014-717/SESAR FPA** signed between the Commission and the partners (coordinating as well as implementing partners) on the 5th of December 2014, as last amended (hereinafter referred to as "the Framework Agreement").

The Commission has decided to award a grant ("specific grant for an action"), under the terms and conditions set out in the Specific Agreement and the Framework Agreement, for the action entitled "**SESAR Deployment Programme Implementation - 2017**" ("the action"), action number **2017-EU-TM-0076-M** as described in Annex I.

With the signature of the Specific Agreement, the partners accept the grant and agree to implement the action in accordance with the terms and conditions of the Specific Agreement and the Framework Agreement, acting on their own responsibility.

ARTICLE 2 – ENTRY INTO FORCE OF THE AGREEMENT AND DURATION OF THE ACTION

2.1 The Specific Agreement shall enter into force on the date on which the last party signs.

2.2 The action shall run from 12/04/2018 ("the starting date") until 31/12/2023 ("the completion date").

ARTICLE 3 - MAXIMUM AMOUNT AND FORM OF THE GRANT

The grant for the action shall be of a **maximum amount of EUR 228,353,574.30.**

The grant shall take the form of:

(a) the reimbursement of the eligible costs of the action ("reimbursement of eligible costs"), which are estimated at EUR 458,039,313 according to the following conditions:

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(a1) Reimbursement of 20% of the eligible costs for the direct costs of the following activities: Activity 8, which are
  (i) actually incurred ("reimbursement of actual costs")
  (ii) reimbursement of unit costs: not applicable
  (iii) reimbursement of lump sum costs: not applicable
  (iv) reimbursement of flat-rate costs: not applicable
  (v) declared on the basis of an amount per unit calculated in accordance with the beneficiary's usual cost accounting practices ("reimbursement of costs declared on the basis of the beneficiary's usual cost accounting practices") for personnel costs

(a2) Reimbursement of 50% of the eligible costs for the direct costs of the following

activities: Activity 1, Activity 2, Activity 3, Activity 4, Activity 5, Activity 6, Activity 7, which are

(i) actually incurred ("reimbursement of actual costs")
(ii) reimbursement of unit costs: not applicable
(iii) reimbursement of lump sum costs: not applicable
(iv) reimbursement of flat-rate costs: not applicable
(v) declared on the basis of an amount per unit calculated in accordance with the beneficiary's usual cost accounting practices ("reimbursement of costs declared on the basis of the beneficiary's usual cost accounting practices") for personnel costs

(b) unit contribution: not applicable

(c) lump sum contribution: not applicable

(d) flat-rate contribution: not applicable

ARTICLE 4 – ADDITIONAL PROVISIONS ON REPORTING, PAYMENTS AND PAYMENT ARRANGEMENTS

4.1 Reporting periods and payments

In addition to the provisions set out in Articles II.23 and II.24 of the Framework Agreement, the following reporting and payment arrangements shall apply:

4.1.1 Reporting periods

The action is divided into the following reporting periods:
- Reporting period 1 from the starting date of the action to 31 December 2018;
- Reporting period 2 from 1 January 2019 to 31 December 2019;
- Reporting period 3 from 1 January 2020 to 31 December 2020;
- Reporting period 4 from 1 January 2021 to 31 December 2021;
- Reporting period 5 from 1 January 2022 to 31 December 2022;
- Last reporting period from 1 January 2023 to the completion date of the action.

4.1.2 Payments

Upon entry into force of the Specific Agreement, the Agency shall make a first pre-financing payment equivalent to 40% of the amount of the first annual instalment of the maximum CEF contribution as indicated in Annex II of the Specific Agreement to the coordinator in accordance with Article II.24.1, subject to the receipt of a guarantee of an amount equal to the first pre-financing payment to be made.

At the end of each reporting period, except the last reporting period, the coordinator may submit a request for further pre-financing payment in accordance with Article II.23.1b of the Framework Agreement. The further pre-financing payment shall be calculated on the basis of 40% of the cumulated financing needs and in accordance with Article II.24.2b of the Framework Agreement. The Agency shall make the further pre-financing payment to the coordinator in accordance with Article II.24.2b of the Framework Agreement, subject to the

receipt of a further guarantee of an amount equal to the further pre-financing payment to be made.

At the end of at least every two reporting periods, the coordinator shall submit a request for interim payment in accordance with Article II.23.2b of the Framework Agreement. The Agency shall make an interim payment to the coordinator in accordance with Article II.24.3 of the Framework Agreement.

At the end of the last reporting period, the coordinator shall submit the request for payment of the balance in accordance with Article II.23.2c of the Framework Agreement. The Agency shall make the payment of the balance to the coordinator in accordance with Article II.24.4 of the Framework Agreement.

4.1.3 Ceiling for pre-financing and interim payments

The total amount of pre-financing and interim payments shall not exceed 80% of the maximum grant amount set out in Article 3.

4.2 Time limit for payments

The time limit for the Agency to make the interim payment(s) and payment of the balance is 90 days.

4.3 Language and submission means of requests for payment, reports and financial statements

All requests for payments, reports and financial statements shall be submitted in English.

The Action Status Report referred to in Article II.23.1b of the Framework Agreement shall be submitted via TEN-Tec.

Other documents or, if applicable, scanned copies of the original signed paper versions and electronic files, shall be sent via e-mail to the address of the Agency specified in Article I.3.2 of the Framework Agreement.

ARTICLE 5 – BANK ACCOUNT FOR PAYMENTS

All payments shall be made to the coordinator's bank account as indicated below:

Name of bank: ING Belgium NV/SA
Address of branch: Bruxelles Schuman. Rond-Point R. Schuman 8, 1040 Bruxelles, Belgium
Precise denomination of the account holder: SESAR Deployment Alliance AISBL
Full account number (including bank codes): BE21 3631 6904 7903
BIC: BBRUBEBB

ARTICLE 6 – ENTITIES AFFILIATED TO THE BENEFICIARIES

For the purpose of this Specific Agreement, the following entities are considered as affiliated entities:

- Lufthansa Systems Poland Sp. z o.o, affiliated to Deutsche Lufthansa Aktiengesellschaft;
- Germanwings GmbH, affiliated to Deutsche Lufthansa Aktiengesellschaft;
- AIR DOLOMITI S.p.A. Linee Aeree Regionali Europee, affiliated to Deutsche Lufthansa Aktiengesellschaft;
- Austrian Airlines AG, affiliated to Deutsche Lufthansa Aktiengesellschaft;
- Lufthansa Cargo AG, affiliated to Deutsche Lufthansa Aktiengesellschaft;
- Lufthansa Systems GmbH & Co. KG, affiliated to Deutsche Lufthansa Aktiengesellschaft;
- Lufthansa CityLine GmbH, affiliated to Deutsche Lufthansa Aktiengesellschaft;
- Swiss International Airlines AG, affiliated to Deutsche Lufthansa Aktiengesellschaft;
- Eurowings GmbH, affiliated to Deutsche Lufthansa Aktiengesellschaft;
- Eurowings Europe GmbH, affiliated to Deutsche Lufthansa Aktiengesellschaft;
- Sabre France SARL, affiliated to Sabre Austria GmbH;
- Sabre Polska Sp. Z.o.o., affiliated to Sabre Austria GmbH;
- Sabre Airline Solutions GmbH, affiliated to Sabre Austria GmbH;
- SITA OnAir SARL (Switzerland), affiliated to SITA Information Networking Computing BV;
- SITA IT Services France (France), affiliated to SITA Information Networking Computing BV;
- SITA INC BV Canada Branch, affiliated to SITA Information Networking Computing BV;
- Transavia France, affiliated to Société Air France;
- ACI Europe, affiliated to Sesar Related Deployment Airport Operators Grouping, EEIG (SDAG).

ARTICLE 7 - IMPLEMENTING BODIES DESIGNATED BY THE BENEFICIARIES

Not applicable.

ARTICLE 8 – ADDITIONAL PROVISIONS ON REIMBURSEMENT OF COSTS DECLARED ON THE BASIS OF THE BENEFICIARY'S USUAL COST ACCOUNTING PRACTICES

In addition to the conditions set out in Article II.20.5 of the Framework Agreement, where, in accordance with point (v) of Articles 3(a1) and 3(a2), the grant takes the form of the reimbursement of unit costs, lump sum costs or flat-rate costs declared by the partner on the basis of its usual cost accounting practices, the partner shall ensure that the cost accounting practices used are also in compliance with the conditions laid down in Commission Decision C(2016)478 of 3 February 2016.

ARTICLE 9 – ADDITIONAL PROVISIONS ON USE OF THE RESULTS (INCLUDING INTELLECTUAL AND INDUSTRIAL PROPERTY RIGHTS)

In addition to the provisions of Article II.8.3 of the Framework Agreement, the partners shall warrant that the Agency has the rights to:

- summarise the results of the action and distribute the summary;
- extract a part (e.g. audio or video files) of, divide into parts or compile the results of the action.

ARTICLE 10 - INAPPLICABILITY OF THE NO-PROFIT PRINCIPLE

Not applicable.

ARTICLE 11 - INELIGIBILITY OF VALUE ADDED TAX

By way of derogation from Article II.19.2 (h) of the Framework Agreement, amounts of value added tax (VAT) paid are not eligible under the Specific Agreement for the following partners: Air Navigation Services Finland Oy, Österreichische Gesellschaft für Zivilluftfahrt mit beschränkter Haftung, limited liability company, BELGOCONTROL, Croatia Control Ltd, DFS Deutsche Flugsicherung GmbH, The French State -Ministère de la Transition écologique et solidaire, DGAC (Direction générale de l'aviation civile), DSNA (Direction des services de la navigation aérienne), ENTIDAD PÚBLICA EMPRESARIAL ENAIRE, ENAV S.p.A., European Organisation For The Safety Of Air Navigation, French Ministry of the Armies/Direction General de l'Armement, Hellenic Civil Aviation Authority, HungaroControl Air Navigation Services Pte Ltd Co., Irish Aviation Authority, limited liability company, Italian Air Force (MoD), Luftfartsverket, a state enterprise, Luchtverkeersleiding Nederland (Air Traffic Control The Netherlands), Navegação Aérea de Portugal – NAV Portugal, E.P.E., Polish Air Navigation Services Agency, Romanian Air Traffic Services Administration, Slovenia Control, Slovenian Air Navigation Services, Limited, Serbia and Montenegro Air Traffic Services Llc., SPANISH AIR FORCE, State Enterprise "Oro navigacija", Swedavia AB, Paris Lodron Universität Salzburg, State Enterprise "Air Traffic Services Authority", FABCE, letalske storitve, d.o.o. (FABCE, Aviation Services, Ltd.), Météo-France, Naviair, a state owned company and DAA PLC.

ARTICLE 12 - SPECIAL PROVISIONS ON ELIGIBLE COSTS

Not applicable.

ARTICLE 13 – WAIVING OF THE OBLIGATION TO PROVIDE CERTIFICATES ON THE FINANCIAL STATEMENTS

Not applicable.

ARTICLE 14 - FINANCIAL SUPPORT TO THIRD PARTIES

Article II.11 of the Framework Agreement is not applicable.

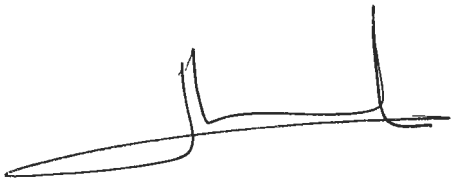
ARTICLE 15 — IMPLEMENTATION OF ACTION TASKS BY BENEFICIARIES NOT RECEIVING EU FUNDING

Not applicable.

SIGNATURES

For the coordinator For the Agency

Nicolas Warinsko



Done at Brussels, on

18/12/18

p.o. Dirk Beckers

Done at Brussels, on

19/12/2018

In duplicate in English

ANNEX I

DESCRIPTION OF THE ACTION

ARTICLE I.1 – IMPLEMENTATION OF THE TEN-T NETWORK

The action contributes to the implementation of:
- the core network
  - Horizontal priority: Single European Sky – SESAR system.

ARTICLE I.2 – LOCATION OF THE ACTION

I.2.1 Member State(s): Austria, Belgium, Bulgaria, Croatia, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Lithuania, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom

I.2.2 Region(s) (using the NUTS2 nomenclature): Burgenland (AT) (AT11), Kärnten (AT21), Niederösterreich (AT12), Oberösterreich (AT31), Salzburg (AT32), Steiermark (AT22), Tirol (AT33), Vorarlberg (AT34), Wien (AT13), Prov. Antwerpen (BE21), Prov. Brabant Wallon (BE31), Prov. Hainaut (BE32), Prov. Limburg (BE) (BE22), Prov. Liège (BE33), Prov. Luxembourg (BE) (BE34), Prov. Namur (BE35), Prov. Oost-Vlaanderen (BE23), Prov. Vlaams-Brabant (BE24), Prov. West-Vlaanderen (BE25), Région de Bruxelles-Capitale / Brussels Hoofdstedelijk Gewest (BE10), Jadranska Hrvatska (HR03), Kontinentalna Hrvatska (HR04), Hovedstaden (DK01), Midtjylland (DK04), Nordjylland (DK05), Sjælland (DK02), Syddanmark (DK03), Etelä-Suomi (FI1C), Helsinki-Uusimaa (FI1B), Länsi-Suomi (FI19), Pohjois- ja Itä-Suomi (FI1D), Åland (FI20), Bedfordshire and Hertfordshire (UKH2), Berkshire, Buckinghamshire and Oxfordshire (UKJ1), Cheshire (UKD6), Cornwall and Isles of Scilly (UKK3), Cumbria (UKD1), Derbyshire and Nottinghamshire (UKF1), Devon (UKK4), Dorset and Somerset (UKK2), East Anglia (UKH1), East Wales (UKL2), East Yorkshire and Northern Lincolnshire (UKE1), Eastern Scotland (UKM2), Essex (UKH3), Gloucestershire, Wiltshire and Bristol/Bath area (UKK1), Greater Manchester (UKD3), Hampshire and Isle of Wight (UKJ3), Herefordshire, Worcestershire and Warwickshire (UKG1), Highlands and Islands (UKM6), Inner London (UKI1), Inner London - East (UKI4), Inner London - West (UKI3), Kent (UKJ4), Lancashire (UKD4), Leicestershire, Rutland and Northamptonshire (UKF2), Lincolnshire (UKF3), Merseyside (UKD7), North Eastern Scotland (UKM5), North Yorkshire (UKE2), Northern Ireland (UKN0), Northumberland and Tyne and Wear (UKC2), Outer London (UKI2), Outer London - East and North East (UKI5), Outer London - South (UKI6), Outer London - West and North West (UKI7), Shropshire and Staffordshire (UKG2), South Western Scotland (UKM3), South Yorkshire (UKE3), Surrey, East and West Sussex (UKJ2), Tees Valley and Durham (UKC1), West Midlands (UKG3), West Wales and The Valleys (UKL1), West Yorkshire (UKE4), Andalucía (ES61), Aragón (ES24), Canarias (ES70), Cantabria (ES13), Castilla y León (ES41), Castilla-La Mancha (ES42), Cataluña (ES51), Ciudad Autónoma de Ceuta (ES63), Ciudad Autónoma de Melilla (ES64), Comunidad Foral de Navarra (ES22), Comunidad

Valenciana (ES52), Comunidad de Madrid (ES30), Extremadura (ES43), Galicia (ES11), Illes Balears (ES53), La Rioja (ES23), País Vasco (ES21), Principado de Asturias (ES12), Región de Murcia (ES62), Bratislavský kraj (SK01), Stredné Slovensko (SK03), Východné Slovensko (SK04), Západné Slovensko (SK02), Dél-Alföld (HU33), Dél-Dunántúl (HU23), Közép-Dunántúl (HU21), Közép-Magyarország (HU10), Nyugat-Dunántúl (HU22), Észak-Alföld (HU32), Észak-Magyarország (HU31), Abruzzo (ITF1), Basilicata (ITF5), Calabria (ITF6), Campania (ITF3), Emilia-Romagna (ITH5), Friuli-Venezia Giulia (ITH4), Lazio (ITI4), Liguria (ITC3), Lombardia (ITC4), Marche (ITI3), Molise (ITF2), Piemonte (ITC1), Provincia Autonoma di Bolzano/Bozen (ITH1), Provincia Autonoma di Trento (ITH2), Puglia (ITF4), Sardegna (ITG2), Sicilia (ITG1), Toscana (ITI1), Umbria (ITI2), Valle d'Aosta/Vallée d'Aoste (ITC2), Veneto (ITH3), Mellersta Norrland (SE32), Norra Mellansverige (SE31), Småland med öarna (SE21), Stockholm (SE11), Sydsverige (SE22), Västsverige (SE23), Östra Mellansverige (SE12), Övre Norrland (SE33), Border, Midland and Western (IE01), Southern and Eastern (IE02), Severen tsentralen (BG32), Severoiztochen (BG33), Severozapaden (BG31), Yugoiztochen (BG34), Yugozapaden (BG41), Yuzhen tsentralen (BG42), Arnsberg (DEA5), Berlin (DE30), Brandenburg (DE40), Braunschweig (DE91), Bremen (DE50), Chemnitz (DED4), Darmstadt (DE71), Detmold (DEA4), Dresden (DED2), Düsseldorf (DEA1), Freiburg (DE13), Gießen (DE72), Hamburg (DE60), Hannover (DE92), Karlsruhe (DE12), Kassel (DE73), Koblenz (DEB1), Köln (DEA2), Leipzig (DED5), Lüneburg (DE93), Mecklenburg-Vorpommern (DE80), Mittelfranken (DE25), Münster (DEA3), Niederbayern (DE22), Oberbayern (DE21), Oberfranken (DE24), Oberpfalz (DE23), Rheinhessen-Pfalz (DEB3), Saarland (DEC0), Sachsen-Anhalt (DEE0), Schleswig-Holstein (DEF0), Schwaben (DE27), Stuttgart (DE11), Thüringen (DEG0), Trier (DEB2), Tübingen (DE14), Unterfranken (DE26), Weser-Ems (DE94), Vzhodna Slovenija (SI03), Zahodna Slovenija (SI04), Alentejo (PT18), Algarve (PT15), Centro (PT) (PT16), Lisboa (PT17), Norte (PT11), Região Autónoma da Madeira (PT30), Região Autónoma dos Açores (PT20), Bucuresti - Ilfov (RO32), Centru (RO12), Nord-Est (RO21), Nord-Vest (RO11), Sud - Muntenia (RO31), Sud-Est (RO22), Sud-Vest Oltenia (RO41), Vest (RO42), Drenthe (NL13), Flevoland (NL23), Friesland (NL) (NL12), Gelderland (NL22), Groningen (NL11), Limburg (NL) (NL42), Noord-Brabant (NL41), Noord-Holland (NL32), Overijssel (NL21), Utrecht (NL31), Zeeland (NL34), Zuid-Holland (NL33), Dolnoslaskie (PL51), Kujawsko-Pomorskie (PL61), Lubelskie (PL31), Lubuskie (PL43), Lódzkie (PL11), Malopolskie (PL21), Mazowieckie (PL12), Opolskie (PL52), Podkarpackie (PL32), Podlaskie (PL34), Pomorskie (PL63), Slaskie (PL22), Swietokrzyskie (PL33), Warminsko-Mazurskie (PL62), Wielkopolskie (PL41), Zachodniopomorskie (PL42), Lietuva (LT00), Anatoliki Makedonia, Thraki (EL51), Attiki (EL30), Dytiki Ellada (EL63), Dytiki Makedonia (EL53), Ionia Nisia (EL62), Ipeiros (EL54), Kentriki Makedonia (EL52), Kriti (EL43), Notio Aigaio (EL42), Peloponnisos (EL65), Sterea Ellada (EL64), Thessalia (EL61), Voreio Aigaio (EL41), Alsace (FR42), Aquitaine (FR61), Auvergne (FR72), Basse-Normandie (FR25), Bourgogne (FR26), Bretagne (FR52), Centre (FR24), Champagne-Ardenne (FR21), Corse (FR83), Franche-Comté (FR43), Guadeloupe (FRA1), Guyane (FRA3), Haute-Normandie (FR23), Languedoc-Roussillon (FR81), Limousin (FR63), Lorraine (FR41), Martinique (FRA2), Midi-Pyrénées (FR62), Nord - Pas-de-Calais

(FR30), Pays de la Loire (FR51), Picardie (FR22), Poitou-Charentes (FR53), Provence-Alpes-Côte d'Azur (FR82), Rhône-Alpes (FR71), La Réunion (FRA4), Île de France (FR10)

I.2.3 Third country(ies): Serbia

ARTICLE I.3 – SCOPE AND OBJECTIVES OF THE ACTION

The European Air Traffic Management (ATM) system currently handles around 26,000 flights daily, which can get to 33,000 flights on busy days. The 2020 forecast shall increase to 17 million flights yearly and 50,000 flights on busy days. At the same time, European ATM costs increase by an additional €2-3 billion every year, compared to other similar systems in the world. The challenge for the European airspace is thus to accommodate the increasing air traffic flows and at the same time to cut costs and improve its performance.

In order to meet this need, the European Commission launched in 1999 the Single European Sky initiative, which places at its heart the SESAR (Single European Sky ATM Research) Programme. Representing the technological pillar aimed at implementing a new ATM infrastructure in Europe able to meet capacity needs, enhance safety and interoperability, and reduce environmental impact to meet traffic, SESAR entered the final deployment phase in 2014. The required new generation of ATM technological systems and components must be produced and implemented by the European ATM stakeholders, through their progressive injection in the stakeholders' investments planning.

In order to effectively contribute to achieving the SES performance objectives and the overall economic benefits expected from ATM modernisation, SESAR implementation must be managed in a timely, synchronised and coordinated way.
To meet this objective, the Commission adopted the Implementing Regulation (EU) No 409/2013 which defines two instruments to support SESAR deployment: centralised Deployment governance, and the Common Projects.

The Deployment governance was established on 5th December 2014 with the signature of the SESAR Framework Partnership Agreement between European Commission (EC) and the SESAR Deployment Alliance (SDA), appointed as the SESAR Deployment Manager (SDM); furthermore, the Deployment Programme (DP) was published concurrently and maintained every year.

This Action contributes to the Pilot Common Project (PCP, established by the Commission Implementing Regulation (EU) no. 716/2014) and combines coherent technological improvements aiming to enhance the performance of the European ATM system in the medium term in EU Member States.

The Action is a multi-stakeholder application composed of 62 beneficiaries, which addresses the implementation of an integrated set of 49 Implementation Projects (IPs) covering all Pilot Common Project 6 ATM functionalities (AFs).

The Action will significantly contribute to the implementation of the PCP, addressing the deployment gaps and covering 23 families of the SESAR Deployment Programme. Particular focus is given to the 11 Priority Families identified in the Call text and to IPs aiming to implement datalink capability in support to AF6.

The Action groups 49 IPs in 8 activities, supported by 1 coordination activity, which will ensure timely and synchronised support to the IP Leaders in the realisation of their projects:

Activity 1: Action Coordination;
Activity 2: 4 IPs covering AF1-50% co-funding rate;
Activity 3: 5 IPs covering AF2-50% co-funding rate;
Activity 4: 10 IPs covering AF3-50% co-funding rate;
Activity 5: 6 IPs covering AF4-50% co-funding rate;
Activity 6: 19 IPs covering AF5-50% co-funding rate;
Activity 7: 3 IPs covering AF6-50% co-funding rate;
Activity 8: 2 IPs covering AF6-20% co-funding rate.

Moreover, 22 IPs are multi-stakeholders where a combination of beneficiaries is committed together for the realisation of a common implementation objective.

Activities supported by this specific agreement shall not include any activity or task supported under Programme Support Actions foreseen in Article I.1.1.3 of the Framework Partnership Agreement. Otherwise, they may not be considered as eligible under this specific agreement.

ARTICLE I.4 – ACTIVITIES

I.4.1 Activities timetable

Activity number	Activity title	Indicative start date	Indicative end date	Milestone number
1	Framework Partnership Agreement (FPA) Action Coordination	12/04/2018	31/12/2023	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11
2	AF1 Implementation (50% co-funded)	12/04/2018	31/12/2023	12, 13, 14, 15
3	AF2 Implementation (50% co-funded)	12/04/2018	31/12/2023	16, 17, 18, 19
4	AF3 Implementation (50% co-funded)	12/04/2018	31/12/2023	20, 21, 22, 23
5	AF4 Implementation (50% co-funded)	12/04/2018	31/12/2023	24, 25, 26, 27
6	AF5 Implementation (50% co-funded)	12/04/2018	31/12/2023	28, 29, 30, 31
7	AF6 Implementation (50% co-funded)	12/04/2018	31/12/2023	32, 33, 34, 35
8	AF6 Implementation (20% co-funded)	12/04/2018	31/12/2023	36, 37, 38, 39

I.4.2 Activities description

Activity 1: Framework Partnership Agreement (FPA) Action Coordination

Leader: SESAR Deployment Alliance
Start Date: 12/04/2018
End Date: 31/12/2023

The activity aims at ensuring the efficient and effective coordination of the Action to be conducted in accordance with the relevant provisions (as set out in both SESAR FPA and SGA model with reference to the FPA and Action coordinator) in order to:

- Deliver project objectives within time, resource and budget constraints;
- Align Action execution with the European strategy, CEF priorities and SESAR DM mission (according to PCP, DP and ATM Master Plan);
- Identify and mitigate any risk for the Action execution and monitor impact of the mitigations;
- Identify innovative solutions and approaches, based on industry best practices and experiences sharing among the different partners;
- Lead efficiently multi-stakeholder and multinational teams.

In line with the above, the Activity 1 will perform all tasks associated with the five main processes to be governed by the Action coordinator and which are described in the following paragraphs:

- Sub - Activity 1.1 – Action Coordination
- Sub - Activity 1.2 – Action monitoring and reporting
- Sub - Activity 1.3 – Financial management: payments, checks and audits
- Sub - Activity 1.4 – Action Information management
- Sub - Activity 1.5 – Communication management for stakeholder support

In order to deliver the above-mentioned objectives, the SDM will count also on external support which has been selected through a competitive call for tender process. SDM will perform such activities in full alignment with the CEF Programme management requirements and FPA provisions.

External support will aim at supporting, integrating and contributing to all the activities that the coordinator will carry out within the current Action under the coordinator's leadership and instructions, with the aim of:

- Ensuring the progress of the Action within the planned and expected timing, costs and quality standards expected;
- Ensuring the total alignment of the activities envisaged within the Action with the scope and objectives pursued by PCP.

The coordinator will also deliver the support services in terms of efficient, effective and timely back- office services and support, in order to deliver its commitments under the FPA Coordination. All the tasks reported hereunder are specific for this Action[1] and shall not overlap with the tasks performed under the Programme and Support Actions (PSA) SGAs.

Sub - Activity 1.1: Action Coordination

The coordinator will be in charge of ensuring that Action pursues the expected objectives, in particular addressing:

- Maintenance of the Work Breakdown Structure (WBS) and Organisational Breakdown Structure (OBS) of the Action;
- Planning of the activities (Gantt) in line with the Multi Annual Work Programme and DP evolution.

In order to achieve the above-mentioned objectives, the Action coordination will be performed by the coordinator through a coordination team composed of one leader per each activity, among the coordinator's staff. To secure efficiency and keep the coordination team down to a manageable size, the activities related to the same ATM Functionality (AF) will have the same leader.

Activity leaders will be in charge of addressing the two major objectives at activity level (Maintenance of the Work Breakdown structure (WBS) and Planning of the activities).

In particular, the Activity leaders will also ensure that all processes needed for the overall implementation of the Action are conducted in line with the coordinator's indications.

[1] Except CBA/Performance analysis, which is performed on the basis of the threads of the IPs

Deliverables:

1.1.1 Launch of the Action - Kick-Off Meeting Minutes (31/12/2018)
1.1.2 Action WBS and OBS - 31/03/2023 (yearly updating from 2019)
1.1.3 Action GANTT - 31/03/2023 (yearly updating from 2019)
1.1.4 Guidelines for Action Execution - 31/01/2019

Sub - Activity 1.2: Action monitoring and reporting

The Action coordinator will monitor the Action execution in order to ensure its implementation in accordance with the Framework Partnership Agreement and the Specific Grant Agreement, including relevant Annexes, through:

- Continuous monitoring: identifying and managing discrepancies, risks and issues, as well as the mitigation actions to ensure that the Action implementation is synchronised among partners and performance driven;
- Periodic monitoring and reporting at specific monitoring gates (two times per year):
  - Action Synchronisation and Execution: gathering the necessary Action - related information on the overall synchronisation of the Deployment Programme;
  - Performance monitoring - CBA/Performance analysis: gathering the necessary information to perform the CBA/Performance analysis of the deployed projects.
- Contractual Reporting: gathering technical and financial information to ensure the provision to INEA of the contractual documents (ASR and Final Report);
- Quality Management: quality management process encompassing three different elements (Quality Planning; Quality Assurance and Quality Control).

Continuous monitoring:

The coordinator will ensure the continuous monitoring of the Action through "continuous interactions" with Implementing Partners (IPPs). These interactions will be managed by the Programme Management Tool: SESAR Tool for ATM Rollout (STAR). The continuous monitoring of the implementation progress throughout the year will allow an early detection of misalignments and will anticipate the identification and addressing of possible discrepancies/risks/issues.

Periodic monitoring and reporting:

Action Synchronisation and Execution

In line with the Deployment Programme "Monitoring View", the Action will go through two monitoring cycles.
The relevant monitoring gates are set on 15th January and 15th September of each year. The coordinator will collect implementation progress and will formalise the information into a comprehensive monitoring dashboard for the Action, which will be used as a contribution to the DP Execution Progress Report (EPR).
In order to provide all the necessary information to enable an effective coordination, the coordinator will cooperate with the beneficiaries of the Action. In this respect, it will be supported by the external support "Support to FPA Coordination" which will provide

complementary skills to the coordinator in order to fully accomplish its role. The coordinator and external support will work to address the right trade-off between relevance and frequency of the information collection and avoid overload for the IPPs. In particular, the request for information to IPPs will be tailored to the IPs specificities (i.e. complexity degree, magnitude, duration, etc.), safeguarding, at the same time, a minimum threshold which ensures a reliable DP implementation picture.

The Internal Achievement Points for each project (Activities 2-8) are defined in the description of each Implementation Project (IP).

CBA/Performance analysis

The coordinator estimates cost benefit analysis first according to its top-down model and later taking into consideration the interactions with the project managers as described in the Deployment Programme Annex D. To perform this task, SDM needs to create groupings of projects whose benefits are inter-related: these groupings are called "threads". The benefits of these projects can only be assessed as a whole, at thread level, and not separately, at project level. As threads in many cases are composed of projects belonging to different Actions, the benefits of the threads can be apportioned to specific Actions. Therefore, SDM will perform CBA/Performance analysis at thread level, providing also a view for each of the Actions under execution.

Contractual reporting

The coordinator collects the information from IPPs with reference to each calendar year until Action closure and provides INEA with a full pack of information for Action monitoring (on both technical and financial matters).

Collection will be performed by the coordinator on the first monitoring gate set for 15th of January, in accordance with the specific template provided by INEA, and through the STAR tool, in order to finalise the Action Status Report (ASR) within the deadline.

The ASR (and Final Report) represents the contractual report to be submitted to INEA to monitor the implementation of the Action in terms of technical and financial progress. Once the ASR is finalised, the coordinator will coordinate the ASR certification by each Member State participating in the Action, before its final submission to INEA foreseen on 31st March of each year. The ASR represents the main reference also for the management of the Sub-Activity 1.3.

Quality Management

The coordinator will address a quality management process at Action level encompassing three different elements:

- Quality Planning, aiming at identifying quality requirements of the whole Action with particular regard to methodologies and deliverables;
- Quality Assurance, aiming at planning procedures oriented towards the prevention, detection and reporting of any issue which might have an impact on the Action's quality;
- Quality Control, aiming at verifying the effective implementation of quality

procedures. The implementation of the quality management processes will be provided by the coordinator in support to AF leaders and IPPs and it is part of its role.

Such elements will be addressed throughout the Action with specific reference to the Action processes:

- Elaboration and submission of the Action Status Report;
- Management of expected payments (pre-financing payments, interim payments and payment of the balance);
- Technical, performance and financial monitoring and reporting processes which are performed to elaborate the DP Execution progress report and the Cost Benefit Analysis.

Based on the best practices identified by PMI (Project Management Institute), the coordinator identified a Quality Management framework, which aims at ensuring the proper alignment of the Action results with expected standards of quality, throughout the execution of the current Action.

It has to be noted that the term "Action results" refers to: processes adopted during the Action execution and respective outcomes; deliverables and means of verification produced and milestone achieved.

Deliverables:
1.2.1 Action Execution Progress Dashboard – 30/11/2023 (two reporting gates per year (04/03; 30/11) until 2023 starting from 2019)
1.2.2 Action Quality Plan - 31/05/2019
1.2.3 Action Performance Report - 30/11/2023 submitted every year until 2023 starting from 2019 (one reporting gate per year (15/09))
1.2.4 Action Status Report (ASR) - 31/03/2023 - submitted every year until 2023 starting from 2019
1.2.5 Final Report (Technical Content) - 31/12/2023

Sub - Activity 1.3: Financial management: payments, checks and audits

The coordinator will bear responsibility for the financial management of the Action. Financial management includes all relevant tasks underpinning Action payments, checks and audits and will be conducted by the coordinator in accordance with the relevant provisions, set in both SESAR FPA and SGA. In order to support this sub-Activity, the coordinator procured the support system through open Call for Tenders. Indeed, as per FPA art II.1.3. the coordinator is responsible for:

- Ensuring that all the appropriate payments are made to the other partners without unjustified delay;
- Establishing the requests for payment in accordance with the Framework Partnership Agreement and the Specific Grant Agreements;
- Supporting the requested beneficiaries in making the appropriate arrangements for providing any financial guarantees required under the Framework Partnership Agreement or a Specific Grant Agreement.

The coordinator will also bear responsibility for providing all the necessary documents in the event of checks and audits initiated before the payment of the balance, and in the event of

evaluation in accordance with Article II.27 of the FPA.

Deliverables:
1.3.1 Payments (pre-financing, interim and balance) - 31/12/2023
1.3.2 Checks and Audit procedure (to be included into the Quality Plan) - 31/05/2019

Sub Activity 1.4: Action Information management

The coordinator will be the intermediary for the communications between the partners and the Commission, except where otherwise stated in the Framework Partnership Agreement or the Specific Grant Agreements. This Sub-Activity covers any potential adjustment or amendment of the SGA to be put in place. Such process will be managed by the coordinator, in close cooperation with all IPPs and with the European Commission/INEA and in full alignment with the FPA and SGA provisions.

Deliverables:
1.4.1 Action Communication Plan - 31/05/2019

Sub - Activity 1.5: Communication management for stakeholders' support

The coordinator will provide Beneficiaries with the below communication tools to support them during the execution phase.

After the Agreement's finalisation, the following communication tools will be made available by the coordinator:

- Workshops and events:
  - These ad hoc meetings will provide Action Beneficiaries with information to ensure a successful execution and closure of the Action (e.g. Overview of the main activities; procedures and roadmaps to be followed for Interim Payment etc.). Such meetings are for example the kick-off meeting, annual meetings and specific topic-based workshops and/or trainings.

- Dedicated tools:
  - SESAR Deployment Manager **website**: beneficiaries have all public information on SESAR deployment at hand during their project performing process just by visiting the SDM website which contains all latest relevant information (e.g. about SDM, news, events, Q&A, Deployment in Europe status): www.sesardeploymentmanager.eu;
  - **Videos and tutorials**: Beneficiaries can find (on specific sections of the SDM website) informative videos about the content of the SDP and the tutorials to use the STAR Tool;
  - **Dedicated email address**: a dedicated email address will be set up to facilitate the communications between the Implementing Partners and the coordinator during the entire Action lifecycle;
  - **Questions & Answers**: the SDM website contains a dedicated, publicly available, section where all relevant Questions & Answers are published periodically
  - **Bimonthly Newsletter**: A dedicated electronic letter will be sent to all IPPs to

inform about the progress of the activities performed by IPPs and the coordinator;
- **Online interactive stakeholder calendar**: this dedicated calendar contains all actions to be taken by the beneficiaries and by the coordinator. It gives a secured clear overview throughout the entire Action on the deadlines and activities and contains all relevant documents for each step in the process;
- **STAR:** this cooperative coordination, synchronisation and monitoring tool will be the main online tool for the Implementing Partner to interact with the coordinator for the action execution.

Activity 2: AF1 Implementation (50% co-funded)

Extended Arrival Management (AMAN) and Performance Based Navigation (PBN) in high density Terminal Manoeuvring Areas (TMAs) improve the precision of the approach trajectory and facilitate air traffic sequencing at an earlier stage. Extended AMAN supports extension of the planning horizon out to a minimum of 180-200 Nautical Miles, up to and including the Top of Descent (TOD) of arrival flights. PBN in high density TMAs covers the development and implementation of fuel efficient and/or environmentally friendly procedures for arrival and departure (Required Navigation Performance 1 Standard Instrument Departures (RNP 1 SIDs), Standard Arrival Routes (STARs) and approach (Required Navigation Performance Approach (RNP APCH)).

It is composed of the following technical families:
S-AF 1.1: Arrival Management extended to en-route Airspace:
- Family 1.1.1: Basic AMAN;
- Family 1.1.2: AMAN upgrade to include Extended Horizon function;

S-AF1.2: Enhanced TMA using RNP-Based Operations:
- Family 1.2.1: RNP approaches with vertical guidance;
- Family 1.2.2: Geographic Database for procedure design;
- Family 1.2.3: RNP 1 operations in high density TMAs;
- Family 1.2.4: RNP 1 operations – aircraft capabilities;
- Family 1.2.5 – RNP routes connecting Free Route Airspace (FRA) with TMA.

Within the objective of the present Action the following Families are addressed:
Family 1.2.1: RNP approaches with vertical guidance;
Family 1.2.3: RNP 1 operations in high density TMAs; and
Family 1.2.4: RNP 1 operations – aircraft capabilities.

Sub - Activity 2.1 - Activity 2 Coordination

Leader: SESAR Deployment Alliance
Start Date: 12/04/2018
End Date: 31/12/2023

This sub - activity aims at coordinating the implementing initiatives within the scope of AF1 and its sub-AFs, for those projects with a co-financing rate of 50%.
According to the Deployment Programme Methodology, each Implementing Partner will support SDM during Cost Benefit Analysis (CBA) finalisation at Action Level.
The SDM will steer the Implementing Partners to provide all contributions needed to prepare

CBA according to the INEA guidelines.

Deliverables:

2.1.1 Action Status Report (ASR) – IP Level – submitted as an Annex to Action Status Report (del. 1.2.4) every year until 2023
2.1.2 Risks and Issues, and mitigation Actions Registry – AF1level – submitted 2 times per year (30/04; 30/09) until 2023 starting from 2019
2.1.3 Final Report (technical content) – 31/12/2023

Sub - Activity 2.2 - AF1 Implementation Projects

- **2017_004_AF1 - Flight Crew Training for RNP1 Operations**

Start/end date: 12/04/2018 - 31/12/2023

Project Leader: Deutsche Lufthansa Aktiengesellschaft

Project Contributors:

- AIR DOLOMITI S.p.A. Linee Aeree Regionali Europee;
- Austrian Airlines AG;
- Eurowings Europe GmbH;
- Eurowings GmbH;
- Germanwings GmbH;
- Lufthansa Cargo AG;
- Lufthansa Cityline GmbH;
- Swiss International Airlines AG.

Overview:

The main objective of this Implementation Project (IP) is to prepare, conduct and monitor pilot's simulator training to assure practical skills regarding operation on RNP1 (Required Navigation Performance) procedures for Lufthansa Group.

Specific objectives:

This IP specifically aims to deliver a training for 9 Airlines and 9162 pilots. The RNP1 training will consist of 7 min briefing time and 35 minutes full flight simulator time, being part of a broader PBN (Performance Based Navigation) training programme:

- Handling of flight management system regarding Required Navigation Performance (5 min)

- Demonstrate effects on x-track error and specialities of RNP1 and Radius to Fix (RF) (10 min)
- Failure sequence on RNP1 procedure: Loss of GNSS (Global Navigation Satellite System), loss of AP (Autopilot) and FD (Flight Director), map shift. Realise effects on navigation performance (10 min)
- Engine Failure followed by go around on RF Leg on turn to final of an RNP1 to ILS Approach (or RNP1 to xLS Approach) (10min).

Tasks:

The Implementation Project consists of the following tasks:

- Task 01 - Project Management: The Project Management task relates to all general management tasks that are required to coordinate and track the fulfillment of the related project tasks. The project management will be performed throughout the whole lifecycle of the project, including the project initialisation and finalisation.
  The Project Management task includes the following sub-tasks:
  - Initiating: relates the setup of the project including the appointment of project manager and project team and the definition of the project charter;
  - Planning: refers to the approvement of all planning documents with all contributing partners and the signing of the project charter,
  - Monitoring and Controlling: include tracking of the progress of single tasks and sub-tasks, definition and monitoring of project risks and problems and all reporting tasks related to the project, support of takeover activities and approving and declining of project change requests;
  - Coordination: refers to the organisation and initialisation of the single project tasks and sub-tasks with all involved project partners and ensuring availablity of adequate resources;
  - Closing: includes issuing of the final project report and breaking up the project team after project finalisation.
- Task 02 - Flight Crew Training: Train pilots on RNP1 procedures:
  - 4076 pilots for Dlh
  - 640 pilots for Lufthansa Cityline
  - 445 pilots for Lufthansa Cargo
  - 1301 pilots for Swiss
  - 1205 pilots for Austrian Airlines
  - 400 pilots for Eurowings GmbH
  - 400 pilots for Eurowings Europe
  - 118 pilots for Air Dolomiti
  - 577 pilots for Germanwings
- Task 03 - Documentation: will bring the education documentations of the HR-departments of the involved airlines together into one document in order to enable the controlling and progress reporting.

Expected Results:

The following numbers of pilots will be trained at the end of the Action:

- 4076 pilots for Deutsche Lufthansa
- 640 pilots for Lufthansa Cityline
- 445 pilots for Lufthansa Cargo
- 1301 pilots for Swiss
- 1205 pilots for Austrian Airlines
- 400 pilots for Eurowings GmbH
- 400 pilots for Eurowings Europe
- 118 pilots for Air Dolomiti
- 577 pilots for Germanwings

Internal Achievements Points:

- Start of training - 15/04/2018
- End of training - 15/12/2022
- Parallel Operations / Operational Trials - 15/04/2018
- Cutover SW (Software) ready and successfully tested – N/A
- Cutover and fall-back period completed – N/A

Contractual Milestone:

- Project completed - 31/12/2023

Performance Benefits:

The PBN training regarding RNP1 and RF capabilities for Lufthansa Group Airlines has an enabling character. The benefits result from using respective new RNP1 procedures in daily operation published by Air Navigation Service Providers (ANSPs) at PCP airports. The benefits are dependent on the quality of the RNP1 (and RF) procedures developed by European ANSPs.

- **2017_023_AF1 - Enhanced Terminal Airspace using RNP Based Operations at Manchester Ringway Airport**

Start/end date: 12/04/2018 - 12/05/2023

Project Leader: Manchester Airport PLC

Project Contributor: N/A

Overview:

The main objective is to implement procedures for departure, arrival and initial approaches using PBN/RNP in high density TMAs, as detailed in the RNP 1 specification.
The implementation will facilitate increased safety and throughput for operators in associated High-Density Terminal Manoeuvring Area (TMA). For Manchester Ringway Airport the IP aims to develop and implement RNP1 SIDs (Standard Instrument Departure Routes) procedures and Arrival transition procedures for Runways (RWYs) 23R, 23L, 05R and 05L.
This will involve converting the conventional SIDs and arrival routes to RNP1 design standards as per the ICAO and EASA standards to achieve PCP (Pilot Common Project) compliance. This will facilitate increased safety by incorporating GNSS technology and on-board monitoring and alerting for aircraft and will deliver a better integration for Manchester Ringway Airport to the En-Route network.
Within this IP a procedure design organisation will be appointed to work with identified stakeholders to optimise arrival and departure routes for Manchester Ringway Airport. The state regulator will be informed about the intention to design and implement RNP based operations in line with the requirements of the UK CAA (Civil Aviation Authority) CAP (Civil Aviation Publication) 1616 documentation.
A comprehensive design and public consultation process will be undertaken with clear and concise communication materials, as required by the regulatory process. Full environmental impact studies will be conducted as required which will analyse both the noise and fuel burn benefits.
UK airspace is being fundamentally re-designed to improve efficiency and safety, through NATS PLAS (Prestwick Lower Airspace Systemisation) project, and this project will integrate Manchester Ringway Airport into this wider en-route network with higher efficiency.
In addition, this project will close the identified gaps within family 1.2.3 for Manchester Ringway Airport.
This project is directly linked to the CEF Call 2014 (Action 2014-EU-TM-0136-M) IP #119_AF1 (Implementing Partner NATS Nerl) in which the RNP1 SID was introduced by the design of the Point Merge and has an interdependency with 2017_024_AF1.

Specific objectives:

The Implementation Project aims to:

- Design and implement RNP1 Arrival transitions for all runways.
- Design and implement RNP1 SIDs for all runways.
- Publish the RNP1 procedures in UK Aeronautical Information Publication (AIP)
- Undertake a Public Consultation of new RNP SIDs
- Develop a Safety assessment and an operational validation,
- Validate the procedure by a flyability simulation.

Tasks:

The Implementation Project consists of the following tasks:

- Task 01 - Project management and strategy definition: Identification of a complete project team which will include representatives from Airside Operations, Community Relations, External Affairs, Group Services, Finance and Peer Review Consultants. The chosen project team will have a complete and detailed understanding of all financial, operational and technical elements of the project which will ensure successful implementation;
  Development of a procurement strategy for Instrument Flight Procedure Design in consultation with relevant members of the project team; and
  Definition of a comprehensive implementation roadmap by the complete project team. The task will result in the creation and distribution of a detailed breakdown of the projects' delivery schedule with associated accountability and responsibility to ensure success. This roadmap will consider all previous elements of the project to ensure an adequate coverage of all requirements.
- Task 02 - ATM systems upgrade: Completion of the required ATM System Upgrade which is an enabler for the project. This will be carried out in partnership with the airport ANSP at Manchester (NATS Services Limited (NSL)) who are engaged and understand the requirements. It should be noted that NATS NSL are the ANSP at the airport under direct contract with Manchester Airport Group (MAG). This is separate from the provision of en-route air traffic services, which is conducted by a separate company for all UK airspace by NATS NERL.
- Task 03 - Procedure design: Design of RNP-1 SID: including the whole process of the entire procedure design work using the design principles agreed with stakeholders, from expert group meetings (workshops to define which procedures to implement) to final design.
  MAN will conduct flyability (Simulator) tests of all RNP1 procedure design options, the results of which will inform the last element of this task which will be the RNP procedure validation exercise.
- Task 04 - Public consultation: Meet with Civil Aviation Authority (CAA) (SRG – Safety Regulation Group) to assess design principles. MAN will schedule and facilitate a face to face framework briefing with the CAA which will ensure that the UK regulator agrees with the chosen approach. MAN will take this opportunity to discuss design criteria and potential challenges with the regulator and MAN will then enter into discussions with stakeholders regarding design principles to be used. Using the expertise of the appointed project consultant, MAN will use the output from these discussions to produce design options for public consultation that align with stakeholders' and regulator's requirements.
  Consultation Phase: Preparation of all consultation materials enabling MAN to enter a successful consultation period. This exercise will also include a high-level plan of the

entire process; planning of consultation events including a detailed breakdown of timings and locations; preparation of required media for consultation events to include posters, flyers and other engagement resources and planning of stakeholder engagement with the aim of the completion of public consultation for the project.

- Task 05 - Safety assessment: MAN will conduct hazard identification (HAZID) workshops in association with the airport ANSP to ensure safety issues are identified and corrected. Assessment of consultation feedback by relevant members of the project team and analysis of findings to ensure finalised processes consider relevant consultation and HAZID findings; Update of RNP designs as appropriate based upon the findings of the consultation period. This will also include any other amendments to designs as required, which may be a result of factors from across the project; provision of relevant safety case assessments to all required parties and finally; submission of airspace change proposal to the UK regulator (CAA) for final review.
- Task 06 - ATCO Training and Publication: Completion of full training programme including simulator exercices to all relevant individuals with special focus on ATCO (Air Traffic Controller) understanding of procedures.

Expected Results:

The following results are expected:

- The main Gaps for family 1.2.3 for Manchester Ringway Airport are closed.
- The integration for Manchester Ringway Airport to the on-route network is improved.
- It will be possible to remove the outdated ground based VOR infrastructure in line with PCP objectives.
- More flexible and environmentally friendly procedures for aircraft using RNP1 routes in the high-density Manchester TMA.
- Spread of flight tracks during turns is reduced therefore reducing flown track miles.
- The on-board capability of aircraft to perform monitoring and alerting can be effectively utilised which enhances safety.

Internal Achievements Points:

- Start of training - 01/10/2020
- End of training - 01/03/2022
- Parallel Operations / Operational Trials - 22/04/2021
- Cutover SW ready and successfully tested - 22/04/2021
- Cutover and fall-back period completed - 22/04/2021

Contractual Milestone:

- Project completed - 12/05/2023

Performance Benefits:

The new RNP1 procedures will deliver better integration for Manchester Ringway Airport to the en-route network and will also link directly to the RNP Approaches that are also being implemented. This creates a consistent operation within the Manchester TMA and will provide an environmental benefit by facilitating Continuous Descent Operations (CDO) which reduce airline fuel burn and costs.
These CDOs will also create a noise reduction benefit within the highly populated areas surrounding Manchester Ringway Airport due the elimination of level segments of flight that require thrust to be increased.
For departures, a more consistent operation within the TMA will be provided with environmental benefits resulting from aircraft flying Continuous Climb Operations (CCO) on departure which provide a similar benefit in reducing noise and fuel burn.
In addition, all of the RNP1 procedures will deliver increased aircraft safety through the provision of procedures that utilise the Area-NAV (RNAV) and on-board monitoring and alerting capability of the aircraft. These provide an indication to aircrew of any deviation from intended track and therefore provide an assurance on aircraft position.

- **2017_024_AF1 - RNP approaches to landing runways (23R, 05L and 05R) at Manchester Ringway Airport**

Start/end date: 12/04/2018 - 12/05/2023

Project Leader: Manchester Airport PLC

Project Contributor: N/A

Overview:

The main objective is to implement Required Navigation Performance (RNP) final approaches to landing runways (23R, 05L and 05R) at Manchester Ringway Airport using Performance Based Navigation (PBN) as required by the Pilot Common Project (PCP) to enable removal of the VOR (Very high frequency Omnidirectional Range) ground-based navigation infrastructure. Landing runway 23L is already equipped with an RNP Approach procedure.
UK airspace is being fundamentally re-designed to improve efficiency and safety, through NATS NERL PLAS (Prestwick Lower Airspace Systemisation), which will better integrate Manchester Ringway Airport into the wider en-route network with higher efficiency. This project will close the identified gaps within family 1.2.1 for Manchester Ringway Airport.
The decommissioning of the legacy VOR ground-based navigation infrastructure will result in the withdrawal of all Manchester's existing conventional non-precision approach procedures all of which are dependent on this facility. This VOR is located on the Manchester Airfield but is owned and maintained by NATS En-Route Limited (NERL). As part of the

UK NERL VOR rationalisation programme there is a requirement to withdraw the Manchester VOR navigation infrastructure. Although precision approaches will still exist (primarily ILS) the proposed RNP approaches will guarantee safe approaches for non-precision equipped aircraft, and during times of system failure and maintenance.
The project team will need to indicate to the state regulator the intention to design and implement RNP based operations in line with the publication of the UK CAA CAP1616 procedures documentation. The RNP approach procedure design and public consultation will be conducted in line with this UK CAA guidance.
This procedure consists of six stages and takes a minimum of 2 years to be completed. This is due to the requirement to consider a full range of options in developing the design, to conduct full environmental analysis of all options and to consult with aviation and public stakeholders for a minimum of 3 months. There will be a significant investment in creating a team of 8-10 dedicated people with the specific skills to achieve the outcome, and also to develop and provide clear and concise communication materials and undertake public consultations as required by the regulatory process. There is also a requirement to conduct environmental impact studies as required identified by the scope of the project and the legislation.

Specific objectives:

The Implementation Project aims to:

- Design and implement RNP approaches to landing runways 23R, 05L and 05R to LPV200 standard;
- Publish the RNP procedures in UK AIP;
- Conduct a Public Consultation of new RNP APCH procedures;
- Develop a Safety assessment and an operational validation;
- Validate the procedure by a flyability simulation.

Tasks:

The Implementation Project consists of the following tasks:

- Task 01 – Project management and strategy definition: Identification of a complete project team which will include representatives from Airside Operations, Community Relations, External Affairs, Group Services, Finance and Peer Review Consultants. The chosen project team will have a complete and detailed understanding of all financial, operational and technical elements of the project which will ensure successful implementation;
  Development of a procurement strategy for Instrument Flight Procedure Design in consultation with relevant members of the project team and;
  Definition of a comprehensive implementation roadmap by the complete project team. The task will result in the creation and distribution of a detailed breakdown of the projects' delivery schedule with associated accountability and responsibility to ensure

success. This roadmap will consider all previous elements of the project to ensure an adequate coverage of all requirements.

- Task 02 – ATM systems upgrade: Completion of the required ATM System Upgrade which is an enabler for the project. This will be carried out in partnership with the airport ANSP at Manchester (NATS NSL) who are engaged and understand the requirements. It should be noted that NATS NSL are the ANSP at the airport under direct contract with MAG. This is separate from the provision of en-route air traffic services, which is conducted by a separate company for all UK airspace by NATS NERL.
- Task 03 – Procedure design: Create a full procedure design (RNP approaches) and completed parameter calculation, include the whole process of the entire design work using the design principles agreed with stakeholders, from expert group meetings (workshops to define which procedures to implement) to final design. MAN will conduct flyability (Simulator) tests of all RNP1 procedure design options, the results of which will inform the last element of this task which will be the RNP procedure validation exercise.
- Task 04 – Public consultation: Meet with Civil Aviation Authority (CAA) (SRG – Safety Regulation Group) to assess design principles. MAN will schedule and facilitate a face to face framework briefing with the CAA which will ensure that the UK regulator agrees with the chosen approach. MAN will take this opportunity to discuss design criteria and potential challenges with the regulator and MAN will then enter discussions with stakeholders regarding design principles to be used. Using the expertise of the appointed project consultant, MAN will use the output from these discussions to produce design options for public consultation that align with stakeholder and regulator requirements.

  Consultation Phase: Preparation of all consultation materials enabling MAN to enter a successful consultation period. This exercise will also include a high-level plan of the entire process; planning of consultation events including a detailed breakdown of timings and locations; preparation of required media for consultation events to include posters, flyers and other engagement resources and planning of stakeholder engagement with the aim of the completion of public consultation for the project.
- Task 05 – Safety assessment: MAN will conduct hazard identification (HAZID) workshops in association with the airport ANSP to ensure safety issues are identified and corrected. Assessment of consultation feedback by relevant members of the project team and analysis of findings to ensure finalised processes consider relevant consultation and HAZID findings; Update of RNP designs as appropriate based upon the findings of the consultation period. This will also include any other amendments to designs as required, which may be a result of factors from across the project; provision of relevant safety case assessments to all required parties and finally; submission of airspace change proposal to the UK regulator (CAA) for final review.

- Task 06 – ATCO training and Publication: Completion of full training programme including simulator exercices to all relevant individuals with special focus on ATCO (Air Traffic Controller) understanding of procedures.

Expected Results:

The following results are expected:

- The Main Gaps family 1.2.1 for Manchester Ringway Airport is closed.
- The integration for Manchester Ringway Airport to the on-route network is improved.
- It will be possible to remove the outdated ground based VOR infrastructure in line with PCP objectives.
- More flexible and environmentally friendly procedures for aircraft using PBN/RNP in high density TMAs, as specified in RNP1.
- Spread of flight tracks during turns is reduced therefore reducing flown track miles.

Internal Achievements Points:

- Start of training - 01/10/2020
- End of training - 01/03/2022
- Parallel Operations / Operational Trials - 22/04/2021
- Cutover SW ready and successfully tested - 22/04/2021
- Cutover and fall-back period completed - 22/04/2021

Contractual Milestone:

- Project completed - 12/05/2023

Performance Benefits:

The new RNP approach procedures for Manchester Ringway Airport will deliver better integration of Manchester Ringway Airport to the en-route network and will provide an environmental benefit by facilitating Continuous Descent Operations which reduce airline fuel burn and costs. These CDOs also create a noise reduction benefit for local communities due to the elimination of level segments of flight that require thrust to be increased.
In addition, the approach procedures will deliver increased aircraft safety through the provision of final approach procedures that utilise the Area-NAV (RNAV) capability of the aircraft to provide vertical and lateral guidance. This will provide obstacle clearance and guidance for non-precision approach equipped aircraft, or when precision ground-based aids such as the Instrument Landing System (IILS) are unserviceable.

- **2017_064_AF1 - Final phase RNP APCH procedures Amsterdam Schiphol**

Start/end date: 01/09/2018 - 01/11/2022

Project Leader: Luchtverkeersleiding Nederland (Air Traffic Control The Netherlands)

Project Contributor: N/A

Overview:

The main objective of the Implementation Project is to implement new procedures for landing aircrafts using Required Navigation Performance (RNP) approach procedures with vertical guidance (RNP APCH) in the high-density Terminal Manoeuvring Area (TMA) of Amsterdam Airport Schiphol, as part of the Performance Based Navigation (PBN) implementation.
RNP APCH is an approach specification offering performance superior to conventional non-precision approach and without dependency on ground-based infrastructure. Instead, RNP APCH utilises the capabilities of the on-board navigation system to provide 3D guidance.

Specific objectives:

The Implementation Project specifically aims to deploy RNP APCH procedures to the remaining six runway ends at Amsterdam Airport Schiphol (EHAM) at runway ends 27, 18R, 24, 36C, 04 and 09. For each corresponding runway end, two RNAV approach procedures will be established:

- LPV (Localizer Performance with Vertical guidance) approach using the European Geostationary Navigation Overlay Service (EGNOS) system, aiming for CAT (Category) I minima;
- LNAV/VNAV (Lateral Navigation/Vertical Navigation) approach as present in large part of the fleet, with LNAV as reversionary mode.
- For RWY (Runway) 18R there will even be a third design, aiming at independence from RWY 27, possibly with RF (Radius to Fix) leg.

The Implementation Project will establish ATC (Air Traffic Controller) working methods and flight procedures considering the PBN equipped fleet mix.

Tasks:

The Implementation Project consists of the following tasks:

- Task 01 - Project Management: Project Management for all tasks and closure of the project including aftercare.
- Task 02 - RNP APCH for EHAM runways 18R, 27 and 36C: RNP APCH for EHAM runways 18R, 27 and 36C including procedure for independent simultanuous approaches of runways 18R and 27. Design RNP APCH and operational procedure, Review and consultation, validation flights, Safety analysis, ATCO training, Publication of Procedures and Operations manuals.

- Task 03 - RNP APCH for EHAM runway 24: RNP APCH for EHAM EHAM runway 24. Design RNP APCH and operational procedure, Review and consultation, validation flights, Safety analysis, ATCO training,
- Task 04 - RNP APCH for EHAM runways 04 and 09: RNP APCH for EHAM runway 04 and 09. Design RNP APCH and operational procedure, Review and consultation, validation flights, Safety analysis, ATCO training, Publication of Procedures and Operations manuals.

Expected Results:

The following results are expected:

- RNP APCHs and operational procedures are designed,
- validation flights for the designed procedures are executed,
- the safety of the designed procedures is analysed,
- RNP APCH procedures are published in the National Aeronautical Information Publication (AIP),
- Air Traffic Controllers are trained,
- Operational use of the procedures is ensured.

Internal Achievements Points:

- Start of training – 01/08/2019
- End of training - 01/08/2022
- Parallel Operations / Operational Trials - N/A
- Cutover SW ready and successfully tested - 01/08/2022
- Cutover and fall-back period completed - 01/08/2022

Contractual Milestone:

- Project completed - 01/11/2022

Performance Benefits:

In terms of performance benefits, the following areas can be identified:

- Backup procedures are established enhancing operational sustainability;
- Independent converging operations will improve reliability in adverse weather conditions;
- Several runway ends will be accessible where the IFR (Instrumented Flight Rules) business case was not positive until now.

This project completes the implementation of Family 1.2.1 "RNP Approaches with vertical guidance" at Amsterdam Airport Schiphol. The withdrawing of existing non-precision approach procedures and the corresponding decommissioning of related nav-aids (radio beacons) for Amsterdam Airport Schiphol is part of another CEF Transport funded project

named "Performance Based Navigation procedures and rationalisation of Air Navigation infrastructure in the Netherlands", action number 2016-NL-TM-0336-W, the RNP APCH procedures for Amsterdam Schiphol (in this IP) are not included within the scope of this action.
Publication and operational implementation of RNP APCH to RWY 22 is funded under Action 2014-EU-TM-0136-M (IP #107AF1: "First phase of RNAV1 and RNP-APCH approaches Amsterdam Schiphol (EHAM)") and of RNP APCH to RWY 06, 18C and 36R under Action 2015-EU-TM-0196-M (IP 2015_186_AF1: "RNP approaches to three main landing runways Amsterdam Schiphol").

Activity 3: AF2 Implementation (50% co-funded)

Airport Integration and Throughput facilitates the provision of approach and aerodrome control services by improving runway safety and throughput, enhancing taxi integration and safety and reducing hazardous situations on the runway.
It is composed of the following technical families:
S-AF 2.1: DMAN synchronised with Pre-departure sequencing:
- Family 2.1.1: Initial DMAN
- Family 2.1.2: Electronic Flight Strips (EFS)
- Family 2.1.3: Basic A-CDM
- Family 2.1.4: Initial Airport Operations Plan (AOP)

S-AF 2.2: DMAN integrating Surface Management Constraints:
- Family 2.2.1: A-SMGCS Level 1 and 2

S-AF 2.3: Time Based Separation for Final Approach:
- Family 2.3.1: Time Based Separation (TBS)

S-AF 2.4: Automated Assistance to Controller for Surface Movement Planning and Routing:
- Family 2.4.1: A-SMGCS Routing and Planning Functions;

S-AF 2.5: Airport Safety Nets:
- Family 2.5.1: Airport Safety Net associated with A-SMGCS (Level 2);
- Family 2.5.2: Implement aircraft and vehicle systems contributing to Airport Safety Nets.

Within the objective of the Action, the following Families are addressed:
Family 2.1.4 - Initial Airport Operations Plan (AOP);
Family 2.3.1 – Time Based Separation (TBS); and
Family 2.4.1 - A-SMGCS Routing and Planning Functions;

Sub - Activity 3.1 - Activity 3 Coordination

Leader: SESAR Deployment Alliance
Start Date: 12/04/2018
End Date: 31/12/2023

The Activity aims at coordinating the implementing initiatives within the scope of AF2 and its sub AFs. According to Deployment Programme Methodology, each Implementing Partner will support SDM during Cost Benefit Analysis (CBA) finalisation at Action Level. The SDM will steer the Implementing Partners to provide all contributions needed to prepare CBA according to the INEA guidelines.

Deliverables:

3.1.1. Action Status Report (ASR) – IP Level – submitted as an Annex to Action Status Report (del. 1.2.4) every year until 2023
3.1.2. Risks and Issues, and mitigation Actions Registry – AF2 level – submitted 2 times per year (30/04; 30/09) until 2023 starting from 2019
3.1.3. Final Report (technical content) – 31/12/2023

Sub - Activity 3.2 - AF2 Implementation Projects

- **2017_022_AF2 - Synchronised stakeholder decision on process optimisation at airport level**

Start/end date: 12/04/2018 - 31/12/2020

Project Leader: Brussels Airport Company NV/SA

Project Contributors:

- Aeroporti di Roma S.p.A.;
- Aéroports de la Côte d'Azur;
- Aéroports de Paris;
- BELGOCONTROL;
- DAA PLC;
- ENAV S.p.A.;
- Flughafen München GmbH;
- Fraport AG - Frankfurt Airport Services Worldwide;
- Københavns Lufthavne A/S;
- Manchester Airport PLC;
- STAL - Stansted Airport Limited;
- Società per Azioni Esercizi Aeroportuali – SEA;
- Swedavia AB.

Overview:

The main objective of the Implementation Project is to close the gap on Initial Airport Operations Plan (iAOP) in 12 airports and 2 Air Navigation Service Providers. AOP project implementation will be harmonised with the implementation of other projects such as DMAN (Departure Manager), Electronic Flight Strips (EFS) and Basic A-CDM (Airport Collaborative Decision Making).
The iAOP is a single, common and collaboratively agreed rolling plan available to all airport stakeholders whose purpose is to provide common situational awareness and to form the basis upon which stakeholders' decisions relating to process optimisation can be made. It reflects the operational status of the airport and therefore facilitates demand and capacity

balancing. It connects the relevant stakeholders, notably the airspace users' flight operations centre. It contains data and information relating to the different status of planning phases and is in the format of a rolling plan, which evolves over time.
The iAOP information will be shared with the local stakeholders and ready for the AOP - NOP (Network Operations Plan) Connection (Family 4.2.4) to ensure the positive impact on the network level. By introducing the Demand Capacity Functionality and On-Time Key Performance Indicator the A-CDM (Airport Collaborative Decision Making) performance assessment and reporting process will be improved/implemented. Before starting the AOP NOP integration a certain level of understanding and implementation of AF2 iAOP must be accumulated.

Specific objectives:

The Implementation Project specifically aims to:

- Implement an Initial AOP at 12 airports and 2 ANSPs to enhance common situational awareness and efficiency of operations, connected with the Network Operation Plan (NOP, Family 4.2.4.).
- Develop new KPIs (Key Performance Indicators) to measure both planned and executed operations.
- Define the type, quality and quantity of the NOP / AOP data exchange with the relevant stakeholders (ANSP/Airspace Users).

In particular, for each airport this IP covers the following specific objectives:

- Brussels airport: the specific aim is to have proactive, collaborative and efficient performance management by every operational stakeholder at the airport, by providing real time information from and to all stakeholders and enable direct communication. Both planned and executed operations are monitored, to identify where action needs to be taken by the Airport Operations Centre. It includes a hub control tool for the home carrier to improve efficiency that will support real time transparency of the hub operation, predict operational bottlenecks before they occur, visualize the critical path, monitor the handling status of each flight, provide decision support for disruption handling, increase TOBT accuracy, adherence to A-CDM. The AOP will take into account both landside (including accessibility) and airside processes and as such will transversally coordinate pax, bag and aircraft processes. This project is the continuation of project 2015_244_AF2 (Action 2015-EU-TM-0193-M), related to the APOC of Brussels Airport. It is implemented in cooperation with the local ANSP Belgocontrol.This project will use the data from the project 2015_245_AF2 "Airstat" (Action 2015-EU-TM-0196-M), which will be used as a tool to optimise and enhance the local iAOP.
- Copenhagen Kastrup Airport: The specific aim of the project is to close the gaps identified under 'initial AOP'. The main gaps are software and system related concerning Arrival Planning Information (API), flight status codes, RWY configuration plan, airport capacity and events, flight schedule and flight linking

information. For the following tracks: API, RWY configuration plan, airport capacity and events, Copenhagen airport will use a software already delivered under project 2015_044_AF2 Initial DMAN & AOP and will develop it further into the needs of AOP.

- Dublin Airport: As a follow-up to A-CDM, the aim of this project is to provide Dublin Airport with a rolling Airport Operational Plan to be made available to airport stakeholders to better manage the airport and enhance the passenger experience. It will combine landside and airside processes together and present a plan in the relevant format with agreed KPIs to assist in the decision making within the airport. Initially it will be necessary to conduct a gap analysis on the available data and it will be necessary to procure the tools, systems and resources to bridge any gaps in the data so the relevant information can be made available. It will also involve the integration of a number of new data sources such as Meteorological and Air Traffic Control (ATC) data using System Wide Information Management (SWIM) methods. It will provide alerts to the stakeholders and also highlight constraints/factors which can impact on time performance.
- Frankfurt International airport: the specific aim is to implement part of the iAOP project at Frankfurt Airport. This covers the IT-realisation of the elaborated iAOP@FRA concept, including the establishment of B2B (Business to Business) and B2C (Business to Client) interfaces to all relevant stakeholders, the creation of the extended DPI (Departure Planning Information) and basic API (Arrival Planning Information) information as well as data processing in the local AODB. IP 2015_225_AF2 "Initial Airport Operations Plan @ FRA" (Action 2015-EU-TM-0196-M) covered the concept and the specification for AOP as well as some preliminary interface work while IP 2017_022 project will cover the full technical implementation of the initial AOP.
- Manchester Ringway airport: the specific aim for Manchester Ringway airport (MAN) is to deliver an information sharing platform presenting a single collaboratively agreed rolling plan and key airport operational status which is available to all airport's stakeholders. The plan is updated with flight trajectory, airport resource & local weather data to provide common situational awareness, KPI performance and alerts on plan variance to form the basis upon which stakeholder's decisions relating to process optimisation and optimal airport performance can be collaboratively made.
- Milan Malpensa airport: the specific aim is to evolve iAOP introducing three different additions to the current technical set of sensors and interfaces that are feeding AODB (Airport Operational Database) and ACDM platform (available to all stakeholders) plus the introduction of a TBT (Ground-to-Air) radio frequency dedicated to Airport Operations and ACDM. The three additions are: installation of 36 new VDGS (Visual Docking Guidance System)/displays for the contact stands, the implementation of automatic real Block-on - Block-off using sensors and the development and introduction of a dedicated Flight Operations Application. The change of the existing

VDGS/Displays with new and enhanced models and the installation of sensors on the non-contact stands is driven by 2 main needs: consolidate the Pre-departure Sequence and enhance predictability of TOBT (Target off block time) and TTOT (Target take-off time) in order to provide it to the Network Manager Operation Center (NMOC) through the DPI (Departure Planning Information) messages. New VDGS/Displays at contact stands will allow also to display key A-CDM information, such as TSAT (Target start-up approval time), to all stakeholders located at the Gate: Airlines crews, Ground handler and Airport operators. This will contribute to the enhancement of the information sharing level and, consequently, improve the accuracy level of the AODB/A-CDM in view of feeding the AOP. The development of a flight Operations application is a key to facilitate cooperation among stakeholders while raising the quality of data and of information dissemination contributing significantly to the quality improvement of "Departure Progress Information" to NMOC in view of AOP-NOP integration. The ground to air frequency will allow a direct contact between Airport Operations Center and pilots thus facilitation information exchange and situation awareness.

- Munich Franz Jozef Strauss airport: the specific aim is to implement and deploy a local airport rolling plan through process optimisation as well as data acquisition and fusion with all relevant stakeholders. Data will be used for monitoring, ex-post evaluation and KPI management. Coordinated approach of stakeholders and better data quality enhances the common situational awareness and the efficiency of the network.

  The activities in project 2015_282_AF2 ("Initial AOP", Action 2015-EU-TM-0193-M) form the basis for initial AOP and initial APOC. IP 2015_282_AF2 focused on the relocation of working positions, improved and simplified communication and coordination structures within a limited number of airport internal stakeholders. The results obtained through the previous project will feed into the current IP, which aims to extend the scope to involve ANSP, airlines and weather service provider. The main tasks will comprise process optimisations and new operational methods in the remits of family 2.1.4.
- Nice Cote d'Azur airport: The specific aim of this project is to consolidate the necessary set of information to Aéroport de Cote d'Azur (ACA), provide a common situational awareness to all stakeholders hence improving the process of a coordinated decision making and optimising the management of airport airside and landside resources and operations. It will also help to better manage the airport performance. This project is complementary to the projects 2015-085-AF2 (Action 2015-EU-TM-0193-M, "DMAN and Pre-departure sequence (PDS) implementations for the CDM implementation") and 2015_083_AF2 (Action 2015-EU-TM-0196-M,"iAOP implementation"). With this project, Family 2.1.4 iAOP will be fully implemented: Project 2015_083_AF2 aims at renewing the AODB and Resources Management System (RMS) to have an integrated solution which will be more efficient, and which will improve operations management. This integrated solution is the first step towards AOP.

IP 2017_022_AF2 "Synchronised stakeholder decision on process optimisation at airport level" is the second step towards AOP. It aims at completing the set of data to be integrated in the AOP which will improve information sharing with the local and European stakeholders, the common situational awareness and the performance management.

- Rome airport: the specific aim is to collect information and performance stemming from the A-CDM operations, in order to monitor and assess, through dedicated KPIs and alerts, the airport operations, allowing a smooth and efficient airport planning. Moreover, the project will connect operational systems, including stakeholders', and will consolidate existing data and KPIs in order to seamlessly gather information which will be conveyed to the new AirPort Operations Centre (APOC). Furthermore, the AirPort Operations Centre will be equipped with up-to-date technology, aiming at guaranteeing the business continuity, including software and hardware facilities dedicated to this purpose, in order to support the airport operativity even in case of technical failures or emergency.
- Stansted airport: the specific aim for Stansted Airport (STAL)is to deliver an information sharing platform presenting a single collaboratively agreed rolling plan and key airport operational status which is available to all airport's stakeholders. The plan is updated with flight trajectory, airport resources & local weather data to provide common situational awareness, KPI performance and alerts on plan variance to form the basis upon which stakeholders' decisions relating to process optimisation and optimal airport performance can be collaboratively made.
- Stockholm Arlanda airport: The specific aim is to establish automated data entry processes of stakeholders' inputs to optimise information sharing capabilities. Moreover, the aim is to introduce automation of data entries of crucial information not taken into account in ongoing projects such as runway capacity, limited by current environmental conditions at every given moment and information from the business system on runway and taxiway maintenance work distribution.
  Planning of airport throughput, e.g. RWY and TWY (Taxi way) capacity and limitations in regards of RWY configuration will be supported by a higher level of automation.
  - The interdependencies with 2015_292_AF2 (DMAN – Departure Management), 2015_290_AF2 (IAOP) and 2015_294_AF2 "OTP implementation" will be taken into account to prohibit overlaps between the projects.

  Most of the data entries today rely primarily on manual entry of data while complete AOP implementation will be performed by using automated data inputs to a large extent. The 2017 project will fill gaps (RWY configuration, occupancy time, data related to current environmental condition etc.) detected during the IAOP project phase.
- Paris Charles de Gaulle (CDG) & Orly (ORY) airports: This project addresses two major goals: the first Consolidation of AOP database by Baggage flows' information

and the second goal being deployment of the Airport Performance Assessment and Management Support (APAMS) & Simulation tools. The purpose of the Consolidation of the AOP database is to consolidate the departure process by providing accurate and reliable information related to baggage process. Paris Airports will use some of the deliverables from Project 2015_135_AF2 in order to implement this project track.

As for the second goal – APAMS & Simulation tools, it is planned that these tools will support the stakeholders to manage and optimise their operations. Similar to the first goal, Paris Airports will use some of the deliverables from project 2015_133_AF2 in order to accomplish this project track.

Tasks:

The Implementation Project consists of the following tasks:

- Task 01 – Common situational awareness: Create common situational awareness. As a part of Task 01 airports need to deliver improvements related to:
    - Flight trajectory data: Information sharing related to Flight Progress Information Elements of an Inbound/Outbound/Airport transit Trajectory to/from/at Airport.
    - Airport Resources data: Airside and Landside resources such as runway capacity & configuration, or parking stands.
    - Local weather data: Information sharing related to MET Information Elements of airport

  This task is applicable to all airports participating in this project.
- Task 02 – Stakeholders' decisions related to process optimisation: This task will help stakeholders on local level to optimise processes by taking the right decision. The local coordination as well as the local monitoring and reporting will be dealt with by the local partners.

  This task is applicable to all airports participating in this project.
- Task 03 – Project Management: this task allocated to Brussels Airport Company will consist in coordinating the participating partners and in ensuring sound and efficient communication, to meet deadlines through project management requirements and project objectives. A dedicated Project Management Office (PMO) will ensure that these objectives are met.
- Task 04 – Project management on local level: This task will consist in coordinating the project on local level. It is to identify all partners' costs related to local project management. This task is applicable to all airports participating in this project.

Expected Results:

By completing the project, it is expected that all airports will have:

- Optimised airport operations which result in better planning, better information sharing and thus ensure a better impact on the network
- Enhanced operational decisions which results in optimised departure surface and arrival management. Implementation of information sharing in order to optimise airport resources data, flight trajectory data and local weather data.

As a result of the project completion it is expected that airports will cover close to 100% of the gap identified under family 2.1.4. – Initial Airport Operational Plan (AOP):
Gap coverage:

- Paris CDG & ORY: 90%
- Stockholm Arlanda airport: 87%
- Brussels Airport: 90%
- Copenhagen Kastrup airport: 100%
- Dublin airport: 70%
- Fiumicino: 100%
- Frankfurt International airport: 100%
- Manchester Ringway airport: 85%
- Munich Franz Jozef Strauss airport: 100%
- Nice Cote d'Azur airport: 100%
- Milan Malpensa airport: 35%
- Stansted airport: 85%
- ENAV: 75%

The airports are expected to implement the following functionalities at 100%:

- Flight trajectory data: Information sharing related to Flight Progress Information Elements of an Inbound/Outbound/airport transit Trajectory to/from/at Airport.
- Airport Resources data: Airside and landside resources such as runway capacity & configuration, or parking stands.
- Local weather data: Information sharing related to MET Information Elements of airport.

Internal Achievements Points:

- Start of training - 12/04/2018
- End of training - 31/12/2020
- Parallel Operations / Operational Trials - 12/04/2018
- Cutover - SW ready and successfully tested - 30/11/2020
- Cutover and fall-back period completed - 31/12/2020

Contractual Milestone:

- Project Completed - 31/12/2020

Performance Benefits:

The implementation of the Initial AOP contributes to a more efficient operation at the participating airports.
The AOP will enhance the local processes in order to ensure the best possible usage of the available capacity and resources and create a positive impact to the network by making available the most actual and reliable data for the network planning process.
The capacity will be improved through optimal use of facilities and services, better use of airport and Air Traffic Flow Management (ATFM) slots.
The IP will bring benefits in terms of optimised airport operations and enhanced operational decisions through integrated systems. In particular, the coordinated approach will ensure the following aspects:

- Enhanced level of synchronisation,
- Sharing of best practises among of the participants,
- Reduced fragmentation,
- Enhance cross-border connections, international (8 EU Countries), national and regional traffic.

Expected Improvements (Annual Benefits):
AOP will improve stability of operations by working pro-actively on predicting future bottlenecks and allowing taking mitigating measures in advance.
AOP will also improve the predictability of operations by linking all airport processes (landside and airside) and assessing the impact of issues in one process on the other processes.
AOP will improve accuracy of timestamps within the airport both internally within the airport's community but also towards the network.
The following timestamp improvements are expected:

- Additional time in Arrival Sequencing and Metering Area (ASMA) 0.1%
- Airport ATFM Delay 0.3%
- Additional time in taxi in 0.1%
- Additional time in taxi out 3.0%
- ATC Delay 0.3%
- Operational Cancellation 18.4%

All of the above will ensure that AOP will achieve better demand-capacity balancing. In times of winter operations AOP will achieve:

- Better insights and predictability of remote de-icing operations, ensuring optimal usage of scarce capacity, reducing queues and thus fuel burnt, reducing amount of glycol used, eliminating the risk for -expiration of hold-over time;
- Better coordination of snow and ice clearing, reducing time spent in holding, queues in front of the runway.

➢ **2017_032_AF2 - TANGe (Tower ATS-System Next Generation) Phase 1+ incl. Service Architecture**

Start/end date: 12/04/2018 - 23/12/2019

Project Leader: DFS Deutsche Flugsicherung GmbH

Project Contributor: N/A

Overview:

A main objective of the project TANGe (Tower Air Traffic Service - ATS) Next Generation – Phase 1, 1+ and 2) is the implementation of core PCP functionalities with regard to deploying A-SMGCS (Advanced Surface Movement and Guidance Control System) Routing and Planning Functions as well as the associated Airport Safety Nets at the airports of Frankfurt (EDDF), Munich (EDDM), Düsseldorf (EDDL) and Berlin (EDDB).
The scope of this Implementation Project is the implementation of a new and enhanced tower ATS-system delivering the required PCP IR functionalities comprising:

- Departure Management Synchronised with Pre-departure sequencing,
- Departure Management integrating Surface Management Constraints,
- Automated Assistance to Controller for Surface Movement Planning and Routing,
- Airport Safety Nets,
- Upgrade to SWIM.

The need for an enhanced DFS tower ATS-system is justified/urgent because the current ATS-system is not capable of supporting the described "Airport Integration and Throughput" functions, except for the "Departure Management Synchronized with Pre-departure sequencing" for which DFS is already PCP compliant through the implementation of A-CDM at the PCP airports of Frankfurt (EDDF), Munich (EDDM), Düsseldorf (EDDL) and Berlin (EDDB; once airport becomes operational).
Furthermore, the current system architecture cannot be upgraded to a future iSWIM service with the relevant interfaces as required by the PCP Implementing Regulation EU No 716/2014 ATM Functionalities AF5. Hence, a change towards a service-orientated system architecture is indispensable.
The project TANGe is the first project of a DFS wide programme called "ZAAS – Zukunftsarchitektur ATS Systeme" - ("Future ATS System Architecture"). The programme ZAAS strives for optimisation of maintenance processes, methods, and ATS Systems. ZAAS supports digital transformation of DFS ATS IT by consolidating ATS Technology in Data Centres using new architecture concepts (e.g. Cloud Computing, Service Orientation). The goal is to accelerate the implementation and deployment of operational requirements. This also strives to optimise the use of resources in the product life cycle.
In order to ensure that the new tower ATS-system meets all operational requirements regarding performance for the Key Performance Areas of capacity, safety, ANS (Air Navigation Service) cost efficiency as well as resilience, interoperability and security of the system, the project / system TANGe will be deployed in three Phases.

- TANGe PHASE 1 defines all activities necessary to achieve the PCP IR S-AF 2.4 and S-AF 2.5 compliance for German PCP Towers (funded under IP 2016_021_AF2, Action 2016-EU-TM-0117-M).
- TANGe PHASE 1+ (scope of this Implementation Project) will use the results from phase 1 to generate requirement specifications needed to create necessary updates of

concept of services, migration, architecture, etc. to achieve the PCP IR S-AF 2.4 and S-AF 2.5 compliance for German PCP Towers.

- In TANGe PHASE 2 (scope of future funding applications) the system/services are developed and ready to be rolled out, will be deployed and taken into operational use at the airports of EDDF, EDDM, EDDL and EDDB. The TANGe System will be fully compliant with PCP IR S-AF 2.4 and S-AF 2.5 for EDDF, EDDM, EDDL and EDDB. It will also include the upgrade to SWIM standards. TANGe Phase 2, following phase 1+, is not part of this funding application.

Coordination with the airport operators regarding technical interfaces and infrastructure will be considered in Phase 2.
Phase 1+ of the TANGe project will deal with:

- Iterative validation and review of functional requirements,
- Iterative validation and review of human machine interface (HMI) requirements,
- Execution of safety assessments,
- Developement and update of an architecture concept aligned with a new established DFS program ZAAS "Future ATS System Architecture",
- Developement and update of a migration concept aligned with a new established DFS program ZAAS "Future ATS System Architecture",
- Developement and update of a maintenance concept for the new ATS System aligned with a new established DFS program ZAAS "Future ATS System Architecture",
- Creation of a process model concept for service orientated software development,
- Refinement of services and technical requirements (Follow-Up of Phase 1),
- Deployment/implementation of basic services,
- Transition and rollout concept ,
- Phase 1+ is a planning activity to achieve the PCP IR S-AF 2.4 and S-AF 2.5 compliance for German PCP Towers.

Specific objectives:

TANGe PHASE 1 (covered by IP 2016_021_AF2, Action 2016-EU-TM-0117-M): Defines concepts and specifies "WHAT" kind of system features and functions to develop with respect to roles and responsibilities.
TANGe PHASE 1+ (scope of this Implementation Project):
In addition to PHASE1, in this phase requirements will be refined. Appropriate validations will be done to clarify "HOW" the exact design of the functions will be.

Tasks:

The Implementation Project consists of the following tasks:

- Task 01 - Project Management: Full management of the project with a particular focus on controlling, timing and goal-orientated steering of the project activities.

- Task 02 - Functional operational requirements management and safety: Functional operational requirements management and safety including requirements management and safety management.
- Task 03 - Architecture and migration management concept: Description of architecture migration and maintenance.
- Task 04 - Software programming: Provision of concept on software definition and specification.
- Task 05 - Transition, rollout and deployment concept: Transition, rollout and deployment concept.

Expected Results:

Phase 1+ of the TANGe project will produce the following results:

- Project specific documents are drafted,
- Safety assessment concept document is drafted – Safety requirements are identified,
- Iterative requirements document is drafted,
- Refinement of services and technical requirements (Follow-Up of Phase 1) are achieved,
- Architecture concept document is drafted,
- Migration concept document is drafted,
- Maintenance concept for the new ATS is designed,
- Process model concept for service orientated software development is designed and approved,
- Basic services are deployed,
- Transition and rollout concept is designed.

Internal Achievements Points:

- Start of training - N/A
- End of training - N/A
- Parallel Operations / Operational Trials - N/A
- Cutover SW ready and successfully tested - N/A
- Cutover and fall-back period completed - N/A

Contractual Milestone:

- Project completed - 23/12/2019

Performance Benefits:

TANGe PHASE 1+:

The Phase 1+ is mandatory for Phase 2 that means the Performance benefits will be generated at the end of TANGe Phase 2 (roll-out).
In the long run, after implementation of TANGe PHASE 2 (not funded under this Action) the following benefits are expected:

- Reduced maintenance costs in system management, software development and deployment, product- and requirement management, reduced hardware costs
- To a create significantly higher flexibility and faster implementation of changes (time-to-operation)
- To achieve a more predictable and targeted further development of the ATS components (innovation capability) in the future
- To align operational requirements to procedures, regulations and ergonomics
- To align the TANGe ATS system with IT security requirements

➢ **2017_037_AF2 - TBS deployment at Paris CDG**

Start/end date: 12/04/2018 - 30/03/2021

Project Leader: The French State -Ministère de la Transition écologique et solidaire, DGAC (Direction générale de l'aviation civile), DSNA (Direction des services de la navigation aérienne)

Project Contributors:

- European Organisation For The Safety Of Air Navigation;
- Météo-France.

Overview:

DSNA is responsible for approach, runway and ground control at CDG (Charles de Gaulle airport). Several actions and projects are conducted at Paris CDG airport with contribution from several stakeholders coordinated within the CDM framework, to improve throughput and safety in a global roadmap planned up to 2024. Within the roadmap, Time-Based Separation (TBS) solution is identified as one major enabler for DSNA's contribution to the roadmap.
In this respect, DSNA contributed to SESAR2020 PJ02 work programme, whose intermediate results demonstrated real operational benefits to be expected from an integrated concept with Controller Support Tool (LORD: Leading Optimisation Runway Delivery). LORD allows for seamless and permanent integration of several separation standards and methods that bring optimised time separation from different perspectives (CSPR – Closely Spaced Parallel Runways, RECAT – Re-Categorisation, Time Based Separation, Pairwise Separation, Weather Dependent Separation, Enhanced Procedures, Runway Occupation Time), dynamically presenting in real time the most constraining separation applicable.

Global benefits are reduced controller workload while dealing with adaptive separations and complex procedures, reduced rate of under-spaced separations, increase and stabilisation of runway throughput.
Also part of the roadmap is the SYSAT programme that will deliver a full electronic environment on control work position. The LORD concept brings a significant evolution of control techniques used at approach and final landing, and requires a full electronic environment as far as the ATM system is concerned. The operational concepts developed in the project will be passed to SYSAT as inputs.
The proposed approach to implementing TBS in CDG is then to split the implementation and bringing into service of the LORD concept into 4 progressive steps up to 2024:

- Step 1, on legacy system: RECAT-EU Final Target Distance Indicator using TBS aircraft list.
- Step 2, on legacy system: procedural application of TBS (REDSEP - Reduced Separation).
- Step 3, on SYSAT system: TBS with wind and compression margin included.
- Step 4, on SYSAT system: target concept to be derived from LORD.

Specific objectives:

As a stepping stone to implement and bring into service TBS at CDG, this IP specifically aims to implement the two first steps of the gradual approach towards LORD and prepare the two last steps through deriving the CONOPS (Concept of operations) for steps 3 and 4.

- Objectives Step 1: RECAT-EU is already in operation at CDG. The objective of step 1 is an improved support of safe and more efficient RECAT-EU separations through direct visualisation on the ATC surveillance HMI of the Final Target Distance (FTD) indication of the RECAT-EU separation minima applicable behind the lead aircraft in sequence on final approach). This allows in addition a first familiarisation with the TBS HMI principles.
- Objective Step 2: Reduced separation at runway threshold, using a wind-based procedural reduction of separation (based on TBS REDSEP procedure designed and developed by EUROCONTROL with contribution of Austro Control for Vienna airport). It consists in applying, at and above certain wind conditions, the current distance-based separation at a displaced separation delivery point located at a given distance from the runway threshold. The obtained separation is eventually reduced at runway threshold thanks to the compression effects between successive aircraft.
- Objective CONOPS: The TBS LORD concept is to be adapted to CDG operational traffic and methods environment. Generic guidance and generic safety case documents for the LORD concept are to be published by EUROCONTROL. They will be the basis of a joint effort between CDG and EUROCONTROL to develop the precise concepts to be implemented at CDG for step 3 and 4.

Tasks:

The Implementation Project consists of the following tasks:

- Task 01 - TBS@CDG Project Management: Task 01 includes all activities related to the organisation and management of the IP and the coordination with external contributors Eurocontrol and Météo France, in order to meet the project objectives. It includes planning, coordination and control of the work progress whilst ensuring the quality of the deliverables within the planned timeframe, as well as coordination and reporting with the Deployment Manager.
- Task 02 - TBS@CDG FTD Implementation: Task 02 is internal to DSNA. It consists in designing and developing an evolution of the existing control HMI to accommodate for the FTD marker. The deployment of the new functionality is itself internal to DSNA since RECAT-EU separations are already in operation at CDG. Therefore "Training" involves only controllers and no information to airspace users is required.
- Task 03 - TBS@CDG REDSEP Procedure Implementation: Task 03 involves the two partners of the IP, Eurocontrol and Météo-France. Eurocontrol will provide support in adapting the REDSEP procedure to CDG traffic and operations context. Météo-France will provide wind data records and analysis relevant to the tuning of the REDSEP procedure. DSNA will be responsible for designing and developing an evolution of the existing control HMI in support of the operational concept designed with the support of the two partners. Stakeholders in the CDM organisation at CDG will contribute to an effort of information to airspace users before deployment of the TBS REDSEP procedure.
- Task 04 - TBS@CDG Conops for step 3 & 4: Task 04 involves the two partners of the action, Eurocontrol and Météo-France. They will provide support in designing operational concepts evolution for the two future steps of the roadmap to the implementation of TBS system functionality and HMI based on the LORD prototype.

Expected Results:

Step 1 and 2: Specification, implementation and bringing into service on legacy ATM system are completed. CONOPS: edition and publication of a document.
The proposed gradual approach is expected to ease the operational transition from step 1 to 4, while allowing taking into account the technical transition from legacy ATM system to the new SYSAT environment.

Internal Achievements Points:

- Start of training - 01/01/2020
- End of training - 29/01/2021
- Parallel Operations / Operational Trials – N/A
- Cutover SW ready and successfully tested – N/A
- Cutover and fall-back period completed - 25/08/2020

Contractual Milestone:

- Project completed - 30/03/2021

Performance Benefits:

Step 1: better delivery of RECAT separations. The FTD is not considered as a target point for radar vectoring, it must be kept as a visual assistance in support of RECAT. Expected gains are an improvement of safety through reducing workload for approach and tower controllers, a decrease of the frequency of missed approaches due to a better anticipation of loss of separation, and a first familiarisation with the TBS HMI principles.
Step 2: improve runway throughput performance and stability, by safely decreasing distance minima beyond separation standards when wind conditions allow for relaxing the wake turbulence constraints. Expected mean gain in capacity is 3 landings/hour, based on the recorded mean wind at CDG of 5kts (knots). Expected gain in waiting time is 224 minutes/day, based on the average day of traffic. That translates into annual gains of 3.6M€ of direct cost, a reduction of 3kT of fuel and 10kT of CO2, if 1min of waiting time is valued at 44€ and 38kg of CO2.

- **2017_058_AF2 - ITWP4LOWW (Integrated Tower Working Position for Vienna Schwechat)**

Start/end date: 12/04/2018 - 30/06/2019

Project Leader: Österreichische Gesellschaft für Zivilluftfahrt mit beschränkter Haftung, limited liability company

Project Contributor: European Organisation For The Safety Of Air Navigation

Overview:

The PCP deployment of A-SMGCS Routing and Planning Functions and Airport Safety Nets associated with A-SMGCS Level 2 (RMCA) results in both the need and the opportunity to re-evaluate the current set-up/layout of the Tower Controller Working Position (CWP). In this context, the further integration of existing Tower systems (such as EFS – Electronic Flight Strips and A-SMGCS) needs to be investigated for its potential of delivering increased operational benefits.

Specific objectives:

Building on the work already undertaken in SESAR R&D (WP6, P6.7.1/2/3, P6.9.2, WP 12), the Implementation Project "ITWP4LOWW (Integrated Tower Working Position for Vienna Schwechat)" focusses on the following three streams of work, with the objective of producing a solid basis for local deployment:

1. The IP will firstly review the EUROCONTROL A-SMGCS Specification and ITWP HMI Description and aims to identify operational and functional requirements applicable to LOWW in the context of the PCP.
2. Secondly, LOWW will be prototyped on the ITWP platform in order to fine-tune software requirements and assess future CWP requirements (Screens, TID etc.).
3. Lastly, a safety assessment by the Local Safety Committee (LSC) will be conducted within the proposed project.

Tasks:

The Implementation Project consists of the following tasks:

- Task 01 - Project Management: Project Planning, Project Coordination, Project Controlling, Project Reporting, Project Closedown, Feedback/Lessons Learned.
- Task 02 - Review of existing EUROCONTROL requirements baseline:
  - 2 day Workshop,
  - Mapping of ITWP and EUROCONTROL A-SMGCS requirements to current status of deployment.
- Task 03 - Definition of Operational Concept LOWW:
  - Presentation of Operational Concept of ITWP by EUROCONTROL,
  - Proof of operational concept based on prototyping runs,
  - Definition of operational concept for LOWW,
  - Review by EUROCONTROL.
- Task 04 - ITWP Platform Adaptation/tuning:
  - LOWW Environment preparation reflecting local procedures, traffic samples and new A-SMGCS Services,
  - Local adaptation of software and hardware at LOWW if platform is to be based there.
- Task 05 - Definition of requirements catalogue for PCP deployment:
  - Definiton of different types of requirements e.g. functional, non-functional, software requirements,
  - These requirements will be used for procurement,
  - Split between working position requirements, software requirements,
  - Elaboration of principles and functionalities, not detailed requirements (e.g. no definition of exact warning colour just defining that there needs to be a warning color).
- Task 06 - Tests on EUROCONTROL Platform: Iterative process:
  - 5-7 prototyping sessions + preparation and debrief with 3-5 AustroControl persons and 4 EUROCONTROL (AustroControl staff can also be easily trained to perform the Simulator pilot inputs);

  - 2-3 days workshop per session;
  - Additional test on site.
- Task 07 - Safety Review: Review of new A-SMGCS Services and their "functions" (e.g. routing, safety nets-nets-RMCA (Runway Monitoring and Conflict Alerting), CATC (Conflicting ATC Clearances), CMAC (Conformance Monitoring Alerts for Controllers)) by TWR LSC.

Expected Results:

Following the three main streams of work, the proposed project aims to implement the specific objectives and reach the following expected results:

1. A table of PCP relevant requirements for Tower LOWW is created in order to reach compliance with 2.4.1 "A-SMGCS Routing and Planning Functions" and 2.5.1 "Airport Safety Nets associated with A-SMGCS level 2".
2. An operational concept is developed with regards to PCP requirements.
3. Controller working position requirements are defined with regards to PCP.

The fulfilment of abovementioned objectives will result in the establishment of a requirement catalogue, which is a prerequisite and indispensable for further implementation, following the project proposed here.
Further implementation (outside the scope of the Action) will build on the requirements defined in this project and aims towards a full coverage of 2.4.1 "A-SMGCS Routing and Planning Functions" and 2.5.1 "Airport Safety Nets associated with A-SMGCS level 2" which will be achieved through the following steps:

1. Development by supplier.
2. Adaptation/Tuning for local environment, CWP redesign, surveillance adaption, ICD definitions to other systems, Procedure definition, etc.
3. Training.

Internal Achievements Points:

- Start of training – N/A
- End of training – N/A
- Parallel Operations / Operational Trials - N/A
- Cutover SW ready and successfully tested - N/A
- Cutover and fall-back period completed - N/A

Contractual Milestone:

- Project completed - 30/06/2019

Performance Benefits:

- Improve safety on LOWW Airport Ground by 20%

- Improve safety on LOWW Airport Runway by 5%
- Improve ATCOs Productivity in LOWW by 15%
- Improve predictability in LOWW by 10%

➢ **2017_063_AF2 - A-SMGCS High Performance Surveillance enhancement in view to support routing & planning functions implementation**

Start/end date: 01/09/2018 - 01/11/2021

Project Leader: Luchtverkeersleiding Nederland (Air Traffic Control The Netherlands)

Project Contributor: N/A

Overview:

The main aim of this Implementation Project is to upgrade the Advanced Surface Movement Guidance and Control System (A-SMGCS) surveillance system at Schiphol Airport to provide the high-performance surveillance information required by (is a pre-requisite for) A-SMGCS routing & planning functions and airport safety nets. The A-SMGCS routing & planning functions and airport safety nets require full coverage of the Runways and Airfield Surface Movement area including the gate areas (for detection of push-backs) and a high availability of the surveillance information. The full coverage requires optimal sensor locations to guarantee detection by surveillance sensors and to improve the quality of the surveillance data. The high availability requires a redundant design for the communication between sensors and central processing units and redundant central processing Ground Surveillance units. The high availability of the new system prevents disturbing outages at Schiphol thus improving resilience. The A-SMGCS surveillance system provides its information to the Air Traffic Control Tower system in which further processing takes place for various functions. These Tower system functions are not in the scope of the Implementation Project.
A state of the art tower system (flight processing system), that is also a prerequisite for A-SMGCS Routing and Planning Functions, is realised by the implementation project 2015_187_AF2 "TWR System at Amsterdam Schiphol". In this tower system project, the last part of the data processing chain needed for A-SMGCS level 1&2 will be realised according to the PCP requirements (Family 2.2.1). The first part of the chain consists of the A-SMGCS surveillance system. In a future CEF call LVNL will propose the activities for adding A-SMGCS Routing and Planning Functions to the tower system. There are no overlaps between the proposed implementation project and the implementation projects 2015_187_AF2 "TWR System at Amsterdam Schiphol" and 2016_150_AF2 _GND "Enabler for Surface Movement & Safety Nets". These implementation projects have a clearly separated scope and complement each other. Flexible routing by means of individual lamp control in the manoeuvring area requires route information provided by the tower system. The tower

system will use A-SMGCS surveillance information and the A-SMGCS Routing and Planning Functions for the Airport safety nets function.

Specific objectives:

The A-SMGCS surveillance system specifically aims to use co-operative airport surveillance sensors at Schiphol which provide both Multi LATeration (MLAT) and Automatic Dependent Surveillance Broadcast (ADS-B) updates. MLAT uses Time Difference Of Arrival (TDOA) measurements to determine the position of transponder equipped aircraft and vehicles. ADS-B forwards the position measured on board of the aircraft or vehicle (usually a GPS position). The implementation project ensures optimal A-SMGCS surveillance coverage at Schiphol Airport by the right number of sensors and optimal sensor locations, installing state of the art sensors which support multiple central surveillance processing systems. The sensor locations are selected in consultation with Amsterdam Airport Schiphol. The installation of additional antennas and communication cables is carried out in good cooperation with Schiphol Airport. High availability of the sensor information is guaranteed by using a redundant data communication infrastructure, and a redundant central surveillance processing system. Then sufficient quality of surveillance data can be obtained for further A-SMGCS processing and use by the tower system.

Tasks:

The Implementation Project consists of the following tasks:

- Task 01 - Project Management: This task includes all project management activities such as, making a project plan, progress reporting, daily project management and release management.
- Task 02 - Determining optimal sensor locations, design and specify the system: Determining optimal sensor locations, design and specify the system. The sensor locations are selected in consultation with the Airport Schiphol.
- Task 03 - The purchase of equipment and realisation of the ground surveillance system: The installation of additional antennas and communication cables is carried out in good cooperation with Schiphol Airport.
- Task 04 - Realise network connecting ground surveillance system: Design and realisation of the data communication network connecting existing and additional ground surveillance sensors with the processing system.
- Task 05 – Project closure: This task includes activities for project aftercare, updating the documentation and project closure.

Expected Results:

- The optimal coverage of the airport with an optimal number and location of the Ground Surveillance sensors is defined.

- An improved (redundant) communication infrastructure between sensors and central units is deployed.
- New surveillance sensors are installed at optimal locations at Schiphol Airport to provide optimal coverage of the airfield.
- Sensors can be controlled by multiple central units.
- The central surveillance processing system is upgraded to a redundant system. A second central surveillance processing system is installed (which shares the ground surveillance sensors with the present central surveillance processing system).
- The upgraded A-SMGCS Surveillance System at Schiphol airport is deployed including validation of the system.
- New & optimised back-up procedures to improve availability in outage situations are deployed.
- Technical and operational personnel are trained for the system.
- Transition of the system into operation is ensured.
- The system is handed-over to the change and maintenance organisation.

Internal Achievements Points:

- Start of training – N/A
- End of training – N/A
- Parallel Operations / Operational Trials - N/A
- Cutover SW ready and successfully tested - N/A
- Cutover and fall-back period completed - N/A

Contractual Milestone:

- Project completed - 01/11/2021

Performance Benefits:

The implementation project improves the ability to withstand and recover from low visibility conditions which cause a loss of nominal capacity. The deployment of the A-SMGCS Surveillance System improves the quality of surveillance data by a better coverage of the Schiphol Airport area and sensor redundancy. The loss of air traffic situation picture in limited visibility conditions is very unlikely but the resilience is improved. Scheduled downtime – related to maintenance and central surveillance processing system upgrades – are being minimised by adding a second central processing system. A second central system allows LVNL to execute maintenance and test activities during regular office hours (thus enabling more effective use of human resources).
A-SMGCS is required for providing aerodrome surveillance as well as planning, routing and guidance for the control of aircraft and vehicles in order to maintain the declared surface movement rate under all weather conditions within the aerodrome visibility operational level (AVOL) while maintaining the required level of safety. The deployment of a high-performance A-SMGCS surveillance system at Schiphol Airport is a prerequisite and critical

enabler to deploy additional performance improvements (on safety, capacity and predictability) that can be obtained by implementing routing & planning functions and airport safety nets in the Air Traffic Control Tower system.

Activity 4: AF3 Implementation (50% co-funded)

Combined operation of Flexible Airspace Management and Free Route enable airspace users to fly as closely as possible to their preferred trajectory without being constrained by fixed airspace structures or fixed route networks. It further allows operations that require segregation, for example military training, to take place safely and flexibly, and with minimum impact on other airspace users.

It is composed by the following technical families:
S-AF 3.1: ASM and Advanced FUA:
- Family 3.1.1: ASM Tool to support AFUA;
- Family 3.1.2: ASM management of real time airspace data;
- Family 3.1.3: Full rolling ASM/ATFCM process and ASM information sharing;
- Family 3.1.4: Management of Dynamic Airspace configurations;

S-AF3.2: Free Route:
- Family 3.2.1: Upgrade of ATM systems (NM, ANSPs, AUs) to support Direct Routings (DCTs) and Free Routing Airspace (FRA);
- Family 3.2.3: Implement Published Direct Routings (DCTs);
- Family 3.2.4: Implement Free Route Airspace.

Within the objective of the Action, the following Families are addressed:
Family 3.1.2 - ASM management of real time airspace data;
Family 3.1.3 - Full rolling ASM/ATFCM process and ASM information sharing; and
Family 3.2.1 - Upgrade of ATM systems (NM, ANSPs, AUs) to support Direct Routings (DCTs) and Free Routing Airspace (FRA).

Sub - Activity 4.1 Activity 4 Coordination

Leader: SESAR Deployment Alliance
Start Date: 12/04/2018
End Date: 31/12/2023

The Activity aims at coordinating the implementing initiatives within the scope of AF3 and its sub AFs. According to Deployment Programme Methodology, each Implementing Partner will support SDM during Cost Benefit Analysis (CBA) finalisation at Action Level. The SDM will steer the Implementing Partners to provide all contributions needed to prepare CBA according to the INEA guidelines

Deliverables:
- 4.1.1 Action Status Report (ASR) – IP Level – submitted as an Annex to Action Status Report (del. 1.2.4) every year until 2023
- 4.1.2 Risks and Issues, and mitigation Actions Registry – AF3 level – submitted 2 times per year (30/04; 30/09) until 2023 starting from 2019
- 4.1.3 Final Report (technical content) – 31/12/2023

Sub - Activity 4.2 AF3: Implementation Projects

- **2017_029_AF3 - Deployment of Centralised Interoperable Center Information Service (Step 1)**

Start/end date: 12/04/2018 - 30/06/2023

Project Leader: DFS Deutsche Flugsicherung GmbH

Project Contributor: N/A

Overview:

CICIS (Centralised Interoperable Center Information Service) is an integrated and interoperable information tool within the Controller Working Position (CWP) [FDA - flight data assistant and SV - supervisor] of the main DFS ATM system for retrieval, exchange and display of strategical and operational information which will be rolled out at all DFS control centres for the iCAS (interoperability through European collaboration centre automation system) system generation. The system will be SWIM service based and deployed as a centralised hosted service.
Compared to its predecessor ATCISS (Air Traffic Control Information Support System) it offers lean maintenance and is based on a state-of-the-art new technological platform as well as interoperable SWIM services (System-Wide Information Management). CICIS offers strategical and operational valuable data and information about weather services, airspace status information, and air traffic flow information such as capacities and demands, concentrated in to one operational information service and display tool to the local ATFCM (Air Traffic Flow and Capacity Management) function.
Furthermore, the service and display tool may provide the supervisor and ATCO with the ability to input bookings of military or other kinds of special use areas directly into the system information exchange. These requirements will be further defined as part of this Implementation Project (IP).

This project, broad in its scope, covers several Families identified in the DP: 3.1.2, 3.1.3, 5.3.1, 5.4.1 and 5.5.1. The project efforts during 2022 and 2023 will aim mainly to implement AF5. As a result, this implementation project will comply with the regulatory deadlines set in the PCP for Free Route implementation (AF3) and the SESAR Deployment Programme (SDP) implementation sequence.

Specific objectives:

- Step 1 (scope of this funding application): CICIS System Project:
  Step 1 specifically aims to undertake the definition of the dedicated system and service requirements, the adaptation and migration of these to a new centralised

system platform as well as the procurement of the new system as well as ensuring its operational readiness. The new system within the control centre (clients) shall thus make use of centrally provided data. Step 1 implementation will conclude with the Factory and Site Acceptance Tests of the new system/ service and includes CICIS system integration at a pilot site.

- Step 2 (scope of future funding application): CICIS Deployment Project:
  Step 2 specifically aims to build on the Step 1 implementation and its operational readiness of the procured system and take the Centralised Interoperable Centre Information Service into operation at the DFS control centres (i.e. clients) Karlsruhe, Munich, Bremen and Langen from a centralised and redundant location.

Tasks:

The Implementation Project consists of the following tasks:

- Task 00 - Project Management: This task includes all project management activities such as, making a project plan, progress reporting, daily project management and release management.
- Task 01 - System/ Service License and Hardware Procurement: Procurement of test and software programming environment including necessary software licenses.
- Task 02 - Definition of Operational Requirements: Capture of user requirements related to system capabilities and Human Machine Interface.
- Task 03 - Definition of Technical Requirements: Capture of non-functional requirements (including definition of all necessary interface description documents) related to robust and stable system operations.
- Task 04 - Definition of System Design/ System Architecture: Investigation of feasibility and means to host CICIS on Data Centres:
  - Creation and update of an architecture concept aligned with a new established DFS program ZAAS "Future ATS System Architecture", which foresees the establishment of Data Centres to host ATS Service provisioning.
  - Creation and update of a migration concept aligned with a new established DFS programme ZAAS "Future ATS System Architecture".
  - Creation and update of a maintenance concept for the new ATS System aligned with a new established DFS programme ZAAS "Future ATS System Architecture".
  - Preparation of HMI adaptation for pilot site.
- Task 05 - Preparation System and Software Requirements: Translation/ refinement of operational and technical requirements into a system/ software specification to be used for software programming.
- Task 06 - Safety Assessment: Task in accordance with DFS safety management process.
- Task 07 - Definition of Software Design: Creation of a concept for service orientated Software development.

- Task 08 - Software Programming: Execution of software programming.
- Task 09 - Test of Software Requirements: Verification of correct implementation of software requirements.
- Task 10 - Factory Acceptance Test (FAT): Verification of correct implementation of system requirements.
- Task 11 - Site Acceptance Test (SAT): Verification of correct implementation of system requirements and verification of integration with operational environment at pilot site.

Expected Results:

- Process/system is upgraded to ready the ATM system for a full rolling ASM (Airspace management)/ATFCM and dynamic ASM/ATFCM process.
- Necessary technical pre-requisites supporting automated ASM information sharing for rolling AUP (Airspace Use Plan), UUP (Updated Airspace use plan) are available.
- Implementation is based on new AUP template content and format based on AIXM (Aeronautical Information Exchange Model).
- Process/System improvements supporting sharing of information of airspace configurations (via AUP/UUP) and full management of Airspace structure are implemented.
- Notification of the activation of an Airspace Reservation/Restriction (ARES) is implemented.
- Notification of the de-activation of an Airspace Reservation/Restriction (ARES) is implemented.
- Pre-notification of the activation of an Airspace Reservation/Restriction (ARES) is implemented.
- Notification of the release of an Airspace Reservation/Restriction (ARES) is implemented.
- Aeronautical information feature is available on request. Filtering is possible by feature type, name and an advanced filter with spatial, temporal and logical operators.
- Query Airspace Reservation/Restriction (ARES) information is available.
- Airspace Use Plans (AUP, UUP) are drafted.
- the system for meteorological information supporting En Route/Approach ATC process or aids involving the relevant MET (Meteorological) information, translation processes to derive constraints for weather and converting this information in an ATM impact, is ready; the system capability mainly targets a 'time to decision' horizon between 20 minutes and 7 days as well as to provide Volcanic Ash Mass Concentration.

The information to be exchanged and displayed to the air traffic controller comprises:

- Maximum airport capacity based on current and near - term weather conditions,
- Departure and arrival planning information,

- ATFCM pre-tactical and tactical plans (regulations, re-routings, sector configurations, runway updates, monitoring values, capacities, traffic volume activations, scenarios, etc.),
- Short term ATFCM measures,
- ATFCM congestion points,
- Network events,
- Rerouting opportunities,
- Restrictions,
- Traffic counts information,
- Demand data (civil, military),
- Flow and Flight message exchange,
- Airspace structure, availability and utilisation,
- Network and En-Route/Approach Operation Plans,
- Network impact assessment,
- Service availability information,
- General information messages (ATFCM Information Messages and headline news).

Internal Achievements Points:

- Start of training – N/A
- End of training – N/A
- Parallel Operations / Operational Trials – N/A
- Cutover SW ready and successfully tested – N/A
- Cutover and fall-back period completed – N/A

Contractual Milestone:

- Project completed - 30/06/2023

Performance Benefits:

Having regard to the Performance Assessment undertaken for the CICIS project particular contributions are achieved for the following Key Performance Indicators (KPI) upon implementation of Step 1 (within the Action) and Step 2 (outside the Action):

1. Flight Efficiency in Fuel;
2. Flight Efficiency in Time;
3. ANS cost.

- A CBA was prepared comparing the CICIS project with a prolonged operational use of the existing outdated information data processing system ATCISS: The CICIS cost benefit analysis indicates a cost reduction in total lifecycle costs.
- Cost sharing in the CICIS SW development. The SW development cost of common requirements will be shared.

- Cost sharing in CICIS SW maintenance.

These KPI are addressed as the deployment of CICIS in German airspace controlled by DFS. The benefits are achieved by providing the supervisor and the air traffic controller with the best quality and most up-to-date information on the current operational situation in a way that the air traffic controller has all information at its disposal in order to most efficiently manage air traffic. This is particularly achieved by providing the air traffic controller with information on airspace reservation status (see Family 3.1.3 and 3.1.2) and the air traffic controller enabling more direct and efficient flight paths pending the actual airspace status. This will reduce fuel consumption and CO2 emissions thus having a positive impact on the environment. Furthermore, the system / service will offer reduced maintenance costs and therewith lower overall lifecycle costs.

- **2017_031_AF3 - Procurement and Deployment of PCP Air Traffic Control System iCAS at DFS Munich and Bremen and LVNL Amsterdam**

Start/end date: 12/04/2018 - 31/12/2023

Project Leader: DFS Deutsche Flugsicherung GmbH

Project Contributor: Luchtverkeersleiding Nederland (Air Traffic Control The Netherlands)

Overview:

The iCAS programme objective is to procure and deploy a state-of-the-art, harmonised and interoperable air traffic control system which will be rolled out at all DFS and LVNL control centres. iCAS is a significant functional evolution to the current DFS ATS systems P1/ATCAS and P1/VAFORIT and the LVNL ATS system AAA. iCAS features a 4D-trajectory and is designed to provide ATC services within the entire airspace of Germany and the Netherlands including all lower and upper control centre sectors (except in airspace controlled by EUROCONTROL Maastricht UAC). iCAS will be used as a fully integrated civil / military ATS system, thus enabling a more "advanced and flexible use of the airspace" (A-FUA) for both civil and military purposes. In addition, iCAS will be used to control and safely guide more than three million flights carrying over 450 million passengers flying through European core airspace per year. The key iCAS components Flight Data Processor, Controller Working Position and Middleware are developed in the iTEC Collaboration together with a total of 7 ANSPs thus enabling a cost-efficient procurement as well as ensuring an interoperable system in line with the strategic goals of the Single European Sky (EU No. 552/2004 and EU No. 1070/2009). iCAS will enable the introduction of future operational concepts which are based on 4D-trajectory information and which aim to move from today's tactical ATM operations towards increasingly strategic ATM operations.
iCAS procurement and deployment is planned in an iterative 2-step approach called iCAS Phase I (iCAS-I) and iCAS Phase II (iCAS-II).
iCAS-I: Deployment of iCAS at Karlsruhe Control Center

Successful deployment at the DFS' Control Centre Karlsruhe is achieved already (funded under Action 2015-EU-TM-0196-M, IP 2015_190_AF3). The roll out planning of iCAS-II at Karlsruhe is part of this Action.
iCAS-II adds all necessary functions to the iCAS-I system to support ATC services in lower en-route and Terminal Manoeuvring Area (TMA) and to enable the transition between free route airspace and low en-route and terminal airspace operations including the integration with their associated TMAs and Extended Arrival Management systems. iCAS will be connected to the major hub airports of Berlin International Airport, Amsterdam-Schiphol Airport, Munich International Airport, Frankfurt International Airport and Düsseldorf International Airport.
iCAS is an important contribution to DFS' and LVNL's ability to achieve the implementation of numerous Families of the Deployment Programme of the SESAR Deployment Manager. Given the number of control centres and their associated airspace within core / central Europe involved, iCAS is understood as a major deployment and contributing project to the European implementation of EU Implementing Regulation 716/2014.The key iCAS components Flight Data Processor, Controller Working Position and Middleware will be deployed into all ACCs of the iTEC ANSPs AVINOR, DFS, ENAIRE, LVNL, NATS, ORO Navigacia and PANSA making a total of 14 control centres with their associated airspace.
iCAS System procurement and Deployment is currently executed by two DFS/LVNL projects that are already part of the SESAR Deployment Programme:

1. The "System Procurement for Deployment of PCP Air Traffic Control System iCAS at DFS and LVNL" (project designator: 2016_026_AF3).
2. The "Deployment of Air Traffic Control System iCAS: Implementation of ATM PCP Functionalities at LVNL and DFS" (project designator: 2015_190_AF3).

These two projects cover iCAS activities until the end of 2020. The current new project will complement these projects by covering iCAS deployment activities up from 2021 without any duplication. There is also no duplication with the DFS Free Route project 2015_189_AF3 because the scope of that project is a deployment of free route airspace structures and free route operational procedures independent from the iCAS programme.

Specific objectives:

This IP specifically aims to achieve the complete deployment of the iCAS-II system at the Amsterdam, Bremen and Munich Control Centres by executing all necessary activities during the years 2021-2023. All 3 Control Centres are scheduled to start operational service based on iCAS-II before the PCP mandated date of 1st. January 2022. All activities after that mandated date are needed to complete the deployment process by decommissioning the old ATC systems. The project also includes the planning for rolling out iCAS-II at the DFS control centre Karlsruhe.
Note: The operational transition towards iCAS based operations is different for DFS and LVNL. Main difference is that LVNL ATCOs work already today without paper strips or electronic strips. One consequence from this is that the LVNL ATCOs require less iCAS training than the DFS ATCOs.

Tasks:

The Implementation Project consists of the following tasks:

- Task 01 - iCAS-II Deployment Planning Control Centre Karlsruhe: Develop a plan to deploy iCAS Phase II at UAC Karlsruhe including the technical and operational transition from iCAS Phase I to iCAS Phase II.
- Task 02 - iCAS-II Deployment Control Centre Munich:
  Note: The activities of this task until 31/12/2020 are already covered by the Specific Grant Agreement 2015-EU-TM-0196-M, IP 2015_190_AF3, which are:
  - to procure and install the iCAS Operational and Training Systems including building and infrastructure measures.
  - to perform a master integration assuring that all system functions and interfaces between the iCAS core and other components work as specified.
  - to perform a system transition, including technical staff training.
  - to perform an operational validation at the supplier's factory (lab check) and on site (debug check) on the software releases that will be used for ACC Munich operational service
  - to verify that the data exchange with all external partners functions correctly.
  - to perform an operational transition including operational staff training to test the operational use of the iCAS system during several operational nightlife and weekend trials.

  This Action includes activities as from 01/01/2021 to cover the full life cycle of the iCAS deployment in Control Centre Munich:
  From beginning of 2021: Post-Cutover Optimisation
  - to perform the final switch-over from P2i to iCAS.
  - to decommission the P2i system.
  - to expand the Operational Room after all P2i systems have been removed.
- Task 03 - iCAS-II Deployment Control Centre Bremen:
  Note: The activities of this task until 31/12/2020 are already covered by the Specific Grant Agreement 2015-EU-TM-0196-M, IP_2015_190_AF3, which are:
  - to procure and install the iCAS Operational and Training Systems including building and infrastructure measures.
  - to perform a master integration assuring that all system functions and interfaces between the iCAS core and other components work as specified.
  - to perform a system transition, including technical staff training.
  - to perform an operational validation at the supplier's factory (lab check) and on site (debug check) on the software releases that will be used for Bremen operational service
  - to verify that the data exchange with all external partners functions correctly.

  The Action includes activities as from 01/01/2021 to cover the full life cycle of the iCAS deployment in Control Centre Bremen:
  From beginning of 2021:

  - to perform an operational transition including operational staff training to test the operational use of the iCAS system during several operational nightlife and weekend trials.
  - to peform the cutover from P1/ATCAS operations to iCAS operations

  Post-Cutover Optimisation
  - to perform the final switch-over from P1/ATCAS to iCAS
  - to decommission the P1/ATCAS system
  - to expand the Operational Room after all P1/ATCAS systems have been removed

- Task 04 - iCAS-II Deployment Control Centre Amsterdam:
  Note: The activities of this task until 31/12/2020 are already covered by the Specific Grant Agreement 2015-EU-TM-0196-M, IP 2015_190_AF3, which are:
  - to procure and install the iCAS Operational and Training Systems at ACC Amsterdam for civil and military use including building and infrastructure measures.
  - to perform a master integration assuring that all systems, functions and interfaces work as specified.
  - to perform a system transition, including technical staff training.
  - to perform an operational validation at the supplier's factory (lab check) and on site (debug check) on the software releases that will be used for ACC Amsterdam operational service.
  - to verify that the data exchange with all external partners functions correctly.

  This Action includes activities as from 01/01/2021 to cover the full life cycle of the iCAS deployment in Control Centre Amsterdam:
  From beginning of 2021:
  - to perform an operational transition including operational staff training to test the operational use of the iCAS system during several operational nightlife and weekend trials.
  - to perform the switch-over from AAA to iCAS in the OPS room A.

  Post-Cutover Optimisation
  - to perform decommissioning of the AAA-system.
  - to perform the final switch-over to iCAS in the OPS room B after all AAA system have been removed

- Task 05 - iCAS Programme: This task includes the overall project management activities including the coordination between the activities and DFS and LVNL organisation.
  The iCAS programme is a management organisation with the main objective to coordinate, monitor and supervise the individual iCAS tasks and projects. DFS and LVNL have agreed an overall iCAS programme governance which defines the main iCAS organisational bodies at all hierarchy levels from Working level up until Executive Management level.

Expected Results:

Main achievement of this project will be to enter into iCAS operational service in the control centres of Amsterdam and Bremen. iCAS-I and iCAS-II achieve a synchronised implementation of the following families from the SESAR Deployment Programme above and below FL310:

1. 3.2.1 ATM systems (NM, ANSPs, AUs) are upgraded to support Direct Routings (DCTs) and Free Route Airspace;
2. 3.1.2 ASM Management of Real Time Airspace Data is implemented;
3. 3.1.4 Management of Dynamic Airspace Configuration is implemented;
4. 3.2.3 Published Direct Routings are implemented;
5. 3.2.4 Free Route is implemented;
6. 1.1.2 AMAN is upgraded to include Extended Horizon function;
7. 1.2.3 RNP1 Operations are implemented in high density TMAs (ground capabilities);
8. 1.2.5 RNP routes connecting Free Route Airspace (FRA) with TMA are implemented;
9. 4.2.3 Interface ATM Systems to NM Systems are implemented;
10. 4.4.2 Traffic Complexity Tools are implemented.

Note: In order to keep the deadline for Family 3.2.1, all 3 Control Centres are scheduled to start operational service based on iCAS-II before 1st January 2022. All activities after that mandated date are needed to complete the deployment process by decommissioning the old ATC systems.

Internal Achievements Points:

- Start of training - 01/01/2021
- End of training - 31/12/2021
- Parallel Operations / Operational Trials - 24/07/2021
- Cutover SW ready and successfully tested - 30/06/2021
- Cutover and fall-back period completed - 31/03/2022

Contractual Milestone:

- Project completed - 31/12/2023

Performance Benefits:

iCAS will have a positive impact on several Key Performance Areas as follows:

- Safety: Advanced conflict management tools will increase situational awareness of potential conflicts.
- Capacity: iCAS will enable free route operational concepts providing more flexibility for management and execution of FABEC (Functional Airspace Block Europe Central) air traffic.
- Cost Effectiveness: Common iTEC development of Key iCAS components will improve cost efficiency.

- Flexibility: Advanced tools that are based on 4D-trajectories will achieve better system performance providing options to handle traffic more pro-actively.
- Productivity: Increased system support and advanced tools will free the ATCOs from routine tasks providing gains in productivity.
- Flight Efficiency: The above performance benefits will enable improve flight efficiency regarding time and fuel consumption.

In the long run, the implementation of iCAS-III version (not part of this Action) will add functionalities from PCP AF5 and AF6 to enable the use of iSWIM and initial 4D trajectory services in operational service. iCAS-III will build on iCAS-II which makes iCAS-II a critical enabler for PCP AF5 and AF6 deployments. Specifically, iCAS-III will in addition deploy the following Families of the DP 2017:

1. 2.3.1 Time Based Separation;
2. 5.1.2 Future PENS;
3. 5.3.1 Upgrade/Implement Aeronautical Information Exchange System / Service;
4. 5.4.1 Upgrade/Implement Meteorological Information Exchange System / Service;
5. 5.5.1 Upgrade/Implement Cooperative Network Information Exchange System / Service;
6. 5.6.1 Upgrade/Implement Flights Information Exchange System/Service supported by Yellow Profile;
7. 6.1.1 ATN (Aeronautical Telecommunication Network) B1 based services in ATSP domain.

➢ **2017_041_AF3 - ASM - LARA Enhancement - Implementation in Italy**

Start/end date: 01/05/2018 - 31/12/2021

Project Leader: ENAV S.p.A.

Project Contributor: Italian Air Force (MoD)

Overview:

The management of airspace in terms of advanced flexibility is of utmost importance for its optimisation. LARA (Local and sub-Regional Airspace Management Support System) is a tool largely used and being implemented by ENAV (2015_202_AF3, Action 2015-EU-TM-0193-M). The main objective of the Implementation Project is to extend this implementation also to the Italian Airforce. The implementation will require further adaptation of existing tools by the Italian Airforce. Moreover, enhancements to LARA in order to completely meet the requirements of Reg. (EU) 716/2014 will be planned through functional and technical requirements.
Project 2015_202_AF3 "ASM tool implementation" (Action 2015-EU-TM-0193-M) covers for ENAV the ASM tool acquisition, installation and customisation, ASM tool integration, ASM tool training, revision of ASM documentation and the implementation.
The Implementation Project under this Action will include:

- LARA implementation by the Italian Air Force at level of Airspace Management Cell in Rome,
- Italian Air Force familiarisation with LARA tool,
- improving interoperability of existing internal Italian Air Force tools by the upgrade and the implementation of external interfaces and
- further identification of LARA enhancement requirements in compliance with Reg. (EU) 716/2014.

Specific objectives:

This Implementation Project specifically aims to align the use of the local ASM tool for both the civil and military authorities, in compliance with military and civilian security requirements, through the adaptation of Italian Air Force specific tools. Furthermore, it includes the enhancement of LARA in order to meet Regulation (EU) 716/2014 requirements, with particular reference to the automated exchange services of ASM data during the tactical and execution phases, continuously and in real time.

Tasks:

The Implementation Project consists of the following tasks:

- Task 00- WP0 - Project management: This activity includes overall management of project tasks, in order to ensure timely implementation of ASM/FUA (Free Use of Airspace) - Lara Enhancement.
- Task 01 – WP1 - ENAV/Italian Air force alignment and use of LARA Tool: First Alignment activity between Italian civil and military ANSPs on the implementation of LARA tool. Client working positions for military personnel will be installed with the LARA tool to allow the military familiarisation period.
- Task 02 – WP2 - Italian Airforce ASM tool update to interoperate with LARA: Upgrade of the existing Italian Airforce tools.
- Task 03 – WP3 - Enhanced LARA: Definition of system requirements and specification, identification of enhanced LARA requirements in order to fill the gap with the Reg.(EU) 716/2014.

Expected Results:

- An ASM management system is implemented at national level to support an advanced Flexible Use of Airspace.
- Functional and technical requirements are defined to meet regulatory demands for ASM.

Internal Achievements Points:

- Start of training - 01/02/2019
- End of training - 30/11/2020
- Parallel Operations / Operational Trials - 31/08/2020
- Cutover SW ready and successfully tested - 30/04/2020
- Cutover and fall-back period completed - 31/12/2020

Contractual Milestone:

- Project completed - 31/12/2021

Performance Benefits:

An improved ASM will ensure more flexibility for airspace users at pre-tactical and tactical level, increasing by 3% the national coordination and by 5% the safety levels. No impact on sectors capacity is expected.

➢ **2017_042_AF3 - Automatic Tactical Controller Tool implementation**

Start/end date: 01/01/2019 - 31/01/2023

Project Leader: ENAV S.p.A

Project Contributor: Italian Air Force (MoD)

Overview:

The Implementation Project is part of the Free Route Programme, which aims to achieve the objectives of AF 3 "Flexible Airspace Management and Free Route". This will allow airspace users to "freely" plan, inside Free Route areas, their flight plan using only the entry and exit points without following the published airways network.
This IP aims at implementing the automatic Tactical Controller Tool (aTCT) as an important integrated function in the ENAV ATM system. This system functionality is complementing IP #063AF3 "ENAV implementation of Free Route" (Action 2014-EU-TM-0136-M) and is to be considered an add-on to the improvements to Free Route brought by the IP 4Flight (2015_204_AF3_Phase_II - 4-Flight deployment in Italy 2019-2020), an additional feature not originally foreseen in that project.
The automatic TCT is allowing air traffic controllers to get promptly and automatically informed in the event of a potential conflict between two or more aircrafts with a prediction of about 15/20 minutes.

Specific objectives:

This IP specifically aims to:

- Support the Air Traffic Control Operator in the management of the airspace.
- Reduce the potential number of STCA (Short term conflict alerts) alerts and reduce the potential risk of separation minima infringement.
- Implement the automatic Tactical Controller Tool over all Italian ACCs to help the Air Traffic Control Operator to detect potential conflicts in his/her assigned portion of airspace. In heavy traffic situation the Air Traffic Control Operator has little reaction time and requires tailored assistance. The main aim of automatic TCT is to give support to the Air Traffic Control Operators to improve safety and operational efficiency reducing ATCO workload.
- Provide accurate support with the aTCT in the vertical and horizontal profiles. aTCT will not be solely dependent on efficient trajectory update (as is the case for MTCD (Medium term conflict detection) planning trajectory).
- Be aware with the aTCT of the traffic situation in terms of aircraft observed behaviour (surveillance) and forecasted behaviour (planned trajectory).
- Operate within the borders of the sector and will complement the planning controller's MTCD tool.
- Alert with the aTCT the controller about potential conflicts (separation minima infringements), that are likely to occur in the near term. In providing this advice the tool will consider both the planned trajectory and the aircraft's current behaviour.
- Provide with the aTCT a separation assurance aid.

Tasks:

The Implementation Project consists of the following tasks:

- Task 00 - WP0 - Project Management: Project Management activity will be conducted in order to ensure the progress of the project with timing, costs and quality standards expected.
- Task 01 - WP1 - Delivery and Integration: All the relevant activities linked to implementation and integration phases of the tool will be carried out within this WorkPackage.
- Task 02 - WP2 - Verification and Validation - WP2.1: Civil Systems Verification and Validation. WP2.2 - Military Systems Verification and Validation.
- Task 03 - WP3 - ATCOs Training - WP3.1: ATCOs Training. WP3.2 - Military ATCOs Training.
- Task 04 - WP4 - Transition to Operation: All activities related to the transition to operation of the new tool will perfomed in this Work Package.

Expected Results:

- aTCT is developed and delivered for the ENAV ATM System

- A more adaptive approach is provided when compared to current operations which is mainly reactive ATC combined with a number of constraints, airspace organisation and flow distribution.
- The tactical controller workload is reduced highlighting all the elements to be taken into account in the solution of potential conflict.

Internal Achievements Points:

- Start of training - 31/01/2022
- End of training - 30/06/2022
- Parallel Operations / Operational Trials – N/A
- Cutover SW ready and successfully tested - 31/03/2022
- Cutover and fall-back period completed - 30/09/2022

Contractual Milestone:

- Project completed - 31/01/2023

Performance Benefits:

- Safety: Early and systematic conflict detection and conformance monitoring enabled by ground based automated tools will reduce the need for tactical interventions. Conformance monitoring reduces the risk of the impact of controllers and pilots' errors. It furthermore ensures a high level of safety with an increase in capacity 3% due to a reduction of controller workload per aircraft.
- Capacity/Environment: The tactical controller workload will be reduced, and a better sector team productivity achieved. Compared to the conventional systems without automated support, the sectors capacity will be increased.

➢ **2017_043_AF3 - Coflight-eFDP Development (Step 2)**

Start/end date: 12/04/2018 - 31/07/2019

Project Leader: ENAV S.p.A.

Project Contributor: The French State -Ministère de la Transition écologique et solidaire, DGAC (Direction générale de l'aviation civile), DSNA (Direction des services de la navigation aérienne)

Overview:

This Implementation Project aims at developing an incremental and fundamental step of the Coflight-eFDP (a new generation of FDP - Flight Data Processor) System that will meet the

needs of European Air Navigation Services Providers (ANSPs) for the next decades satisfying the need for the harmonisation of Air Traffic Management (ATM) systems in Europe.

This Implementation Project will deliver the Version 3 Release 3 (V3R3) FDP version that will be used by the French and Italian 4-Flight ATM Systems.

The Coflight version V3R3 will provide the following major features:

1. Increased operational, technical and economic efficiency in the implementation of Free Route Airspace (FRA):
    - Increased interoperability, improved trajectory prediction;
    - Further lowering of FRA level, making use of automatic conflict detection tools providing vertical and horizontal exchange assistance;
    - Dynamic Lat-Long Cross Area of Responsibility (AoR) Points (COP) enabling Functional Airspace Block (FAB) and Regional Free Route;
    - Increased operational flexibility in the configuration of the airspace volumes;
    - More precise airspace configuration planning in order to accommodate traffic demand in an improved cost-effective manner;
    - Increased automation, through implementation of Air Traffic Controllers tools.
2. Improvement of robustness related to exchanges of information between Aeronautical Fixed Telecommunication Network (AFTN) station (Coflight) and Communication Centre in accordance with [doc1] "ICAO Annex 10 volume II Communication Procedures". It concerns the service messages used to ask the re-emission of mutilated, improperly formatted or non-received messages;
3. Compliance with latest cyber security requirements;
4. Implementation of requirements/needs coming from 4-Flight Programs.

This Coflight version V3R3 follows the version V3R1 developed and co-financed within the framework of the Action 2014-EU-TM-0136-M (#067AF5) that provided a first stable version of the Coflight Product.

During 2016-2017, a Coflight version, namely V3R2, was developed mainly as corrective version that also embarked some evolutions, especially requested by Italian 4-Flight as a result of gap analysis between Coflight and Italian legacy system.

The Coflight version V3R3 will be integrated in the version Build 3 of the Italian programme 4-Flight (2015_204_AF3_Phase_I & II, 2016_115_AF3) and in the French 4-Flight new ATM Systems, both planned to be put into operations by the end of 2021.

No interoperability based on ED133 EUROCAE specifications is foreseen to be implemented within this version V3R3, since it is still a matter of validation under the SESAR R&D framework. The only interoperability that Coflight provides is a native interoperability among Coflight instances based on the Coflight internal version of the Flight Object.

Specific objectives:

The planned release of Coflight specifically aims to:

- Increase operational, technical and economic efficiency in the implementation of Free Route;
- Improve the robustness related to exchanges of information;
- Compliance with latest cyber security requirements;
- Implementation of requirements/needs coming from 4-Flight Programs;
- Contribute to the wider programme that involves the renewal of the whole National ATM System, 4- Flight, for ENAV and DSNA.

Tasks:

The Implementation Project consists of the following tasks:

- Task 01 - WP0 - Project Management:
  - Project Management, from Set-up to Closure.
  - Define and maintain the Product Evolution Roadmap.
  - Co-ordination with the National Integration Programme (NIP) "4-Flight" (both the Italian and the French NIPs) and harmonisation of the new functionalities requested to Coflight.
  - Issue contracts to develop new versions.
  - Communication: includes the promotion to possible additional users, new possible partners, presentation of the new European FDP Product to the ATM community, press, ...".
- Task 02 - WP1 - Development of Coflight V3R3 for VA (Verification aptitude): Content of the version:
  - corrections of problems identified on previous versions;
  - refinement of requirements and/or new requirements as result of validation activities on previous versions;
  - new requirements deriving from the 4-FLIGHT programme needs (impacting Coflight), the next generation ATC common system, in compliance with SES Regulations.
    Output of this work package is the FAT (Factory acceptance test) version of the V3R3 release of the Coflight-eFDP product.
- Task 03 - WP2 - Verification aptitude of Coflight V3R3: Acceptance tests for Coflight V3R3 version.
- Task 04 - WP3 - Acceptance of Coflight V3R3 - WP3: Acceptance of Coflight V3R3 and Lesson learnt dissemination.

Expected Results:

The implementation of the planned release V3R3 will support the Italian and French National ATM Systems Integration Programmes.

Internal Achievements Points:

- Start of training - N/A
- End of training - N/A

- Parallel Operations / Operational Trials - N/A
- Cutover SW ready and successfully tested - N/A
- Cutover and fall-back period completed - N/A

Contractual Milestone:

- Project completed - 31/07/2019

Performance Benefits:

Enhancement of overall ATM system performances (e.g. technical performances, reviewed procedures) thanks to the availability of the new version of Coflight in Italian and French ACCs:

- Increased interoperability, improved trajectory prediction;
- Further lowering of FRA level, making use of automatic conflict detection tools providing vertical and horizontal exchange assistance;
- Dynamic Lat-Long COP enabling FAB and Regional Free Route;
- Increased operational flexibility in the configuration of the airspace volumes;
- More precise airspace configuration planning in order to accommodate traffic demand in an improved cost-effective manner.

➢ **2017_049_AF3 - Electronic Flight Strip (EFS) in En-Route and TMA in SACTA system**

Start/end date: 01/01/2019 - 31/12/2021

Project Leader: ENTIDAD PÚBLICA EMPRESARIAL ENAIRE

Project Contributor: N/A

Overview:

The main objective of this Implementation Project is to upgrade the SACTA system (Spanish Air Traffic control system) by providing an Electronic Flight Strip (EFS) human-machine interface for the En-Route and Approach airspaces. EFS is a prerequisite for the Free Route Airspace (FRA) mode of operation.

Specific objectives:

The IP specifically aims to ensure that this SACTA version also integrates some of the tools that will support the elimination of the current paper strips, such as:

- Planner MTCD (Medium Term Conflict Detection),
- MONA (Monitoring Aids),

- Enhance conflict management tools and controller HMI (Human Machine Interface) functions to support conflict detection and resolution (such as What-if and What-else),
- Electronic management of special strips (OCM (Oceanic Clearance Message), wrong OLDIs (On-Line Data Interchange)),
- Fallback for Surveillance and Flight Plan Data,
- ATCO notes,
- New flight lists,
- Enhanced Holding manager,
- Flight tagging.

Within this Implementation Project timeframe (2019 – 2021) the new SACTA version will be specified, developed by the SW manufacturing company and verified by ENAIRE. The project will end up with the acceptance tests based on functional verification in the ENAIRE´s test centre. Later test phases in the operational centres (such as stress, stability, transition, etc.) are not part of the project´s scope.

Tasks:

The Implementation Project consists of the following tasks:

- Task 01 - Project management: The main objective of the Project Management task is to ensure that all project related activities are performed successfully and according to established contractual and technical requirements. Key features for successful project management are:
    - Management of a project organisation matched to the project complexity;
    - Efficient communication within the organisation;
    - Clear definition of contractual requirements and relationship;
    - Adequate planning and control;
    - Quality.
- Task 02 - Change management engineering: Management of ECR (Engineering Change Requests) ENAIRE applies in its development contracts a methodology based on the ISO/IEC (International Organisation for Standardisation/ International Electrotechnical Commission) 12207 Software Development methodology. The development will be managed in an iterative and incremental way in order to progressively review and validate the changes. This is the reason why the tasks schedules are overlapped.
- Task 03 – Verification: After the SW product release, ENAIRE will perform a verification of the new products, including Site Acceptance Tests (SAT)
  It includes training of a reduced number of Air Traffic Controllers (ATCO) in order to support the verification tasks
- Task 04 - Support Activities: Throughout the project life cycle, from the Initiation until the Closure phases some horizontal activities need to be performed in order to meet the quality and safety regulations and standards applied, such as:
    - Technical Safety Management (including SW Integrity Assurance),

- Documentation Management,
- Quality Management,
- Configuration Management,
- Audits,
- Problems Resolution management,
- Etc.

Expected Results:

SACTA system is upgraded.
An Electronic Flight Strip (EFS) human-machine interface is provided.
This IP therefore contributes to the deployment of Free Route (FRA) operations families 3.2.1 "Upgrade of ATM systems to support DCT and Free Route" and 3.2.4 "Implement Free Route".
ENAIRE is already implementing CEF funded projects aimed at the deployment of family 3.2.1, i.e. 2016_036_AF3 (SACTA-iTEC, Action 2016-EU-TM-0117-M) and 2016_040_AF3 (Upgrade of trajectory management in SACTA-iTEC, Action 2016-EU-TM-0117-M). By means of these two projects the combined family gap coverage was 60%. This project represents an additional 20% increase. Together with project "CWP positions upgrade" (IP 2017_050_AF3), which covers a 10% of the family, the accumulated gap coverage of family 3.2.1 is 90%.

Internal Achievements Points:

- Start of training - 01/01/2020
- End of training - 30/06/2021
- Parallel Operations / Operational Trials - N/A
- Cutover SW ready and successfully tested - N/A
- Cutover and fall-back period completed - N/A

Contractual Milestone:

- Project completed - 31/12/2021

Performance Benefits:

All performance benefits from FRA operations will be attained by the implementation of this project, such as:

- Impact on safety because the use of tools will help improve alerts (Planner MTCD, MONA, conflict management tools...);
- Impact on capacity derived from the operational improvements provided by FRA and the higher efficiency provided by EFS;

- Significant benefits generated are identified in the reduced nautical miles flown, which can be translated in less fuel burn, smaller CO2 footprint and shorter flight times.

➢ **2017_050_AF3 - Controller Working Position (CWP) upgrade**

Start/end date: 12/04/2018 - 31/12/2021

Project Leader: ENTIDAD PÚBLICA EMPRESARIAL ENAIRE

Project Contributor: N/A

Overview:

The main objective of this Implementation Project is to upgrade Controller Working Positions (CWP) in the Spanish Air Traffic Control Centres to provide a higher display surface to the ATCOs (Air Traffic Controllers). This upgrade is needed to display all the information items that the ATCOs need to work in a FRA (Free Route Airspace) environment, derived from the requirements of the new functionalities as well as to manage the Electronic Flight Strip (EFS) interface.

Specific objectives:

Deployment of new CWPs that are able to manage tools/functions such as:

- Electronic Flight Strip (EFS);
- Medium Term Conflict Detection (MTCD);
- Tactical Controller Tool (TCT);
- or Voice over IP Communications Systems (VoIP VCSs), among others.

Within the project timeframe (2018-2021), the HW and SW will be procured, and the new equipment will be deployed at the following ATC centres:

- Canarias,
- Seville,
- Madrid.

Tasks:

The Implementation Project consists of the following tasks:

- Task 01 - Project management: The main objective of the Project Management task is to ensure that all project related activities are performed successfully and according to established contractual and technical requirements. Key features for successful project management are:
    - Management of a project organisation matched to the project complexity;

  - Efficient communication within the organisation;
  - Clear definition of contractual requirements and relationship;
  - Adequate planning and control;
  - Quality.
- Task 02 – Procurement: Procurement process for the acquisition of the new CWPs systems for the En-Route/TMA system in Madrid as well as the Simulation/Contingency system in Madrid, Seville and Canarias Control Centres. This task will encompass:
  - Design/Requirements definition (including safety management requirements);
  - Technical and administrative documentation for the public call for tender;
  - Evaluation of proposals;
  - Contract awarding.
- Task 03 – Deployment: This task will encompass the systems manufacturing, and the technical&operational verification.
  ENAIRE applies in its deployment contracts a methodology based on an iterative and incremental way in order to progressively review and validate the new developments, thus easing the early detection of problems and facilitating the tuning of the user/system requirements if needed.
  Within this task, the specification documents will be issued.
  ENAIRE will also apply its verification process for the system, which implies running both technical and operational tests.
  This task also includes ATCOs training on the new CWP.
  After the successful verification and validation of the system, it is ready for commissioning.
- Task 04 - Support Activities: Throughout the project life cycle, from the Initiation until the closure phases some horizontal activities need to be performed in order to meet the quality and safety regulations and standards applied, such as:
  - Safety Management (including SW Integrity Assurance);
  - Documentation Management;
  - Quality Management;
  - Configuration Management;
  - Audits;
  - Problems resolution management;
  - EC (European Commission) Declaration of Verification (Conformity Assessment);
  - Etc.

Expected Results:

With this Implementation Project the following CWPs will be upgraded:

- 126 CWP in Operations and Contingency room in ACC Madrid
- 40 CWP in Operations and Contingency room in ACC Seville

- 42 CWP in Operations and Contingency room in ACC Canarias

This implementation project will contribute to the deployment of Free Route (FRA) operations (families 3.2.1 "Upgrade of ATM systems to support DCT and Free Route" and 3.2.4 "Implement Free Route").
ENAIRE receives funding under Action 2016-EU-TM-0117-M, such as 2016_036_AF3 (SACTA-iTEC) and 2016_040_AF3 (Upgrade of trajectory management in SACTA-iTEC), whose aim is the SW development of new functions and tools that are required for FRA. These SW enhancements imply the use of a new HW in the CWPs in order to provide the correct information presentation to the Air Traffic Controllers (ATCOs).
The project will also help meet the objectives of family 3.1.4 of the Deployment Plan (Management of Dynamic Airspace Configurations), because it will support the implementation of the new VoIP VCS (Voice Communications System over IP) systems. ENAIRE has some projects in progress within family 3.1.4, which are 2015_221_AF3 (Implementation of Voice over Internet Protocol (VoIP) systems and services in ENAIRE, Action 2015-EU-TM-0196-M), Action 2017-EU-TM-0004-W "Implementation of Voice over IP (VoIP) in Barcelona ACC". This VCS system will be integrated in the new CWP provided by this Implementation Project.

Internal Achievements Points:

- Start of training - 01/01/2020
- End of training - 31/12/2021
- Parallel Operations / Operational Trials - 31/12/2021
- Cutover SW ready and successfully tested - 31/10/2021
- Cutover and fall-back period completed - 31/12/2021

Contractual Milestone:

- Project completed - 31/12/2021

Performance Benefits:

All performance benefits from FRA operations will be attained by the implementation of this project, such as:

- Impact on safety because the use of Tactical MTCD and Tactical Controller Tool will help to improve the 4D trajectory and alerts.
- Impact on capacity derived from the operational improvements provided by FRA.
- Significant benefits generated are identified in the reduced nautical miles flown, which can be translated in less fuel burn, smaller CO2 footprint and shorter flight times.
- A saving of En-Route ATFM (Air Traffic Flow Management) delays.

- **2017_053_AF3 - Implementation of rolling ASM/ATFCM**

Start/end date: 01/01/2019 - 31/12/2021

Project Leader: EUROCONTROL / Network Manager

Project Contributors:

- Deutsche Lufthansa Aktiengesellschaft;
- LH Systems GmbH;
- LH Systems Poland;
- Sabre Airline Solutions GmbH;
- Sabre France SARL;
- Sabre Polska Sp. Z.o.o.;
- Sabre Austria GmbH;
- Société Air France.

Overview:

This project is a key contributor to the following Strategic Objectives (SO) listed in the Network Strategy Plan (NSP) as: SO 3/2 Implement Advanced Flexible Use of Airspace SO 3/3 Implement appropriate cross-border airspace structures, enabling a flexible use of airspace.
This implementation project is the continuation of the CEF2016 IP, 2016_134_AF3 Implementation of rolling ASM/ATFCM through which the partners will have already implemented partly Family 3.1.3.
Although some partners have experienced some delays in project 2016_134_AF3, this is only related to the definition / requirements phase and shall not impact on the final scope / implementation results of this IP.
The Network Manager main objective will be the finalisation the technical implementation and deployment in NM Systems of the changes related to PCP Family 3.1.3 - Full rolling ASM-ATFCM process and ASM information sharing (see specific objectives below) This implementation will be performed through depployment of NM System releases 25 and 25.5 (while CEF2016 IP, 2016_134_AF3 will stop by release 24.5).
Furthermore, two CFSPs (Computer Flight-planning Service Providers) (Sabre Austria GmbH and Lufthansa Systems GmbH & Co. KG), will continue updating their Systems to support the Rolling ASM/ATFCM process implemented by NM – in alignment with NM planning of releases-.
SABRE Austria contribution will be supported by Sabre`s affiliated entities. Sabre Germany and Sabre France will contribute to the task 1 (Project Management) and Sabre Polska will contribute to the task 4 (Sabre implementation).

Lufthansa Group airlines will upgrade their OCC systems and required cockpit interfaces to allow implementing the Rolling ASM/ATFCM process.
To allow for a clear distinction between the Systems' versions implemented through CEF2016 IP (2016_134_AF3) and the Systems' version subsequently implemented through this IP (2017_053_AF3), NM, Sabre, Lufthansa Systems and Lufthansa Group will organise for a robust requirements and implementation management process. It will allow to clearly identify the different implementation items per different systems' versions (hence IPs) and to make sure effort / costs can be traced and allocated to that level without any redundancy.
In a continued implementation process, the start of the implementation of a new release -i.e. the identification of concerned business requirements and development of detailed specification- is always happening quite some time before the finalisation of the implementation of a previous version. This is the reason for the overlap in time between 2016_134_AF3 and 2017_053_AF3 (this IP).

Specific objectives:

The IP specifically aims to

- Upgrade NM system related to the final steps of the implementation of the full rolling ASM/ATFCM process, i.e.:
    - improvement of the capability to perform network impact assessment, including FRA operations (implementation items referred to as "Process ASM scenarios", "Process UUP changes" in the current NM ASM technical operational / roadmaps),
    - the improvement of the automation of the CDM process with involved stakeholder for the finalisation of "optimum" airspace (e.g. "Draft UUP to AOs" – still to be discussed / refined in the NM-Stakeholders ASM Working Group-)
    - consideration of full management of real time airspace data (implementing item still to be agreed in the NM-Stakeholders ASM Working Group).
- Implement Procedural changes in NM related to full rolling ASM/ATFCM process;
- Upgrade SABRE System solution in coherence with rolling ASM/ATFCM process;
- Upgrade Lufthansa Systems Lido/Flight and NetLine/Ops software in coherence with the rolling ASM/ATFCM process and the NM releases (this includes data provision (including implementation of available B2B services) and applications using the data).
  Major developments at Lufthansa Systems will include novel Slot Management to adapt to the expected high dynamic regulations in dependency to the flexible airspace usage publications. It is expected, that due do traffic hotspots, volatile airspace status within free route environment and corresponding flight route changes, the regulations from Network Manager / local ATC will be more challenging to identify best flight route efficiency for single flight events and at the same time for the whole airline operation. The Slot Management within a Flight Operation Centre at Lufthansa provided by Lufthansa needs to be enriched with integrated functionalities for flight planning and operations control. Objective will be the most efficient delay cost management including flight preferences based on the User Driven Priority Process (UDPP). Overall it is envisaged to ensure the best usage of "flight efficiency

opportunities" based on the airspace status environment. All required B2B Services will be integrated into affected airline systems (flight planning, operations control,…) This will also include B2B services for ATM information offered by NM. Consequently, Lufthansa Systems will further develop their systems to the core developments from the NM releases related to ASM aspects (e.g. Scenario Repository, ...)

- Have airlines participating in the description of the CFSPs' Systems requirements as relevant to their usage and in the validation / deployment of the CFSPs' Systems of their interest.
- Business process management and management-of-change to allow procedural adaptions in the complex operational environment
- Upgrade of Lufthansa Group airlines OCC systems and required cockpit interfaces to allow implementing the Rolling ASM/ATFCM process

Tasks:

The Implementation Project consists of the following tasks:

- Task 01 - Project Management: The project management relates to tasks concerning the organisation of the project, its monitoring and its control in application of requirements stemming from the CEF / Deployment Manager monitoring and reporting process.
  Otherwise Partners will comply with their internal management processes to execute their different tasks.
- Task 02 - Implementation NM system changes: NM system changes are related to finalisation of the technical Implementation of a full Rolling ASM/ATFCM process.
  In particular, latest upgrades will concern:
  - the improvement of the capability to perform network impact assessment, including FRA operations (implementation items referred to as "Process ASM scenarios", "Process UUP changes" in the current NM ASM technical operational / roadmaps),
  - as well as the improvement of the automation of the CDM process with involved stakeholder for the finalisation of "optimum" airspace (e.g. "Draft UUP to AOs" – still to be discussed / refined in the NM-Stakeholders ASM Working Group-)
  - and consideration of full management of real time airspace data (implementing item still to be agreed in the NM-Stakeholders ASM Working Group).

  These deployments will be performed as part of releases 25 and 25.5.
- Task 03 - Implementation of procedural changes (ASM handbook): Development of the procedural and ASM handbook changes related to full Rolling ASM/ATFCM process, the improved CDM process and implementation of full sharing of airspace data information
- Task 04 - Sabre implementation:
  - Technical impact analysis of required enhancements with regards to integrated SABRE flight planning solutions and adjacent systems including interphases.

  - Implementation of new system (integrated or standalone enhancements to SABRE Flight Planning solutions as outlined in task 5
  - Implementation or adaptation of Interfaces
  - Functional test
- Task 05 - Sabre deployment preparation: Focus of this task is to:
  - Analyse impact of new operational concept in consideration of flight (trajectory) planning, operations control, flight monitoring
  - Analyse and define requirements (technical/operational) compulsory to implement new operational concept
  - Review and analyse service and procedure descriptions provided by NM with regard to ASM
  - Provide technical description defining the new concept and specifying the integration into the SABRE Flight Planning solutions, to be used by the system and software developers to produce the new system (integrated or standalone enhancements to SABRE Flight Planning solutions.
  - Description of operational procedures for airlines using SABRE Flight Planning solutions.
  - Outline and describe training required for AU`s to implement the new concept
  - Prepare draft scheme for standard User Acceptance Testing (UAT)
  - Provision of training to participating AU`s (optional)
- Task 06 - Requirements Engineering (Deutsche Lufthansa AG, Air France, LH Systems): The Requirements Engineering aims at the preparation of all technical documentation and specification that are required to implement the technical systems that relate to the new operational concept.
  The requirements engineering task includes the following sub-tasks:
  - Analysis of Concept;
  - Developing the implementation concept;
  - Specifying the software.
- Task 07 - System Implementation (Deutsche Lufthansa AG, Air France, LH Systems, LH Systems Poland): In this task the technical systems, including required documentations and user manuals will be updated.
- Task 08- Preparation of phase-in (Deutsche Lufthansa AG, Air France): This task gathers all activities that relate to preparatory work that is required to perform the complete deployment of the new procedures and system into the respective Lufthansa Group airlines and Air France operations. This includes an analysis of potential gaps between previous operating methods and the new operating procedures, safety assessment, updates of respective manuals (procedures/ safety etc.) as well as the scheduling of the real deployment of the system and procedures.
- Task 09 - Deployment at Lufthansa Airlines and Air France (Deutsche Lufthansa AG, Air France, LH Systems): This task aims at the phase-in of the enhanced systems and procedures into operations. At the end of this task the updated concepts will be fully operational from the respective Lufthansa Group airlines and Air France perspective.

Expected Results:

This Implementation Project aims at NM (Network Manager) system upgrades and procedural changes pertinent to completing in NM System releases 25 and 25.5 the process/system upgrades supporting a full rolling ASM/ATFCM (Air Traffic Flow and Capacity Management) and dynamic ASM/ATFCM process allowing data sharing to all operational stakeholders. These NM systems releases will be deployed operationally and allow NM to receive, exploit/process data from the relevant/appropriate source(s).
Furthermore, the two CFSPs (Sabre Austria GmbH and Lufthansa Systems GmbH & Co. KG) will update their systems to support the Rolling ASM/ATFCM process implemented by NM.
Sabre will prepare material for later industrial deployment of its system for use by/for potential customer Airspace Users.
Lufthansa Systems and participating Airspace Users (Société Air France, Deutsche Lufthansa AG) will cooperate to validate / deploy the Lufthansa Systems Lido/Flight System, which will be upgraded (together with Lufthansa Systems NetLine/Ops) in the course of this project by Lufthansa Systems and Lufthansa Systems Poland.
Lufthansa Group airlines will upgrade their OCC systems and required cockpit interfaces to allow implementing the full rolling ASM ATCM and ASM information sharing business processes in LH Group Airlines OCCs. This will ensure the most optimal flight operations at Lufthansa within the increasing complexity of ATM including on the one side the challenges of dynamic flight adaptations due ATCFM measures (ASM) and on the other side the upfront CMD processes defined within TBO.

Internal Achievements Points:

- Start of training - 30/11/2020
- End of training - 29/10/2021
- Parallel Operations / Operational Trials - 29/10/2021
- Cutover SW ready and successfully tested - 29/10/2021
- Cutover and fall-back period completed - 30/11/2021

Contractual Milestone:

- Project completed - 31/12/2021

Performance Benefits:

The project delivers reduction in flight time and fuel consumption for increased awareness of available shortest routes. Similarly, the project enables increase in ATC capacity utilisation due to increased awareness of available routing to GAT (General Air Traffic) and improved LIDO/SABRE operational capability to avoid most penalising regulations.

Based on previous CBAs (IP 2016_134_AF3, Action 2016-EU-TM-0117-M), the Implementation Project is expected to deliver additional benefits of about € 30 million undiscounted, under the assumption that all stakeholders deploy the PCP as mandated in PCP regulation.

- **2017_055_AF3 - NM Systems upgrades in support of FRA**

Start/end date: 01/05/2018 - 31/12/2021

Project Leader: EUROCONTROL / Network Manager

Project Contributor: N/A

Overview:

The main objective of the Implementation Project is to continue work performed by NM in IP #81AF3 (Action 2014-EU-TM-0136-M) and 2015_107_AF3 (Action 2015-EU-TM-0196-M) that consist of NM responsibilities towards ensuring FRA (Free Route Airspace) implementation across ECAC (European Civil Aviation Conference) as described in PCP Sub-AF 3.2 Free Route.
This Implementation Project is a key contributor to the following Strategic Objectives (SO) listed in the Network Strategy Plan (NSP) as: SO 3/1 (Deploy full free route airspace throughout the European ATM network, to the maximum extent possible) and SO 3/4 (Coordinate the development and implementation of airspace design and airspace management improvements to achieve the flight efficiency targets and ensure appropriate network connectivity and coordination).
This will lead to achieving the Network Strategic Plan (NSP) and PCP objective to implement full FRA cross border implementation in areas where all conditions are met.

Specific objectives:

This IP specifically aims to

- continue and and finalise the implementation / deployment of NM Systems upgrades related to Family 3.2.1 - Upgrade of ATM systems (NM, ANSPs, AUs) to support Free Routing Airspace (FRA). This objective concerns Task 2, particularly continuing the work performed in CEF 2015 project 2015_107_AF3 that will stop by the end of 2020 with NM system release 24.5. Task 2 will cover release 25 and 25.5 -with identification of implementation items for release 25 / 25.5 expected in March 2020.
- facilitate ANSPs' FRA deployment in supporting the harmonisation and adaptation of FRA enablers as needed by implementing ANSPs (e.g. operational procedures, airspace design...). This objective concerns Task 3 particularly continuing and extending the work performed in CEF 2014 project #81AF3 which was completed in June 2017.

Tasks:

The Implementation Project consists of the following tasks:

- Task 01 - Project Management: The project management relates to tasks concerning the organisation of the project, its monitoring and its control. It is performed according to EUROCONTROL adopted methodology. It will also take care for the application of management requirements stemming from the CEF / Deployment Manager coordination (e.g. technical and financial progress reporting…) and the organisation of relevant tasks.
- Task 02 - NM Systems Development: This consists in the final adaptation of NM Systems (continuing the work of NM Action 201-EU-TM-0196-M, IP 2015_107_AF3) as part of releases 25 and 25.5 so that to cope with needs related to latest FRA implementing areas particularly in the core area of Europe and related particularly to Cross border implementation):
    - Flight Plan Border Checking Improvement;
    - Traffic Volume / Regulation service Merge;
    - Cross border AUA time-dependent sectorisation.
- Task 03 - FRA deployment: The task concerns NM role in facilitating FRA deployment organised by the implementing ANSPs.
  NM will participate to ANSPs' FRA deployment in supporting the harmonisation and adaptation of the following FRA enablers as needed by implementing ANSPs:
    - Operational procedures;
    - AIS (Aeronautical Information Service) publication;
    - Checklists of Free Route Airspace Implementation Actions, as described in the NOP (Network Operations Portal)/ERNIP (European Route Network Improvement Plan);
    - Airspace design, ASM / ATFCM related processes.

  This development will lead to achieving the NSP and PCP objective to implement full FRA cross-border implementation in areas where all conditions are met.

Expected Results:

Evolutions and fine tuning of NM systems are implemented and deployed to accommodate cross-border FRA implementation across ECAC (European Civil Aviation Conference) at a final stage through deployement NM System releases 25 and 25.5.
In particular, expected improvements concern Cross border related implementation, e.g.:

- Flight Plan Border Checking Improvement;
- Traffic Volume (TV) / Regulation Service (RS) Merge;
- Cross border AUA time-dependent sectorisation.

NM is expected to facilitate ANSPs' FRA deployment with supporting the harmonisation and adaptation of different FRA enablers as needed by implementing ANSPs, e.g.:

- Operational procedures;
- AIS publication;
- Checklists of Free Route Airspace Implementation Actions, as described in the NOP/ERNIP;
- Airspace design, ASM / ATFCM related processes.

Internal Achievements Points:

- Start of training - 01/07/2021
- End of training - 29/10/2021
- Parallel Operations / Operational Trials - 01/09/2021
- Cutover SW ready and successfully tested - 03/05/2021
- Cutover and fall-back period completed - 30/11/2021

Contractual Milestone:

- Project completed - 31/12/2021

Performance Benefits:

From historical trends since 2008 and improvements as measured with flight efficiency KPI, the yearly Nautical Miles saving expected by the progressive AF3 implementation is at least four Millions Nautical Miles. NM simulations have allocated those benefits to each AF3 project and Nautical Mile savings have been monetised according to standard parameters derived from post operation data: Approximatively € 20 millions of undiscounted benefits can be attributed to this project.

➢ **2017_074_AF3 - Hungarian ATM system upgrade for AF3-AF4**

Start/end date: 16/04/2018 - 30/06/2021

Project Leader: HungaroControl Air Navigation Services Pte Ltd Co.

Project Contributor: N/A

Overview:

The main objective of the Implementation Project is to further develop the Hungarian ATS system (MATIAS) in order to fulfil the requirements of the Pilot-Common-Project Regulation EU No. 716/2014, AF3 and AF4. This implementation project is a contribution to the on-going IP 2016_075_AF3_B "FAB CE wide Study of DAM and STAM project" (funded under Action 2016-EU-TMC-0113-M) and can be considered as a continuation of IP

2015_034_AF3 "MATIAS ATM System upgrade for cross-border free route operation" (Action 2015-EU-TM-0197-M).
The main objective of IP 2016_075_AF3_B – FAB CE wide Study of DAM and STAM project is to obtain a FAB CE key high-level document that contains all relevant elements required for a consequent FAB CE wide implementation of DAM and STAM processes. This IP project is a kind of technological pillar of the FAB CE initiative, to implement all the necessary function, which is connected to Hungarocontrol's ATM system, like the Management of Dynamic Airspace Configuration and the Interface between the NM and HungaroControl ATM system.
In order to support cross-border free route operations some upgrades of ATM systems are necessary as pre-conditions for a future FAB CE wide free-route implementation. The ultimate goal of HungaroControl is achieving the full PCP compliance of its ATM system (MATIAS).

Specific objectives:

This Implementation Project specifically aims to upgrade HungaroControl ATM system in order to ensure:

- ASM Management of real time airspace data: Adapt ATM systems to exchange airspace reservation (ARES) messages containing real time (tactical) activation status of predefined airspace structures with local ASM support systems and to display airspace status data at the CWP.
- Management of Dynamic Airspace Configurations: System improvements supporting the management of dynamic airspace configuration including DCTs and FRA.
- Interface ATM systems to NM systems: Upgrade the ATM system with the capability to receive and process EFPL (Extended Flight Plan) information via FF (Flight & Flow)-ICE (Information for a Collaborative Environment)/1 and develop the associated procedures.

Tasks:

The Implementation Project consists of the following tasks:

- Task 01 - Project Management: The objective of the Task is to ensure the technical, administrative and financial implementation of the Action is in accordance with the related regulations and programme requirements through the timely coordination and monitoring of the activities, the preparation and submission of interim and final reports, consultation and close cooperation with national authorities and SDM.
  Communication and dissemination initiatives ensure the visibility requirements of CEF funding. The Target groups of the Actions are the national and European industry stakeholders, relevant policy decision makers as well as the general public. Communication and dissemination will be carried out in a timely manner through different media channels and appropriate means.

- Task 02 - Operational activities: Within the task, HungaroControl develops the OPS Concept to collect and prioritise operational needs and challenges, builds the concept as the basis for subsequent system development and implementation.
  Development of new working procedure for ATCOs or changing, amending the existing one is also necessary on the areas where it is required by the use of the new or enhanced system functionalities.
  A training plan and package will be developed and the ATCO training will be performed.
- Task 03 - ATM system upgrade: This task includes the preparation of tender documentations, evaluation of the offer, followed by the contract negotiation and closed with the contract signature. This task also involves the manufacturer to revise the technical specifications and to prepare engineering change proposals that suit best the requirements and needs of the development. The preliminary design phase mainly concentrates on high level design and the major related technical issues.
- In this Task, the manufacturer makes final revisions on the engineering change proposals and develops the system modification functionality in response to the needs of HungaroControl. The detailed design deals with the finer technical details and the human machine interface solutions to ensure the usability and user friendliness of the system. The completion of the sub activities of the work package enables the project to move on to the factory acceptance tests.
  The main activities include the development of the software and the preparation of the Test Procedure Books (TPB) for factory acceptance tests. After that the FAT will be conducted at the premises of the manufacturer. Site acceptance tests will complete the technological actions undertaken in the project.
  On the grounds of the factory acceptance tests and the implemented actions of the previous work package HungaroControl initiates acceptance tests at its own premises. As a result of extensive testing a SAT Complete Certificate will be issued to demonstrate that the technical instalments of the system have been completed and that the system is fully functional and operational.
- Task 04 - System Commissioning: Operational trial is planned to use the test system to check the proper implementation of the new functionalities and working procedure using live airspace data. It also aims to test the viability of the new software version specially to perform tests focusing for those areas that are critical to new working procedures point of view. The Operational deployment and the start of the operation will begin after the reception of the NSA (National Supervising Authority) approval.
  The authority approval for live operation will be the final activity of the project, resulting from consecutive, interrelating technical developments.

Expected Results:

- All the relevant data are integrated into the ATM System. Interoperability with the Network Manager system and with other ASM systems as described in the family 3.1.2 is ensured.
- ATM system is upgraded for dynamic sectorisation as required in the family 3.1.4
- ATM system is upgraded to generate messages to NM and for NM to receive and process and distribute as required in the family 4.2.3 (including FSA (First System Activation), CPR (Correlated Position Report), AFP (ATC Flight Plan Proposal), APL (ATC Flight Plan), ACH (ATC Flight Plan Change) messages) and EFPL from Airspace Users.

Internal Achievements Points:

- Start of training - 30/11/2020
- End of training - 31/03/2021
- Parallel Operations / Operational Trials - 31/03/2021
- Cutover SW ready and successfully tested - 31/05/2021
- Cutover and fall-back period completed - 31/05/2021

Contractual Milestone:

- Project completed - 30/06/2021

Performance Benefits:

The Implementation Project will contribute positively to capacity (traffic management and congestion/reduction in delays), safety, cost efficiency, security and resilience:

- Increased situational awareness of Flow Management Positions (FMPs), supervisors and ATCOs give more options to avoid overloads which increases safety.
- Better usage of available airspace volumes with reduced complexity will lead to higher capacity. Short-term opportunities are effectively and efficiently managed. Overall increase of airspace capacity through optimised utilisation of airspace configurations and scenarios.
- A capacity increase combined with increased situational awareness of the ATCO is enhanced through the introduction of complexity assessments for expected scenarios. Combined this will lead to adjustements of sector monitoring values and ATCO productivity.
- Increased flight efficency in time, as trajectories are expected to be more efficient due to procedures and processes accommodating short-term changes. Larger selection of airspace configurations/scenarios will be available to allow for more robust planning.
- Increased fuel efficency for AU thanks to shorter and more direct routes. In addition, increased robustness on the overall allocation of airspace will lead to a more appropriate fuel loading of airspace users.

- The application of the data / information sharing concept among all involved stakeholders will lead to an increased robustness and predictability of the FAB CE managed airspace.

Activity 5: AF4 Implementation (50% co-funded)

Network Collaborative Management improves the European ATM network performance, notably capacity and flight efficiency through exchange, modification and management of trajectory information. Flow Management shall move to a Cooperative Traffic Management (CTM) environment, optimising the delivery of traffic into sectors and airports and the need for Air Traffic Flow and Capacity Management (ATFCM) measures.

It is composed of the following technical families:
S-AF 4.1: Enhanced STAM:
- Family 4.1.1: STAM Phase 1;
- Family 4.1.2: STAM Phase 2;

S-AF 4.2: Collaborative NOP:
- Family 4.2.2: Interactive Rolling NOP;
- Family 4.2.3: Interface ATM systems to NMS;
- Family 4.2.4: AOP/NOP Information Sharing;

S-AF4.3: Calculated Take-off Time to Target Times for AFTCM Purposes:
- Family 4.3.1: Target Time for ATFCM purposes;
- Family 4.3.2: Reconciled Target Times for ATFCM and arrival sequencing;

S-AF4.4: Automated Support for Traffic Complexity Assessment:
- Family 4.4.2: Traffic Complexity Tools.

Within the objective of the Action, the following families are addressed:
Family 4.1.2 - STAM Phase 2;
Family 4.2.2 – Interactive Rolling NOP;
Family 4.2.4 - AOP/NOP Information Sharing; and
Family 4.4.2 - Traffic Complexity Tools.

Sub - Activity 5.1 - Activity 5 Coordination

Leader: SESAR Deployment Alliance
Start Date: 12/04/2018
End Date: 31/12/2023

The Activity aims at coordinating the implementing initiatives within the scope of the AF4 and its sub AFs. According to Deployment Programme Methodology, each Implementing Partner will support SDM during Cost Benefit Analysis (CBA) finalisation at Action Level. The SDM will steer the Implementing Partners to provide all contributions needed to prepare CBA according to the INEA guidelines.

Deliverables:
5.1.1 Action Status Report (ASR) – IP Level – submitted as an Annex to Action Status Report (del. 1.2.4) every year until 2023
5.1.2 Risks and Issues, and mitigation Actions Registry – AF4 level – submitted 2 times

per year (30/04; 30/09) until 2023 starting from 2019

5.1.3 Final Report (technical content) – 31/12/2023

Sub - Activity 5.2 AF4: Implementation Projects

- **2017_038_AF4 - Enablers of Network Collaborative Management for En-Route and Airports at DSNA**

Start/end date: 12/04/2018 - 31/12/2021

Project Leader: The French State -Ministère de la Transition écologique et solidaire, DGAC (Direction générale de l'aviation civile), DSNA (Direction des services de la navigation aérienne)

Project Contributors:

- Aéroports de Paris;
- Société Air France.

Overview:

In the recent years, facing a high traffic increase, DSNA has put a lot of emphasis on the development of the Collaborative Network Management concept and on the implementation of supporting tools in order to optimise the use of the capacity through flexible flow management and Collaborative Decision Making in both En route and airport contexts.
In the En route context, SALTO (Swift ATFCM Local Tools Organiser) is an ATFCM (Air Traffic Flow & Capacity Management) local tool developed by DSNA to support FMP (Flow Management Positions) in its ACCs (Area Control Centres). SALTO is intended to offer an enhanced substitute to the present CHMI (Collaborative Human Machine Interface) provided by the NM. It is taking advantage of NM B2B services to deliver to the FMP operators advanced functionalities such as what-if simulations capabilities, enabling them to assess the potential impact of an ATFCM measure. The development of SALTO follows an incremental approach. The initial versions of the system have been deployed since 2016 in the 5 French ACCs. New functionalities will be developed and fielded under the present IP.
In the airport context, ANSPs are a major actor of the AOP (Airport Operations Plan)/NOP (Network Operations Plan) process, as being in charge of air traffic control and traffic flow management at the airports and in their vicinity and between airports at a regional level. In France, DSNA has to accommodate different levels of airports:

- In the Paris area, which is hosting the major traffic hubs, DSNA has built a strong cooperation framework through the CDM (Collaborarive Decision Making) programme associating Aéroport de Paris (ADP), the airport operator at Orly and CDG, and the airlines. The BigSky system, under development by DSNA, aims to provide to Tower and Approach supervisors assistance tools for collaborative

management of traffic flows. Under this IP, the development of BigSky will be completed and the system put into service.

- At regional airports, DSNA is defining with stakeholders a CDM concept tailored to their needs and will further develop automated assistance tools.

Finally, through Collaborative Network Management, DSNA is striving to re-conciliate En-Route and airports constraints. DSNA is integrating on the same platform tools and processes in a consistent and seamless concept, merging airport and En-Route oriented services to deliver integrated information to the airlines and airports. This is the scope of the DSNA Collaborative Operational Portal which is already providing a first set of services for many airlines and at several airports and will be enhanced under the present IP.

The project will be managed in coherency and will coordinate its implementation scope with AF4 Network Manager CEF projects (i.e. 2015_105_AF4, 2015_110_AF4, 2015_114_AF4, 2015_115_AF4 (all funded under Action 2015-EU-TM-0196-M) and 2017_054_AF4) and with projects undertaken by ADP to address AOP and AOP/NOP needs (2015_135_AF2, 2015_113_AF4 (both funded under Action 2015-EU-TM-0196-M, 2017_022_AF2).

Specific objectives:

In the En Route environment, this IP specifically aims to develop advanced functionalities of the SALTO system that will help enhancing the European ATM network performance:

- by making it possible for flow managers to better evaluate the workload of the controllers with the help of complexity assessment tools. These tools will greatly help optimising capacity;
- by developing functionalities and procedures to ensure an efficient working relationship between NM, FMP and airspace users. Hotspot detection and declaration tools as well as STAM (Short Term ATFCM measures) preparation, coordination and dissemination support tools will be developed to reach that goal;
- by disseminating relevant ATFCM information to the Control Working Positions.

In the airports and approach environment, this IP will enhance BigSky with tools and processes enabling ATC operators to participate to AOP/NOP information sharing. Making use of SWIM (System Wide Information Management) concepts, BigSky will interface AOP and NOP systems and deliver to tower and approach operators a set of dedicated decision tools supporting processes such as slot management, runway balancing, and satellite airport traffic flow integration.

Regarding DSNA Collaborative Operational Portal, this IP will enlarge the scope of the hosted information, enrich information by cross-referencing between different sources and offer to external customers a register of suitable API (Application Programming Interface) to enable B2B access in addition to the existing HMI, which provides only an end user-oriented access.

Additionally, some adaptations to interface the ATM legacy system with the collaborative tools will be necessary.

Tasks:

The Implementation Project consists of the following tasks:

- Task 01 - CDM@DSNA Project Management: Task 01 covers the overall management of the project such as monitoring of progress, resources and budget, performing of project reviews, generation and approval of reports and coordination between work packages and parties involved.
- This task will deliver progress reports, stating the progress in the tasks, the problems encountered, the risks identified and the proposed solution to cope with the risks.
  This task will also cover the necessary coordination of scope between NM and other stakeholders involved in Collaborative Traffic Management and AOP/NOP concepts.
- Task 02 - CDM@DSNA SALTO upgrade to complexity tools and STAM Phase 2: Task 02 covers the upgrade of the SALTO system to achieve 2 major objectives:
  - implementation of complexity tools;
  - implementation of STAM phase 2 services, with cross-border coordination scope depending on the availability of support by NM systems.

  Development is organised in several increments, each leading to a software release subject to evaluation and feedback from the operators in order to enable the functionalities to rapidly reach maturity.
  Each release will involve requirement consolidation, development of a software increment, operators training and procedures development, software and procedures validation and will end by operational trial.
  At the end the new functions are put into service as primary tool and the CHMI terminal is moved to a fall-back status.
- Task 03 - CDM@DSNA Enhance DSNA Collaborative Operational Portal: Task 03 will enable the development by increments of DSNA interactive B2C Portal and in parallel of B2B information sharing.
  For the B2C portal, services will be offered in sequence as follows:
  - Sharing of pre-tactical operational information (hotspot, ATFCM, pre-tactical measures,…);
  - Post ops analysis
  - Tools for supporting crisis management (crisis cells);
  - CDG post ops dashboard;
  - Integration of Departure/ Arrival sequences (AMAN, iAMAN, DMAN/GLD Departure Management/ Gestion Locale des Départs) step1;
  - Displayed data enhancement through ADS-B (Automatic dependent surveillance—broadcast) feeds;
  - Improvements of Curfew Monitoring Tool for Summer 2019;
  - Integration of Departure/ Arrival sequences (AMAN, iAMAN, DMAN/GLD) step2;
  - Tools for supporting national ATFCM;
  - Enhanced information sharing with Aircraft Operators;

  - Consolidation of take off time information on regional airports.

For B2B information sharing following enablers will be implemented as follows:

  - Architecture study for a robust B2B interface;
  - Interface of CAP (Collaborative Advanced Planning) with NM to exchange route proposals;
  - CAP / SALTO Interoperability;
  - TTA (Target Time of Arrival) management: transmission to NM of flights to be prioritized (use case for curfew management).

This task will benefit of Air France and Groupe Aéroports de Paris participation to contribute to the specifications and to adapt their relevant systems and procedures.

- Task 04 - CDM@DSNA Deploy tools for AOP NOP: Task 04 will enable the deployment of DSNA BigSky tools for AOP NOP coordination in three versions:
  - BigSky airport area: will provide multiple runway flow management support and a substitute to CHMI for tower controllers;
  - BigSky approach area: will provide flow management support for approach area and a substitue to CHMI for approach controllers;
  - BigSky regional area: will provide support for collaborative flow management with other airports in the vicinity.

  This task will benefit of Air France and Groupe Aéroports de Paris participation to contribute to the specifications and to adapt their relevant systems and procedures.

Expected Results:

- The interface of DSNA ATM Systems to NM Systems in DSNA ACCs is enhanced.
- Coordination is optimised between local entities (such as ANSP, Airport and AU-airspace user) and NM tools in Paris area.
- Shared Target Time for ATFCM purposes for Paris arrivals is implemented.
- Basic level of AOP/NOP information sharing provided at several regional airports is implemented.
- Coordination of ATFCM measures between all concerned actors is improved.
- Operational efficiency is improved by disseminating STAM information on the control working positions.
- Situational awareness and decision support for FMPs operators and Tower/Approach supervisors are improved.

Internal Achievements Points:

- Start of training - 31/03/2021
- End of training - 30/06/2021
- Parallel Operations / Operational Trials - 30/11/2021
- Cutover SW ready and successfully tested - 30/11/2021
- Cutover and fall-back period completed - 31/12/2021

Contractual Milestone:

- Project completed - 31/12/2021

Performance Benefits:

- STAM will lessen the need for ATFCM regulations, leading to a decrease of ATFCM delays.
- More traffic fluidity will improve flight efficiency (ASMA (Arrival Sequencing and Metering Area), Pre-departure delay and Taxi Out time on satellite airports).
- Increased CTOT (Calculated Take-off time) adherence on satellite airports.
- Capacity enhancement due to optimised use of available capacity.
- Better predictability of operations, to the benefit of airspace users and passengers.

➢ **2017_045_AF4 - ENAV Deployment of traffic complexity tool and STAM phase 2**

Start/end date: 01/11/2018 - 31/12/2021

Project Leader: ENAV S.p.A.

Project Contributor: N/A

Overview:

The first part of the Implementation Project aims at the deployment of the Traffic Complexity Tool. Traffic complexity tool continuously monitors sector demand and evaluates traffic complexity (by applying predefined complexity metrics) according to a predetermined qualitative scale. The predicted complexity coupled with traffic demand enables ATFCM (Air Traffic Flow and Capacity Management) to take timely action to adjust capacity, or request the traffic profile changes in coordination with ATC (Air Traffic Control), airspace users and NM (Network Manager).
The main objective of the Implementation Project is to enhance the European ATM network performance, notably optimised capacity and flight efficiency, through the exchange, modification and management of aircraft trajectory information.
Flow Management shall move to a Cooperative Traffic Management (CTM) environment, optimising the delivery of traffic into sectors and airports whilst acknowledging the requirement for Air Traffic Flow and Capacity Management (ATFCM) measures. That will be achieved involving Network Manager in order to exchange information.
STAM (Short Term ATFCM Measures) Phase 2 procedures will be defined and implemented as required by EU 716/2014.

STAM consist of a system supported approach to smooth sector workloads by reducing traffic peaks through short-term application of minor ground delays, appropriate flight level capping, timing and modalities of ATC re-sectorisation, exiguous re-routings to a limited number of flights. These measures are capable of reducing the traffic complexity for ATC with minimum curtailing for the airspace users.
This project is complementary to IP 2016_114_AF4 "ENAV Traffic Complexity Tool Implementation" (Action 2016-EU-TM-0117-M). While IP 2016_114_AF4 aims at designing and developing the TCT, in IP 2017_045_AF4 the TCT will be implemented on all Italian ACCs and the design, the development and training of STAM2 procedures will be processed.

Specific objectives:

This IP specifically aims to:

- Allow the implementation of the new operational concepts defined by Deployment Programme in the future ATM systems.
- Facilitate the integration of advanced tools in the global ATM system.
- Monitor and evaluate current and expected traffic loads and estimated controller's workload in order to optimise the use of available capacity.
- Involve the Network Manager in the initiative to exchange information.
- Design, develop, and implement the STAM phase 2 after the implementation of the Traffic Complexity Tool.

Tasks:

The Implementation Project consists of the following tasks:

- Task 00 - WP0 – Project Management: This task will cover the whole management process.
- Task 01 - WP1 – TCT implementation: This task will cover the procurement and implementation of the Traffic Complexity Tool in all Italian ACCs.
- Task 02 - WP2 – Procedure Design STAM 2: This task will be used to prepare and design the STAM 2 procedures.
- Task 03 - WP3 – Procedure Development and Implementation STAM 2: In this task STAM 2 procedures will be developed and implemented.
- Task 04 - WP4 –Training STAM 2: This task will cover all the training sessions for the STAM 2.

Expected Results:

At the end of the project the following results are expected:

- TCT is implemented in all Italian ACCS: The tools will use predefined metrics to enhance long-term ATFCM, and/or enhanced planned trajectory prediction for mid-

term ATFCM and/or real time trajectory data for short term ATFCM. Traffic complexity tools also enhance the real time ATCO workload estimation.
- STAM2 procedure are designed, developed and implemented.
- Staff are trained.

Internal Achievements Points:

- Start of training - 31/01/2021
- End of training - 31/12/2021
- Parallel Operations / Operational Trials - 31/01/2020
- Cutover SW ready and successfully tested - 31/10/2019
- Cutover and fall-back period completed - 31/10/2019

Contractual Milestone:

- Project completed - 31/12/2021

Performance Benefits:

- Enhancement of overall ATM system performances (expected at least a 5% increase)
- Reduce delays by 3% and controller's workload by 5%.

➢ **2017_052_AF4 - AOP-NOP Integration - Extended Implementation**

Start/end date: 01/01/2019- 31/12/2021

Project Leader: EUROCONTROL / Network Manager

Project Contributors:

- Aeroporti di Roma S.p.A.;
- Aéroports de la Côte d'Azur;
- Flughafen Düsseldorf GmbH;
- Flughafen Wien Aktiengesellschaft;
- Manchester Airport PLC;
- STAL - Stansted Airport Limited;
- Società per Azioni Esercizi Aeroportuali – SEA.

Overview:

This Implementation Project builds on project 2015_113_AF4 AOP-NOP (Action 2015-EU-TM-0196-M) and 2016_131_AF4 "AOP-NOP integration - extended implementation"

(Action 2016-EU-TM-0117-M), expanding the scope to other airports part of the Family 4.2.4 implementation area.
The main objective of this Implementation Project is to enable the system to system exchanges between a local AOP and the NOP (NM systems) beyond the current A-CDM. This willl be realised through the implementation of the Predicted Departure Planning Information (P-DPI) exchange before the time horizon of the A-CDM process (Estimated Off Block Time (EOBT) -3hours) as to improve pre-tactical planning. This exchange shall be possible within the SWIM yellow profile, i.e. exchange via B2B web-services.

Specific objectives:

The project specifically aims to focus on the data exchange for efficient cooperation between NMOC and local collaborative structures for improved Network Management.
In particular, it will:

1. review and refine the intial AOP-NOP integration Concept and related information exchanges as produced in 2015_113_AF4 AOP-NOP and 2016_131_AF4 to ensure harmonisation across all airports;
2. adapt system change requirements for processing the exchanged data in NM and setting up requirements for airport systems of different airport types;
3. develop and deploy the different systems adaptation to allow fully tested AOP-NOP interfaces between NM and the participating airports.

The project will require coordination through common meetings / workshops particularly with respect to tasks 01 and 02 (hence travel costs associated). Internal organisation of airports (work may also require some level of travel for their own tasks related to requirements, implementation and testing).

Tasks:

The Implementation Project consists of the following tasks:

- Task 01 - Project Management: The project management relates to tasks concerning the organisation of the project, its monitoring and its control. It is performed according to EUROCONTROL adopted methodology.
  It will also take care for the application of management requirements stemming from the CEF / Deployment Manager coordination (e.g. technical and financial progress reporting…) and the organisation of relevant tasks
- Task 02 - AOP-NOP Concept refinement: The task will review and refine the AOP-NOP Concept and related information exchanges that were initially defined in projects 2015_113_AF4 AOP-NOP and 2016_131_AF4 so that to ensure harmonisation across all airports. In particular this will concern analysing technical interface requirements between NM and airports, discuss with NM and other airports and define final Interface requirements that will ensure harmonisation across all airports.

This analysis will be both in terms of the list / type of information exchanged and in technical terms (SWIM / B2B mechanisms).
The resulting deliverable shall provide for a high-level description of the Concept in terms of the information exchanged and their processing as well as the associated Interface Description / Control Document.

- Task 03 - NM System Requirements: Adapt NM System requirements for AOP Information Processing to fit needs of all airport types. The review of the ICD will result in necessary adaptations for different kinds of airports. NM will set up the requirements for the necessary system changes.
- Task 04 - Roma Fiumicino airport (FCO) System Requirements: Develop Airport (APT) System requirements for NOP Information Processing.
  Regarding the delivery of data from the NOP to the AOPs the respective airport will use the data contained in the ICD in order to increase the Network predictability by processing the data for the purpose described in the use cases that will be part of the Annex of the ICD. The airports will set up the system requirements for the necessary changes on their side.
- Task 05 – Milan Malpensa airport (MXP) System Requirements: Develop APT System requirements for NOP Information Processing
  Regarding the delivery of data from the NOP to the AOPs the respective airport will use the data contained in the ICD in order to increase the Network predictability by processing the data for the purpose described in the use cases that will be part of the Annex of the ICD. The airport will have to set up the system requirements for the necessary changes on their side.
- Task 06 – Nice airport (NCE) System Requirements: Develop APT System requirements for NOP Information Processing
  Regarding the delivery of data from the NOP to the AOPs the respective airport will use the data contained in the ICD in order to increase the Network predictability by processing the data for the purpose described in the use cases that will be part of the Annex of the ICD. The airport will set up the system requirements for the necessary changes on their side.
- Task 07 - Vienna airport (VIE) System Requirements: Develop APT System requirements for NOP Information Processing
  Regarding the delivery of data from the NOP to the AOPs the respective airport will use the data contained in the ICD in order to increase the Network predictability by processing the data for the purpose described in the use cases that will be part of the Annex of the ICD. The airport will set up the system requirements for the necessary changes on their side.
- Task 08 – Manchester airport (MAN) System Requirements: Develop APT System requirements for NOP Information Processing
  Regarding the delivery of data from the NOP to the AOPs the respective airport will use the data contained in the ICD in order to increase the Network predictability by processing the data for the purpose described in the use cases that will be part of the

Annex of the ICD. The airport will set up the system requirements for the necessary changes on their side.

- Task 09 – Stansted airport (STN) System Requirements: Develop APT System requirements for NOP Information Processing
  Regarding the delivery of data from the NOP to the AOPs the respective airport will use the data contained in the ICD in order to increase the Network predictability by processing the data for the purpose described in the use cases that will be part of the Annex of the ICD. The airport will set up the system requirements for the necessary changes on their side.
- Task 10 – Duesseldorf airport (DUS) System Requirements: Develop APT System requirements for NOP Information Processing
  Regarding the delivery of data from the NOP to the AOPs the respective airport will use the data contained in the ICD in order to increase the Network predictability by processing the data for the purpose described in the use cases that will be part of the Annex of the ICD. The airport will set up the system requirements for the necessary changes on their side.
- Task 11 – Network Manager (NM) System Implementation: Implement system changes as per system requirements (from related system requirement task) and ICD from NM System 23.5
  Implementation and testing for the participating airports can take place over the course of two years (2019-2022) in a non-synchronised manner. The project will adapt to the local implementation schedules as much as possible.
- Task 12 - FCO Implementation: Implement system changes as per system requirements (from related system requirement task) and ICD.
  Implementation and testing for the participating airports can take place over the course of two years (2019-2021) in a non-synchronised manner. The project will adapt to the local implementation schedules as much as possible.
- Task 13 – MXP Implementation: Implement system changes as per system requirements (from related system requirement task) and ICD
  Implementation and testing for the participating airports can take place over the course of two years (2019-2021) in a non-synchronised manner. The project will adapt to the local implementation schedules as much as possible.
- Task 14 – NCE Implementation: Implement system changes as per system requirements (from related system requirement task) and ICD.
  Implementation and testing for the participating airports can take place over the course of two years (2019-2021) in a non-synchronised manner. The project will adapt to the local implementation schedules as much as possible.
- Task 15 – VIE Implementation: Implement system changes as per system requirements (from related system requirement task) and ICD.
  Implementation and testing for the participating airports can take place over the course of two years (2019-2021) in a non-synchronised manner. The project will adapt to the local implementation schedules as much as possible.

- Task 16 – MAN Implementation: Implement system changes as per system requirements (from related system requirement task) and ICD.
  Implementation and testing for the participating airports can take place over the course of two (2019-2021) in a non-synchronised manner. The project will adapt to the local implementation schedules as much as possible.
- Task 17 – STN Implementation: Implement system changes as per system requirements (from related system requirement task) and ICD.
  Implementation and testing for the participating airports can take place over the course of two years (2019-2021) in a non-synchronised manner. The project will adapt to the local implementation schedules as much as possible.
- Task 18 – DUS Implementation: Implement system changes as per system requirements (from related system requirement task) and ICD.
  Implementation and testing for the participating airports can take place over the course of two years (2019-2021) in a non-synchronised manner. The project will adapt to the local implementation schedules as much as possible.
- Task 19 – NM Testing: Testing and debugging data exchange between NM and Airports.
- Task 20 - FCO Testing: Testing and debugging data exchange between NM and Airport.
- Task 21 - MXP Testing: Testing and debugging data exchange between NM and Airport.
- Task 22 - NCE Testing: Testing and debugging data exchange between NM and Airport.
- Task 23- VIE Testing: Testing and debugging data exchange between NM and Airport.
- Task 24 - MAN Testing: Testing and debugging data exchange between NM and Airport.
- Task 25 - STN Testing: Testing and debugging data exchange between NM and Airport.
- Task 26 - DUS Testing: Testing and debugging data exchange between NM and Airport.

Expected Results:

AOP-NOP Information sharing as described in the family 4.2.4 documentation is operational between the participating airports and the Network Manager.
The project is within the scope of NSP and NOP and in particular it links to NSP: SO 4/3 SO 06/2; and SO 6/4.

Internal Achievements Points:

- Start of training – N/A
- End of training – N/A
- Parallel Operations / Operational Trials - 01/07/2020
- Cutover SW ready and successfully tested - 30/06/2020
- Cutover and fall-back period completed - 30/11/2020

Contractual Milestone:

- Project completed - 31/12/2021

Performance Benefits:

Taking into account SESAR performance assessments (PARs) and previous AOP/NOP projects under deployment, AOP/NOP integration provides for the following performance benefits:

- Increased traffic predictability which enhances capacity available in the planning phase. - Increased ATCO productivity (indirect benefit).
- Cost-efficiency: no Aeronautical Fixed Telecommunication Network (AFTN) or Société Internationale de Télécommunications Aéronautiques (SITA) connections required any more. Significant operating cost reduction through better predictability of arrival runway capacity which reduces airborne and taxi-out holdings. This generates time savings and fuel saving.
- Reduction of reactionary delays and reactionary flight cancellations at the destination airport.

AOP/NOP integration will provide benefits to airports through an improved information flow concerning arrival flights, and to en-route and TMA units through a more accurate traffic picture in advance of real operations. Based on previous CBAs and on airport expertise, the following quantified benefits are the first estimation (under the assumption of a full PCP implementation):

- An improved en-route capacity utilisation of some € 25 million on top of 2015_113_AF4 and 2016_131_AF4 AOP-NOP integration projects.
- An improved runway capacity utilisation which results in a reduction of arrival airport ATFM delays (5%).
- A reduction of air transport non-ATM reactionary delays (-5%) and air transport non-ATM reactionary cancellations (- 0.5%).

➢ **2017_054_AF4 - Network Collaborative Management**

Start/end date: 01/10/2019 - 31/12/2021

Project Leader: EUROCONTROL / Network Manager

Project Contributor: N/A

Overview:

The main objective is for NM to finalise the implementation and deployment related to the PCP ATM Functionality Network Collaborative Management, and more particularly related to Families 4.2.2 Interactive Rolling NOP, 4.1.2 STAM Phase 2, 4.3.1 Target Time for ATFCM purposes and 4.4.2 Traffic Complexity Tools. It will continue deployment work carried out by CEF 2015 IPs (i.e. 2015_105_AF4, 2015_110_AF4, 2015_114_AF4, 2015_115_AF4) to enable full deployment of these Families by NM. This deployment will be performed through the deployment of NM releases 25 and 25.5 while the CEF 2015 projects will stop with NM System release 24.5.
The time overlap between the CEF 2015 IPs and this IP is due to the fact that identification of operational requirements / detailed specifications related to the release 25 shall start quite before release 24.5 has been deployed.

Specific objectives:

The IP specifically aims to:
(Task 2):

- achieve the deployment of interfaces related to the latest developments concerning PCP AF4 (Task 03, 04) for NM onto the technical platform in support of the Collaborative NOP (i.e. n-CONECT),
- finalise the migration of any other applications / interfaces due to be available on n-CONECT by end of 2021 (as target date for PCP / AF4 / Interactive Rolling NOP), i.e.
    - FLIGHT (former Collaboration Interface for Aircraft Operator (CIAO) and existing NOP FLIGHT related applications – Safety Assessment of Foreign Aircraft (SAFA), Integrated Initial Flight Plan Processing System (IFPS) Validation System (IFPUV), Call Sign Similarity Tool (CSST), Airborne position Report (AIREP), etc.).
    - Remnants of the NOP Portal (e.g. European Crisis Visualisation Interactive Tool for ATFCM (EVITA)).

(Task 3):

- implement any upgrade to the NM Systems as regards the STAM multi-actors coordination in the context of local implementations interfacing with NM Systems in the period 2020 - 2021.
  It is expected that improvement needs will derive either from further SESAR validation in late 2019 or from initial operations on this matter (i.e. when NM systems releases allowing some initial STAM multi-actors coordination are made available through CEF 2015 IP 2015_110_AF4). These improvements will not be considered as part of NM System releases relevant to CEF 2015 IP 2015_110_AF4 (until release 24.5) but as part of those relevant to this IP (releases 25 & 25.5).

(Task 4):

- implement any upgrade to the NM Systems as regards Network impact assessment (NM "what-if" facilities and interfacing with local tools) and Traffic complexity indicators available to FMPs that do not have local complexity management tools (upgrades will be available via the technical platform developed in Task 02).

(Task 5):

- implement any upgrade to the NM Systems as regards the Target Time for ATFCM. Adaptations may be required in support of the wider roll-out of local implementations, both as regards airports and en-route ATC, with the transmission of local TTA/TTO meeting specific local requirements to NM.
  As specified in the DP2017, NM will be then in charge of assessing the network impact leading eventually to coordination with the originator, and of transmission of CTOT and TTA/TTO to the concerned flight. This process will be limited to the planning phase and transmission of CTOT and updated CTOT as per standard processes.

Tasks:

The Implementation Project consists of the following tasks:

- Task 01 - Project Management: The project management relates to tasks concerning the organisation of the project, its monitoring and its control. It is performed according to EUROCONTROL adopted methodology. It will also take care for the application of management requirements stemming from the CEF / Deployment Manager coordination (e.g. technical and financial progress reporting...) and the organisation of relevant tasks.
- Task 02 - Interactive Rolling NOP: The task will continue work performed in the CEF 2015 IP 2015_105_AF4 in achieving the deployment of interfaces related to the latest developments concerning PCP AF4 (Task 03, 04) onto the technical platform in support of the Collaborative NOP (i.e. n-CONECT).
  It will also finalise the migration of any other application or interface due to be available on the new platform by end of 2021 (as target date for PCP / AF4 / Interactive Rolling NOP implementation), i.e.
  - FLIGHT (former CIAO and existing NOP FLIGHT related applications – SAFA, IFPUV, CSST, AIRREP, etc.)
  - Remnants of the NOP Portal (e.g EVITA)

  This implementation / deployment work will concern NM system releases 25 and 25.5.
- Task 03 - STAM Phase 2: The task will continue work performed under Action 2015-EU-TM-0196-M, IP 2015_110_AF4 in assessing and developing any upgrade to the NM Systems as regards the STAM multi-actors coordination in the context of local implementations interfacing with NM Systems in the period 2020 - 2021.
  (Such refinement / upgrade due to assessment of local implementations interfacing operationally with NM Systems are not considered in IP 2015_110_AF4).

This implementation / deployment work will concern NM system releases 25 and 25.5.

- Task 04 - Traffic complexity: The task will continue work performed under Action 2015-EU-TM-0196-M, IP 2015_115_AF4 in assessing and developing any upgrade to the NM Systems as regards network impact assessment (NM "what-if" facilities and interfacing with local tools) and traffic complexity indicators available to FMPs that do not have local complexity management tools.
  Such upgrades will be available via the technical platform developed in Task 02.
  This implementation / deployment work will concern NM system releases 25 and 25.5 -while IP 2015_115_AF4 is stopping at release 24.5.
- Task 05 - Target Time for ATFCM: The task will continue work performed under Action 2015-EU-TM-0196-M, IP 2015_110_AF4 in assessing and developing any upgrade to the NM Systems as regards the Target Time for ATFCM. Adaptations may be required in support of the wider roll-out of local implementations, both as regards airports and en-route ATC, with the transmission of local TTA (Target Time of Arrival)/TTO (Target Times Over) specific local requirements to NM
  As specified in the SDP 2017, NM will be then in charge of assessing the network impact leading eventually to coordination with the originator, and of transmission of CTOT and TTA/TTO to the concerned flight. This process will be limited to the planning phase and transmission of CTOT and updated CTOT as per standard processes.
  This implementation / deployment work will concern NM system releases 25 and 25.5 -while IP 2015_110_AF4 is stopping by release 24.5.

Expected Results:

The expected results will be the availability of NM System (version 25.5) and related n-CONECT platform allowing NM to operate the PCP Network Collaborative Management processes related to coordination of Short-term ATFCM measures, Network Impact Assessment and support to traffic complexity assessment, target time operation in cooperation through standardised exchanges with external stakeholders.
n-CONECT Interfaces will be available to operational stakeholders (mainly ANSPs) for deployment in their operational environment and emulating the related Network Collaborative Management processes.

Internal Achievements Points:

- Start of training - 01/07/2021
- End of training - 29/10/2021
- Parallel Operations / Operational Trials - 01/09/2021
- Cutover SW ready and successfully tested - 03/05/2021
- Cutover and fall-back period completed - 30/11/2021

Contractual Milestone:

- Project completed - 31/12/2021

Performance Benefits:

The main benefit will be an improved efficiency for Airspace Users' operations, particularly a reduction of ATFM En-route delay due to an improved capacity utilisation and improved traffic predictability.
From past CBAs, it is fully recognised that AF4 projects are delivering +33% of benefits compared to the PCP CBA (some 670 Millions €) at a cost not higher than the PCP CBA (so far only 20% of costs initially planned were expended).
Network Collaborative Management projects contribute to one quarter of these benefits. At a first estimation, bBased on previous CBAs, this additional project is expected to deliver at least € 20 Millions of undiscounted benefits. All these benefits provided that all PCP stakeholders deploy PCP as mandate in PCP regulation.

- **2017_057_AF4 - Local traffic complexity management**

Start/end date: 12/04/2018 - 31/12/2022

Project Leader: Polish Air Navigation Services Agency

Project Contributor: State Enterprise "Oro navigacija"

Overview:

The main objective is to introduce a new technology to monitor, manage and evaluate information processed through all the ATFCM phases by the open, modular and extensive tool. The tool itself will be deployed by PANSA/Oro Navigacija to integrate data transfer and processing with the Network Manager and other operational stakeholders.
In accordance with the PCP Implementing Regulation (EU 716/2014) and the Deployment Programme, ATM Functionality # 4 (Network Collaborative Management), including the Project Family 4.4.2 (Traffic Complexity tools), is required to be deployed in the European Air Traffic Management Network (EATMN).
Also, in the subsequent versions of the Deployment Programme, as concerns the Project Family 4.4.2, PANSA/Poland and Oro Navigacija/Lithuania have been indicated as investment gaps, meaning, that the Traffic Complexity tools are still required to be deployed by PANSA/Poland and Oro Navigacija/Lithuania. The end of the project extends Full Operational Capability date for 4.4.2 family; however implementation of TCT (Traffic Complexity Tool) for Polish part is foreseen to be completed in 2019 in line with the FOC (Full Operational Capability) date for Poland. Implementation of local TCT in Lithuania also

meets the FOC deadline for Lithuania. In 2022 the project will consist on coordination work between PANSA/Oro Navigacija and different stakeholders, in particular NM, AUs and MIL, airport operators/slot coordinator through collaborative decision-making processes.
The traffic complexity tools continuously monitor sector demand and evaluate traffic complexity (by applying predefined complexity metrics) according to a predetermined qualitative scale. The predicted complexity coupled with traffic demand enables ATFCM to take timely action to adjust capacity or request the traffic profile changes in coordination with ATC and airspace users (AUs).
The "Local traffic complexity management" project implemented by PANSA/Oro Navigacija is an instrument for automated and dynamic traffic forecasting and sectorisation planning that will provide support to local ATFCM and ATS units in the execution of tasks in order to enable efficient planning of capacity and staffing at PANSA/Oro Navigacija. The Implemeting Project will enable to run fast-time simulations that in turn will develop optimised sectorisation scenarios in terms of capacity parameters and ATCOs resources needs. The Implementation Project will enable coordination between PANSA/Oro Navigacija and different stakeholders, in particular NM, AUs and military, airport operators/slot coordinator through collaborative decision-making processes.
Also, since the eastern part of the EU airspace is exposed to eastward out-of-area traffic from non-IFPS (Initial Flight Plan Processing System) States (e.g. Russia) and traffic volatility due to instability in the region, this Implementation Project will increase traffic predictability thus contributing to delays reduction for the entire European Network.
The Implementation Project is composed of four modules:

- The FMP / ACC module: This module will support the currently used CHMI (Collaboration Human Machine Interface) by delivering the full CHMI functionality expanded with many new options. The system will be used for all the ATFCM phases: strategic, pre-tactical, tactical and postoperative. During the tactical phase, this tool is intended to assist in the dynamic sector and capacity management. In the strategic and pre-tactical phase, the system will allow to precisely plan the day of operation and prepare for special events. In the post-operative phase, the tool will be used for all analyses and reports.
- ACC module: The Implementation Project will provide for fast-time simulation (FTS) that can be used to airspace improvements on strategic level.
- APP (Approach): The Implementation Project will provide for a simulation tool to identify and test the possible modifications of the TMA airspace in terms of: airspace structure and procedures as well as workload of air traffic controllers.
- TWR (Tower):
  The Implementation Project will provide for an IT solution that can provide either fast-time simulation which can be used to look solely at airport infrastructure improvements, either run modelling of schedule as well to show indicative delays across an operational season. The idea is to verify possibility of planned schedules execution, look at infrastructure changes and their impacts/improvements as well as to devise daily operational plans. In-build module containing weather information that creates predicted traffic outputs with high degree of accuracy will be implemented. As concerns post-operative utilisation, the project will use past operations for the purposes of traffic complexity and overload situations prediction in order to develop

mitigation actions to be applied at local and/or Network level.

Specific objectives:

The IP specifically aims to:

1. deploy a Traffic Complexity Tool and procedures aimed at continuous monitoring of traffic demand and evaluation of traffic complexity in Warsaw and Vilnius ACCs, required under the PCP IR (EU 716/2014).
2. provide an automated and dynamic traffic forecasting and sectorisation planning concerning particular tactical adjustments for efficient planning of the capacity and staffing at the Warsaw ACC and Vilnius ACC, with the use of periodical fast-time "what-if" simulations for optimised sectorisation and ATSU (Air Traffic Services Unit) resources planning, based on capacity parameters such as controllers' workload and sector occupancy.
3. enable integration with the Network Manager, including Collaborative Traffic Management, airport planning, Flexible Use of Airspace and neighbouring FMPs for the planning optimisation.
4. provide mitigation measures, when needed, for unexpected increase of traffic volume/workload.
5. enable an early deployment, in coordination with the Network Manager, of the revised Network Function Implementing Rule (Commission Regulation (EU) 677/2011) requirements.

Tasks:

The Implementation Project consists of the following tasks:

- Task 01 - Project management: Management of the project, project documentation and reporting.
- Task 02 - Specification of the TCT system, procurement process and contract award for the TCT for Warsaw: Procurement process, contract award and delivery.
- Task 03 - Installation and deployment of the TCT in Warsaw: Technical installation, FIR EPWW (Flight Information Region Warsaw) airspace modelling and full deployment of the airspace model in the Warsaw TCT (procedures; training; approvals, start of operation).
- Task 04 - Cooperation process with Network Manager: Agreement with the Network Manager on interfacing of the Warsaw TCT with the NM ETFMS.
- Task 05 - Installation and deployment of the TCT in Vilnus: Definition of the Vilnius node of the Local ATFCM (Vilnius TCT, replacing the CHMI) – based on the Warsaw experience, procurement and contract award for the TCT Vilnius and full deployment of the Vilnius TCT – mid 2020.
- Task 06 - Cooperation with stackeholders: Agreement with the major airports and airlines on using the B2B connections with the local ATFCM – under the assumption of revised share of ATFCM tasks between the NM.

Expected Results:

- airspace capacity is increased ;
- number of delays and congestions is reduced in controlled airspace and aerodromes;
- Traffic Flow Management (tactical workload measurement) is more effective;
- ATCOs resources are optimised;
- ATC safety is improved (incidents reduction);
- service quality is improved;
- cost of airspace optimisation is reduced (Fast Time Simulation);
- with better traffic forecasts, overload situations are significantly reduced thus contributing to safety improvement.

Internal Achievements Points:

- Start of training - 31/03/2019
- End of training - 31/07/2019
- Parallel Operations / Operational Trials - 30/09/2019
- Cutover SW ready and successfully tested - 30/09/2019
- Cutover and fall-back period completed - 30/09/2019

Contractual Milestone:

- Project completed - 31/12/2022

Performance Benefits:

It is expected that the project will bring the largest performance benefits in terms of capacity increase and reduction of delays both in en-route and terminal traffic. This assumption is based on on-going ECTL/NM simulations, in particular on already developed simulations concerning implementation projects submitted and awarded in the framework of 2014 and 2015 CEF Transport Calls for Proposals. The project will contribute to ATFM en-route delays saving (CAP5 - Capacity KPI) and ATFM (TMA part) delays saving (CAP4).
As concerns indirect impact, the project will contribute to the following KPAs (Key Performance Areas):

- Safety: The project will enable more precise traffic forecasting leading to a significant reduction of overload situations and having positive impact on improved safety. The project will reduce operational human errors.
- Predictability: The project will enable more precise traffic forecasting and traffic predictability that will have positive impact on capacity increase and delay reduction in both en-route and terminal operations. Improved predictability is a consequence of better capacity utilisation. This improvement is mainly related to improved trajectory and network complexity assessment.
- Flight efficiency: Reduced flight times and delays due to improved trajectory and network complexity assessment.

- Cost efficiency: Increased ATCO productivity due to better allocation of resources to traffic thanks to traffic complexity assessment and EFD (Electronic Flight Display) messages.

In conclusion, the project by PANSA and Oro Navigacija will significantly reduce overload situations and will contribute to a reduction of traffic congestion. By increasing traffic predictability and by making traffic flow smooth and orderly, in particular coming from non-IFPS states, the project will have positive impact on the whole European ATM Network and air traffic flow management. By ensuring that traffic flows are more predictable, the project will contribute to safety improvement and improved service quality for PANSA/Oro Navigacija customers (Airspace Users). As the project is to increase airspace capacity and to reduce delays, the ultimate beneficiaries of the project will be Airspace Users and passengers.

➢ 2017_062_AF4 - Traffic Complexity Assessment and Simulations Tool – TCAST

Start/end date: 12/04/2018 - 28/06/2019

Project Leader: BELGOCONTROL

Project Contributor: N/A

Overview:

The TCAST Implementation Project will implement a local traffic complexity assessment and simulations tool in the Brussels ACC. The Implementation Project covers several tasks including the installation, testing and fine tuning of the tool, the integration of EFD, NM, MET (meteorological) and other relevant data, the development of procedures and guidance information and the training of the operational and technical staff.
Following on from SESAR Solution ID #19, and the identified shortcomings in the current ATFCM process in place at Belgocontrol, the main objective of this Implementation Project is to:

1. Support the efficient and dynamic handling of traffic by adjusting the sector capacity according to the traffic demand and its associated complexity. This will be achieved through:
    a. Procurement and installation of a traffic complexity assessment and simulation tool.
    b. Tuning of the system according to the particularities of the traffic and airspace under the responsibility of Belgocontrol (Brussels ACC/APP) as well as the parametrisation and fine tuning of the complexity algorithm and system outputs.
    c. Redesigning the current way of working by introduction of traffic complexity metrics in the ATFCM process.
2. Integrate internal and external data sources by:

a. Creating a Web Service B2B interface with the NM using the public internet and the SWIM YP.
b. Creating an interface to receive EFDs.
c. Creating internal interfaces with local systems: AMS, ARTAS, MET Systems, etc.

3. Train and familiarize personnel by:
   a. involving the end users during all phases of the project, with an emphasis on the tuning phase.
   b. making participate the end users to a number of training sessions in order to get acquainted with the new system and its functionalities.
   c. providing technical personnel with adequate training.

The TCAST project already started in 2017 but only the activities (and related costs) starting from 12/04/2018 onwards are considered in the framework of the SGA.

Specific objectives:

The implementation project specifically aims to:

1. acquire and implement a support system capable for real time monitoring, assessment and forecasting of air traffic complexity.
2. integrate up-to-date and SWIM compliant information coming from several data sources (NM-B2B webservices, local systems).
3. redesign the overall ATFCM concept and processes applied within Belgocontrol by considering the impact of traffic complexity in the decision-making process with regard to Demand-Capacity Balancing (DCB).

Tasks:

The Implementation Project consists of the following tasks:

- Task 01 - Project Management: This task covers aspects of planning, management, coordination and communication of all project related activities.
- Task 02 – Safety: This task covers all the safety aspects related to the implementation of the TCAST.
- Task 03 - Development of Operational Concept, Procedures and Guidance Documentation: This task covers:
  - the development of the concept of operations, it's fine tuning, review and acceptance by the relevant parties.
  - the development of procedures to be followed by the Traffic Managers/Supervisors in the context of CHMI-Complexity tool dual operations.
  - the development and update of operational guidance documents such as Brussels ATFCM OPS Manual: Guidelines and procedures for the OPS application of the Belgocontrol "Gate-to-Gate" ATFCM concept, etc.

- Task 04 - Technical Implementation of the Traffic Complexity Assessment and Simulations Tool: This task covers:
    - all the preparatory activities for the installation of the traffic complexity tool and the activities related to the installation itself ending with a pilot version of the system.
    - all activities related to the development of interfaces needed for data communication with NM and local systems (AMS, MET systems...etc.), testing of the interfaces as well as the integration of the data in the traffic complexity tool.
    - the necessary developments for the EFD reception and processing by the system.
    - all necessary activities (parametrisation, tuning of algorithms and output data, etc.) necessary for the fine tuning of the air traffic complexity assessment system.
- Task 05 – Training: This task covers all the training needed for the OPS and Technical Personnel in order to assure the right level of familiarisation and acceptance of the tool.

Expected Results:

1. A Traffic Complexity Tool is in operational use.
2. ATFCM procedures are updated.
3. Traffic flow is optimised.

Internal Achievements Points:

- Start of training - 01/06/2018
- End of training - 10/04/2019
- Parallel Operations / Operational Trials - 26/04/2019
- Cutover SW ready and successfully tested - 26/04/2019
- Cutover and fall-back period completed - 26/04/2019

Contractual Milestone:

- Project completed - 28/06/2019

Performance Benefits:

The TCAST project will contribute to enhancements in the following key performance areas:

1. Safety: positive impact due to better ATCO workload predictability (1%).
2. Environment: positive impact due to the use of more optimal routes leading to reduction in emissions (1%).
3. Capacity: positive impact due to the forecast of traffic complexity situations that would allow timely actions to be taken by the Traffic Manager (3%).

4. Operational efficiency: positive impact (7%).

The above-mentioned performance enhancements will bring benefits to Airspace Users, Belgocontrol and neighbouring Air Navigation Service Providers, the Network Manager and the Air Traffic Controllers.

Activity 6: AF5 Implementation (50% co-funded)

System Wide Information Management (SWIM) concerns the development of services for information exchange. SWIM comprises standards, infrastructure and governance enabling the management of information and its exchange between operational stakeholders via interoperable services. Initial System Wide Information Management (iSWIM) supports information exchanges that are built on standards and delivered through an internet protocol (IP)-based network by SWIM enabled systems.

It is composed of the following technical families:
S-AF 5.1: Common Infrastructure Components:
- Family 5.1.1: PENS 1: Pan-European Network Service version 1;
- Family 5.1.2: NewPENS: New Pan-European Network Service;
- Family 5.1.3: Common SWIM Infrastructure Components;
- Family 5.1.4: Common SWIM PKI and cyber security;

S-AF 5.2: SWIM Infrastructures and Profiles:
- Family 5.2.1: Stakeholders Internet Protocol Compliance;
- Family 5.2.2: Stakeholders' SWIM Infrastructure components;
- Family 5.2.3: Stakeholders' SWIM PKI and cyber security;

S-AF 5.3: SWIM Aeronautical Information Exchange:
- Family 5.3.1: Upgrade/Implement Aeronautical Information Exchange System/Service;

S-AF 5.4: SWIM Meteorological Information Exchange:
- Family 5.4.1: Upgrade/Implement Meteorological Information Exchange System/Service;

S-AF 5.5: Cooperative Network Information Exchange:
- Family 5.5.1: Upgrade/Implement Cooperative Network Information Exchange System/Service;

S-AF 5.6: SWIM Flights Information Exchange:
- Family 5.6.1: Upgrade/Implement Flight Information Exchange System/ Service supported by Yellow Profile;
- Family 5.6.2: Upgrade/Implemented Flight Information Exchange system/service supported by Blue Profile.

Within the objective of the Action, the following families are addressed:
Family 5.1.4 – Common SWIM PKI and cyber security;
Family 5.2.1 – Stakeholders Internet Protocol Compliance;
Family 5.2.2 – Stakeholders SWIM Infrastructure Components;
Family 5.2.3 – Stakeholders' SWIM PKI and cyber security;
Family 5.3.1 – Upgrade/Implement Aeronautical Information Exchange System/Service;
Family 5.4.1 – Upgrade/Implement Meteorological Information Exchange System/Service; and
Family 5.6.1 – Upgrade/Implement Flight Information Exchange System/Service supported by Yellow Profile.

Sub - Activity 6.1 - Activity 6 Coordination

Leader: SESAR Deployment Alliance
Start Date: 12/04/2018
End Date: 31/12/2023

The Activity aims at coordinating the implementing initiatives within the scope of the AF5 and its sub AFs. According to Deployment Programme Methodology, each Implementing Partner will support SDM during Cost Benefit Analysis (CBA) finalisation at Action Level. SDM will steer the Implementing Partners to provide all contributions needed to prepare CBA according to the INEA guidelines.

Deliverables:

6.1.1 Action Status Report (ASR) – IP Level – submitted as an Annex to Action Status Report (del. 1.2.4) every year until 2023
6.1.2 Risks and Issues, and mitigation Actions Registry – AF5 level – submitted 2 times per year (30/04; 30/09) until 2023 starting from 2019
6.1.3 Final Report (technical content) – 31/12/2023

Sub - Activity 6.2 AF5: Implementation Projects

- **2017_002_AF5 Aeronautical Information Exchange system for Airlines Flight Operation Centre (FOC) at Lufthansa & Air France**

Start/end date: 01/05/2018 – 28/04/2023

Project Leader: Deutsche Lufthansa Aktiengesellschaft

Project Contributors:

- Lufthansa Systems GmbH & Co. KG;
- Lufthansa Systems Poland Sp. z o.o;
- Société Air France.

Overview:

The main objective of this Implementation Project is to enable the airlines of the Lufthansa Group and Air France to deal with the aeronautical data that will be used by the SWIM Yellow Profile.
The implementation project focusses on the implementation upgrade of the FOC and required cockpit interfaces from LH & AF with Aeronautical Information Exchange systems and services in accordance with SWIM principles. In particular the main activities performed are the service implementations to be compliant with the applicable version of Aeronautical Information Reference Model (AIRM), the AIRM Foundation Material and the Information Service Reference Model (ISRM) Foundation Material.
Furthermore, the Implementation Project includes the integration of the information provided by the Network Manager into the database.

Specific objectives:

The Implementation Project specifically aims to:

- define, develop and deploy an AIXM 5.1 datastore that is able to store the digital aeronautical base data (especially the airspace structure data);
- identify and deploy the SWIM infrastructure components for the retrieval of the digital data by use of the SWIM Yellow Profile;
- deploy and integrate the legacy data into the new datastore;
- ensure implementation of software components that support the users in the quality assurance of the digital data;
- deploy and migrate the software components for the processing of the legacy data into the new datastore;
- update all software components using the data (e.g. for flight planning purposes) to use the digital data and to access the new datastore;
- achieve a implementation of SWIM services that allow other consumers to access the digital data.

Tasks:

The Implementation Project consists of the following tasks:

- Task 01 - Project Management: The Project Management task relates to all general management tasks that are required to coordinate and track the fulfillment of the related project tasks. The project management will be performed throughout the whole lifecycle of the project, including the project initialisation and finalisation.
  The Project Management task includes the following sub-tasks:
  - Initiating: Relates the setup of the project including the appointment of of project manager and project team and the definition of the project charter;
  - Planning: Refers to the approvement of all planning documents with all contributing partners and the signment of the project charter,
  - Monitoring and Controlling: Includes tracking of the progress of single tasks and sub-tasks, definition and monitoring of project risks and problems and all reporting tasks related to the project, support of takeover activities and approving and declining of project change requests;
  - Coordination: Refers to the organisation and initialisation of the single project tasks and sub-tasks with all involved project partners and ensuring availablity of adequate resources;
  - Closing: Includes issuing of the final project report and breaking up the project team after project finalisation.
- Task 02 - Concept Development: The Concept Development aims the preperation of all technical documentation and specification that are required to implement the technical systems that relate to the new operational concept.
- Task 03 - System Engineering & Development: The System Engineering & Development task aims to the provision of the complete system that fulfills all requirements defined in the Requirements and the final acceptance of the respective system by the airlines of the Lufthansa Group.
  The System Development Task includes the following sub-tasks:
  - Implementing the software: Includes all tasks that related to the technical fulfillment of the software and system implementation;

  - Performing internal (INT) Test: Refers to testing of the new system/ software on Lufthansa Systems side as prerequisite for the acceptance test;
  - Issuing the user manual: Aims at the provision of manuals that describe the new functions, workflows, etc. to the operational system users;
  - Issuing the technical manual: Aims at the provision of manuals that describe technical prerequisites for software implementation, system administration procedures etc, as required by system admins;
  - Performing acceptance test: This sub-task aims the final acceptance of the new system/ software by the airlines of the Lufthansa Group.
- Task 04 - Preparation of Phase in: The Preperation of Phase-in task relates to all tasks that are required by the airlines of the Lufthansa Group to ensure that the new operational approach can safely be intruduced to operations.
  The Preperation of Phase-in includes the following sub-tasks:
  - Analysing of gaps in operational procedures: This sub-task aims the identification of gaps between the previous operational procedures and the future operational procedures;
  - Assessing the impact on safety: Aims at the identification of procedural approaches that are safety relevant;
  - Updating of procedure manuals: Aims at the definition of new operational procedures that close the procedural gaps identified;
  - Updating of Safety Management System: Aims at the definition of adequate procedures that ensure the safety of operations of the new procedures/ operational concepts;
  - Issuing of training material: Aims at the preperation of user trainings that allow an efficient and frictionless phase-in of the new operational procedures and systems;
  - Issuing of phase-in plan: This sub-task refers to the scheduling and planning of the phase-in of the new operational procedures, including: User training schedule (ops procedures/ safety etc.); system integration schedule, operational phase-in schedule.
- Task 05 – Deployment: The Deployment task aims to complete integration of the new procedures and systems into the operations of the airlines of the Lufthansa Group.
  The Deployment includes the following sub-tasks:
  - Performing technical training: aims at training system administrators to ensure that the new system can be monitored and operated as specified;
  - Performing operational training: aims at training operational personell that takes part in the new operational concept;
  - Performing safety trainings: aims at training all personell that is involved in the new operational concept or involved in the system administration with regard to safety relevant aspects;
  - System integration: aims at installing and enabling the new software on site of the airlines of the Lufthansa Group, including final on-site acceptance test;
  - Operational phase-in: aims at fully integrating the new operational concept into the operation of the airlines of the Lufthansa Group and the finalisation of the final deployment of the new operational concept.

<u>Expected Results:</u>

- D-NOTAMs (Digital Notice to Airmen) are included in FOC;

- Airspace Usage Plans (AUP, UUP) — ASM level 1, 2 and 3 is deployed;
- Aerodrome mapping data and Airport Maps (including eTOD: electronic Terrain and Obstacle Data) are deployed;
- Notification of the activation of an Airspace Reservation/Restriction (ARES) are deployed;
- Notification of the de-activation of an Airspace Reservation/Restriction (ARES) are deployed;
- Pre-notification of the activation of an Airspace Reservation/Restriction (ARES) are deployed;
- Notification of the release of an Airspace Reservation/Restriction (ARES) - Aeronautical information feature on request are deployed.

Internal Achievement Points:

- Start of training - 01/06/2022
- End of training - 28/04/2023
- Parallel Operations / Operational Trials - 01/02/2023
- Cutover SW ready and successfully tested - 31/05/2022
- Cutover and fall-back period completed - 28/04/2022

Contractual Milestone:

- Project completed - 28/04/2023

Performance Benefits:

In particular the main benefit of this project is the increase of flight safety through processing digital data instead of manual data maintenance of AIP data. Furthermore, flight efficiency is increased by 2 % through consideration for dynamic airspace data Information through B2B services. This is corresponding to 2 % increased fuel efficiency. The migration to the SWIM Yellow Profile for the retrieval and provision of the concerned data will lead to increase the level of automation during data processing and reduction of personal costs. Furthermore the migration to an AIXM5.1 database will lead to compliance with Aeronautical Data Quality (ADQ) regulations.

➢ **2017_018_AF5 SWIM-enabled OCC**

Start/end date: 14/01/2019 - 07/03/2023

Project Leader: Ryanair DAC

Project Contributor: Boeing Research & Technology Europe S.L.U

Overview:

Real time data exchange between airports, the NM, ANSP's, Military Authorities and airspace users through SWIM will contribute to greater operational efficiency, improved predictability and resilience. This project will deliver the required capabilities to achieve

SWIM-enabled information exchanges between the NM and Ryanair FOC and will be designed to be connected to other SWIM nodes of interest, specifically A-CDM airports such as Dublin in the future.
* S-AF 5.2: Implementation of the Yellow SWIM TI Profile over public internet IP-network, for the exchange of ATM data (aeronautical, meteorological, airport, etc.) based on standards and interoperable services.
* As part of S-AF 5.3, a further link can be established to support the exchange of the following aeronautical information using the yellow SWIM TI Profile relevant to RYR FOC and Planning: (Pre-)Notification of the (de-)activation of an Airspace Reservation/Restriction (ARES), aeronautical information on request, aerodrome mapping data and airport maps, D-Notams.
* As part of S-AF 5.4; Meteorological prediction of the weather at the airport concerned, at a small interval in the future: wind speed and direction, the air temperature, the altimeter pressure setting, the runway visual range (RVR); Provide Volcanic Ash Mass Concentration; Specific MET info feature service; Winds aloft information service; Meteorological information supporting Aerodrome ATC & Airport Landside process or aids involving the relevant MET information, translation processes to derive constraints for weather and converting this information in an ATM impact; the system capability mainly targets a "time to decision" horizon between 20 minutes and 7 days; Meteorological information supporting En Route/Approach ATC process or aids involving the relevant MET information, translation processes to derive constraints for weather and converting this information in an ATM impact; the system capability mainly targets a "time to decision" horizon between 20 minutes and 7 days.
The Implementing Partners target to consume iWXXM or GRIB2 (General Regularly-distributed Information in Binary form) from Eumetnet to implement this initially.
* As part of S-AF 5.5: Ensuring a maximum airport capacity based on current and near term weather conditions, Synchronisation of Network Operations Plan and all Airport Operations Plans, Regulations, Slot management, Short term ATFCM measures, ATFCM congestion points, Restrictions, hotspots, Airspace structure, availability and utilisation, Network and En-Route Approach Operation Plans.
* Last but not least, as part of S-AF 5.6: Various operations on a flight object: Acknowledge reception and validate flight plans and routes, route modifications, arrival runway, coordination related information, SSR (Secondary Surveillance Radar) code, STAR, SID, Flight Object information, 4D trajectory, flight performance data, flight status, detailed flight data and Flight update. The aim here is to consume flight object data.
As listed above in PCP highlights for AF5 - Yellow SWIM IT Profile data can be added to the Ryanair FOC, Some components can potentially be also linked with Dublin airport to deploy a Collaborative Decision Making tool to adapt operations in near realtime or in the preflight planning phase.
The core components of AF5 should be achievable once SWIM is fully developed and integrated into the associated sub-systems.

Specific objectives:

- Monitor the deployment of SWIM Governance (2017_084_AF5, "SWIM Common PKI and policies & procedures for establishing a Trust framework") and the individual milestones achieved by the implementing partners - on NM, AO and ANSP Level. This is particularly important for the development and deployment of the SWIM infrastructure ('SWIM enabled Ryanair FOC'). The aim is to monitor the deployment of SWIM

Governance with a view to ensuring that it fulfils the airspace users' needs and requirements. To that aim, Ryanair and Boeing Europe will work closely together to ensure that the core foundation stones for SWIM-enabling are successfully built > Ref. SDM's Action Plan on SWIM Governance (Addendum 2 to the Strategic View of DP16).

- Implement SWIM infrastructure - On Ryanair Operational level: Deploy and bring into operation the hardware infrastructure, software applications and operational procedures required to enable Ryanair's FOC to be fully SWIM compliant. To that aim, Ryanair and Boeing will contribute to and operate in full compliance with the applicable SWIM Governance mechanisms. The goal is to enable Ryanair to incorporate SWIM data in its daily operations and lay the foundations for Ryanair's implementation of the AFs supported by SWIM. This will result in improvements to the efficiency, predictability and resilience of Ryanair's operations and in enhancements to the overall performance of the European air traffic network.
- Establish a SWIM user-case with a SWIM-enabled partner (ex. Dublin Airport) and Eurocontrol / NM to benchmark and showcase the benefits of SWIM in the Yellow Profile: Develop and implement clients to the relevant information services available in SWIM through the Yellow Profile, considering as a potential solution a cloud-based deployment. Integrate the data retrieved from SWIM in different operational applications at Ryanair's FOC in accordance with a set of use cases expected to bring substantial performance benefits both to Ryanair operations and to the European ATM network. Train personnel and transition the SWIM-enabled systems into operation.

Tasks:

The Implementation Project consists of the following tasks:

- Task 01 - General Project management: Project oversight to track and monitor milestones and progress.
- Task 02 - Phase 1.1 - Feasibility Assessment: Conducted in coordination with Boeing and Ryanair IT Labs to make an internal case to show that SWIM deployment will provide sufficient efficiency gains to justify the investment. And to demonstrate the infrastructure will be compatible with current Ryanair OCC.
- Task 03 - Phase 1.2 - Agreement and plan of action with collaborating partners: Feedback to Technical Feasability Assesment.
- Task 04 - Phase 2.1 - Establish a SWIM Governance Compliance Plan and Manual for Ryanair: Contribute to the definition of the SWIM Governance (mainly through contribution to stakeholder consultation platforms) and definition of a SWIM Governance compliance plan and manual for Ryanair's SWIM implementation.
- Task 05 - Phase 2.2 - Define the set of use cases in Ryanair's current and future operations that will require data currently available and anticipated SWIM information services: Define the set of use cases in Ryanair's current and future operations that will require data from the currently available and anticipated SWIM information services. Identify the information flows in those use cases and derive their requirements from the SWIM services. Analyse the expected data flows between Ryanair's FOC and the rest of the SWIM elements (service providers, Registry, etc) with a special focus on the information services provided by network Manager though the Yellow Profile.

- Task 06 - Phase 2.3 - Benchmark Ryanair's current infrastructure to identify any gaps. Based on 2.2 requirements: The analysis will include internal network infrastructure, external connections and network security, in order to identify all the elements related to the deployment of Initial SWIM. In particular, Ryanair's network infrastructure will be audited in order to identify the required modifications to meet connection requirement with SWIM using the mandated IP standards such as IP version 6 and all protocols requirement listed in the Deployment Programme. A roadmap and detailed plan to upgrade the infrastructure to comply with the SWIM requirements will be prepared considering compatibility with middleware solutions required to connect to Yellow Profile.
- Task 07 - Phase 2.4 - Deploy the necessary FOC infrastructure upgrades: Deployment of the required FOC network infrastructure upgrades according to the plan prepared in Task 2.3 and following SWIM Governance.
- Task 08 - Phase 2.5 - Define SWIM services implementation roadmap and detailed plan: Define SWIM services implementation roadmap and detailed plan. Select the set of SWIM services listed in Annex 1 of the Deployment Programme 2016 (services deployed in SESAR 1 or in the process of being deployed by the Network Manager), that are to be consumed by Ryanair's FOC through the Yellow Profile (consider Aeronautical Information Exchanges, Weather Information Exchanges, Cooperative Network Information Exchanges, Flight Information Exchanges and Flight Objet Information Exchanges). The selection will be based on the use cases identified in Task 1 and the timeframe available for deployment (2017-2023). The plan will include the deployment of the appropriate middleware required to connect Ryanair's FOC systems to the selected services. The middleware selection will consider both the connection between internal FOC applications as well as connections with external SWIM services. The required security infrastructure will also be included in the plan. The clients to the SWIM services will act as adaptors that deliver the SWIM data in the right format to a consumer FOC application (potentially mediating between SWIM data standards and legacy proprietary data formats). For each of the Ryanair's applications that will connect and use information from the SWIM services, a deployment and lifecycle plan will be defined in compliance with the SWIM Governance. In particular, all applications accessing SWIM information services deployed during this project will be using the SWIM Registry to declare their role, information flows, and standards used at the different implementation layers from their early deployment until they go operational. This information will include the pertinent layered description of the architecture of the implemented solutions, referencing the design and requirements documents followed (these documents will be published and maintained by SWIM Governance bodies). During the operational life of the services and applications, the Registry entries associated with them will always reflect the latest version information. Thus, the SWIM Registry will be used as an effective two-way tool to communicate with the SWIM Governance in a transparent and systematic way, following its directives and mandates and exposing how the design is compliant with the SWIM requirements at every level. This Task will include the preparation of a business case for the implementation of each of the selected SWIM services.
- Task 09 - Phase 2.6 - Deployment of client applications for selected SWIM services: Deployment of Ryanair's applications for the selected SWIM services according to the plan defined in Task 2.5. Start with middleware deployment and then focus on client application deployment, including integration with FOC systems.

- Task 10 - Phase 2.7 - Operational integration of SWIM data into Ryanair's FOC: Operational integration of SWIM data into Ryanair's FOC systems. Personnel training. Validation tests against identified use cases and transition into operations.
- Task 11 - Phase 3 - SWIM-enabled FOC: Full operational SWIM-enabled Ryanair FOC.
- Task 12 - Phase 4.1 - Interface Requirements and adaptation to build testcase Eurocontrol: Determine the requirements to establish a working SWIM platform between Ryanair's SWIM-enabled FOC, Eurocontrol NM (Unilateral Data flow from NM>RYR) in yellow SWIM Profile.
- Task 13 - Phase 4.2 - Eurocontrol NM Integration: Establish a working SWIM platform between Ryanair's SWIM-enabled FOC and Eurocontrol NM (Unilateral Data flow from NM>Ryanair) in yellow SWIM Profile.

Expected Results:

The ultimate goal is to enable Ryanair to incorporate SWIM data in daily operations and lay the foundations for Ryanair's implementation of the AFs supported by SWIM, leading to improvements in Ryanair's operational efficiency, predictability and resilience and therefore providing better and more accurate information to other pears in its data exchanges with the A-CDM enabled airports and the NM allowing the former to improve the content of their DPI & API messages and the later to directly and indirectly enhance its knowledge about the full network, enhancing the overall performance of the European air traffic network.
By the end of this project, Ryanair will be able to routinely leverage the information relevant to its operations available through the SWIM's Yellow Profile and contribute to some of the available services to improve network operations.

Internal Achievement Points:

- Start of training - 09/11/2021
- End of training - 15/02/2022
- Parallel Operations / Operational Trials - 16/06/2021
- Cutover SW ready and successfully tested - 26/03/2021
- Cutover and fall-back period completed - 29/12/2021

Contractual Milestone:

- Project completed - 07/03/2023

Performance Benefits:

Potential Performance Benefits
- Safety: Enroute + 10 %
- Safety: TMA + 10 %
- Capacity: Airport Ground + 9.8 %
- Capacity: Airport Runway + 9.5 %
- Capacity: TMA + 2 %
- Capacity: EnRoute + 3.5 %
- ANS Cost Efficiency: ATCOs Productivity + 10.3 %

- ANS Cost Efficiency: Flight Efficiency in Time: Airport Ground + 50 %
- ANS Cost Efficiency: Airport Runway + 50%

➢ **2017_020_AF5 Initial SWIM security deployment**

Start/end date: 12/04/2018 - 31/12/2020

Project Leader: Aeroporti di Roma S.p.A.

Project Contributor: N/A

Overview:

Cyber Security in ATM (Air Traffic Management) is addressed in Directive EU 2016/1148 of the European Parliament and of the Council of 6 July 2016 concerning measures for a high common level of security of network and information systems across the Union. In this perspective, Commission Implementing Regulation EU/716/2014 on the establishment of the Pilot Common Project supporting the implementation of the European Air Traffic Management Master Plan is linked to this topic, mainly in relation to cybersecurity and information exchange, which may have an impact on the overall ATM community. In relation to the introduction of SWIM services and its capability of sharing information in a more connected aeronautical environment, cyber security risks are becoming relevant and it is therefore paramount to identify these risks, assess their possible impacts and mitigate them with appropriate measures. In this context, the main objective of this Implementation Project is to implement new and state-of-the-art approaches to cyber security, which will cover the identified gaps, as well as introduce a common and harmonised cyber security approach in Rome Fiumicino Airport, in order to continuously ensure that the proper measures are in place to secure uninterrupted operation.

Specific objectives:

The Implementation Project specifically aims to:

- Assess the current status of Rome FCO internal architecture and Cyber security defences, duly considering the foreseen future capabilities and technical features of SWIM infrastructure;
- Identify gaps to be closed and elaborate a detailed plan for the gap closure, taking into account the business objectives from other families;
- Define how PKI (Public Key Infrastructure) is intended to be used, identifying the connection to be established;
- Define requirements for external service providers and interrelation;
- Select cyber security framework;
- Reach an initial level of Cybersecurity standard by implementing two initiatives at local level.

Tasks:

The Implementation Project consists of the following tasks:

- Task 01 – Project Management: Project management of the initiative.

- Task 02 – Implementation of Firewall tracker: Implementation of a tool to manage the firewall activities tracking and compliance verification.
  Implementing the security software components for:
  Strengthen Network Security Posture & Ensure Compliance, a comprehensive firewall and security policy management solution for multi-vendor firewalls that allow to centralise all firewall policy management in order to enabling ADR to implement the security policy optimisation, cleanup and compliance
  Network Security Change Automation for Business Agility & Policy Compliance, a comprehensive firewall and security policy management solution for multi-vendor firewalls to increases agility and auditability change process, provides policy-based automation and orchestration, enabling ADR to implement accurate changes while maintaining security and compliance.
- Task 03 - Implementation of High availability Firewall console: Implementation of the High availability Firewall console. The security management server includes several databases with information on the system, such as objects, users, and policy information. Every time the administrator makes changes to the system, this data changes. It is crucial to make a backup for this data, so that information is not lost in the event of a failure. If the security management server fails, or is down, a backup server needs to be in place to take over operations. If the primary Security Management (SmartCentre) server is down and there is no backup in place, operations by the security gateway, such as retrieval of the CRL (Certificate Revocation List), or fetching of the security policy cannot take place.
- Task 04 – FCO SWIM Assessment: The task objective is to define gaps to be closed and elaborate a deployment plan to evolve ADR infrastructure into a SWIM enabled infrastructure. In first place a detailed analysis and mapping of ADR infrastructure will be performed, together with an analysis of SESAR SWIM concept. The second step will be to define an evolution roadmap for ADR identifying all the connection to be established and the action to be implemented in the architecture to reach the full compliance to SWIM concept. The roadmap will include an impact assessment for each identified intervention, and a priority analysis to guide the definition of the ADR SWIM Plan.

Expected Results:

- the local level project necessary to apply the SWIM concept to ADR infrastructure is identified;
- the intervention necessary to reach the adequate security level is identified;
- actual cyber security defences are increased reducing the risk of errors and incidents and ensuring the full-time availability of the firewall services, such as certification authority, rules management and VPN (Virtual Private Network) remote access;
- a state-of-the-art Firewall technology is implemented as a primary security measure, forming a virtual checkpoint to protect computers and other network devices from attack;
- continuous compliance and auditability are ensured;
- proactive risk analysis is performed to avoid security policy & compliance violations.

Internal Achievement Points:

- Start of training – 01/09/2020
- End of training – 30/09/2020
- Parallel Operations / Operational Trials – 30/09/2020
- Cutover SW ready and successfully tested – 30/06/2020
- Cutover and fall-back period completed – 30/09/2020

Contractual Milestone:

- Project completed - 31/12/2020

Performance Benefits:

The following benefits are expected to be provided by this Implementation Project:

- to integrate current and future cybersecurity policies, providing an initial alignment to SWIM service architecture with a high level of security
- paramount benefits provided to the airport IT infrastructure by protecting the overall IT systems against cyber-attacks, and in the meanwhile, making an assessment of the airport architecture and business requirements in order to be aligned with SWIM policies and technical requirements
- 20% reduction in working time for firwall rules management

Interdependencies with other projects:
The current project will improve the reliability of ADR network security infrastructure for the following projects:

- ASMGCS (Action 2016-EU-TM-0117-M, IP 2016_117_AF2)
- NOP (IP 2017_052_AF4)
- AOP (IP 2017_052_AF4)

➢ **2017_025_AF5 Stakeholders' SWIM PKI and cyber security**

Start/end date: 12/04/2018 - 31/12/2021

Project Leader: Manchester Airport PLC

Project Contributor: N/A

Overview:

There are many cyber security threats that include attempts to destroy, expose, alter, disable, steal or gain unauthorised access. ATM systems are an attractive target as the critical components that control ATM systems could be particularly vulnerable. Originally physically isolated from the rest of the organisation's infrastructure, Manchester Airport (MAN) has a number of modern ATM systems that will require enhanced connectivity and will be using more and more common and open components, services and standards. Although the benefits of this increased level of interconnectivity are clear, it also exposes these systems to the same personnel and cyber risks associated with corporate infrastructure which, unlike ATM systems, has evolved to include security.
As this trend exposes systems to increased cyber security risks, it is therefore paramount to

identify these risks, assess their possible impacts and mitigate them with appropriate measures.
By implementing those activities Manchester airport group will fulfil prerequisites/enablers to families 5.1.3, 5.2.2, 5.3.1, 5.4.1, 5.5.1, 5.6.1 and 5.6.2f.

Specific objectives:

This IP specifically aims to Plan, Prevent, Detect and Respond as follows:
Plan:

- Define and scope critical operational business priority systems, functions and their interdependencies, including risk assessments and identification of key assets, information exchange and related environment.
- Identification and threat modelling of cyber risks on critical operations assets, systems and processes.
- Development of a governance framework to support SWIM interfaces.

Prevent:

- hardening of critical systems, penetration and vulnerability assessments, use of encrypted traffic.

Detect:

- Deploy detection technologies and monitoring through an established Security Operations Centre (SOC) to monitor and detect a cyber-attack against airport operational and air navigation IT critical systems.
- Security operations centre integration, with bespoke use case development of critical areas identified in objectives above, to protect and militate against the risk of cyber-attack.

Response:

- This work will be further utilised through information exchange with other security operations centre and network manager to provide reliable information about attacks, risks and controls.

Tasks:

The Implementation Project consists of the following tasks:

- Task 01 - Identify project team & governance: Identify project team and governance group for SWIM, not exclusive to, airside operations, external communications, group CSR (Corporate Social Responsibility).
- Task 02 - Define and scoping critical operations: Define and scope critical operational business priority systems and functions, including risk assessments and identification of key assets, information exchange and related environment.
- Task 03 - Detailed mapping of system architecture: Detailed mapping of system architecture for information exchanges in compliance with SWIM governance.
- Task 04 - Threat modelling phase: Identification and threat modelling of cyber risks on critical operations assets, systems and processes.
- Task 05 - Security operations centre integration: Security operations centre integration, with bespoke use case development of critical areas identified in objectives above, to protect and mitigate against the risk of cyber attack.

- Task 06 - Technical implementation: Detailed training of in-house analysts to support incident response and threat hunting.
- Task 07 - Implementation and post-implementation review: Implementation of SOC monitoring and exchange with the Network Manager on threats and vulnerabilities. Completion activities for post-implementation review and creation of standard use cases to share within the network.

Expected Results:

- The current status of Cyber security defences is assessed, taking into account known changes like a SWIM enabled infrastructure, including identification of gaps in defences.
- SOC architecture is defined, designed and implemented, that will be of high availability and will target business continuity scenario;
- Specific use cases for operational systems into the SOC are integrated;
- Training for internal staff managing relationships with outsourced SOC is provided.
- All certification aspects of the project e.g. ATSEP (Air traffic safety electronics personnel) are achieved.
- Detection technologies are deployed which enable monitoring through the established SOC to detect a cyber-attack against airport operational and air navigation IT critical systems.
- SOC is integrated with bespoke use case development of critical areas identified in objectives, to protect and mitigate against the risk of cyber-attack.
- Interoperability for information exchange with other security operations centre and network manager to provide reliable information about attacks, risks and controls dependent on an integration broker is ensured.

Internal Achievement Points:

- Start of training - 01/07/2020
- End of training - 31/12/2021
- Parallel Operations / Operational Trials - N/A
- Cutover SW ready and successfully tested - N/A
- Cutover and fall-back period completed - N/A

Contractual Milestone:

- Project completed - 31/12/2021

Performance Benefits:

The main benefit will be further establishing an outsourced Security Operations Centre (SOC) to monitor and protect high risk systems against cyber-attacks, as well as create information that can be shared with the Network Manager (enabler for 4.2.4). The implementation of monitoring of operational systems will allow for improved visibility of critical operational system's security (50%). Full scope will be defined post the completion of tasks 1, 2 and 3. The risk assessments are required to be performed in order to ascertain how

many systems will be in scope. The measurable benefit will target at minimum 8 in scope applications. With use case deliverables of 30 bespoke use cases linked to threats to aviation. Controls will be in place to mitigate the risk of cyber attacks to an acceptable level (50%). 16 systems are currently targeted. Once tasks 1, 2 and 3 are completed, the scope will be defined. The average time to detect an incident on critical operational systems in scope will be reduced, improving on industry standard of 191 days to detect a breach as quoted by IBM 2017 statistic.
IBM 2017 report: The faster the data breach can be identified and contained, the lower the costs are. Business savings: Manual monthly reporting time reduced (average 3 days per month) Gartner statistic: takes 15 – 30 minutes average to investigate and alert on SIEM (Security information and event management) tool, performance benefits across the information security team where third party outsourced SOC can absorb the work factor.
The project does not include any costs to run the SOC.

- **2017_026_AF5 PKI and Cybersecurity**

Start/end date: 12/04/2018 - 31/12/2021

Project Leader: Københavns Lufthavne A/S

Project Contributor: N/A

Overview:

The main objective of the Implementation Project is to establish the CPH part of a European PKI, that is secure, easy to administer and fully compliant with relevant legislation and to implement a certified 'Information Security Management System (ISMS)' based on ISO27001.
The threats in cyberspace are ever increasing in both diversity and numbers requiring defences to be increased. To make sure that CPH is having a holistic view of cybersecurity at the airport a relevant framework has to been introduced. In a European context the ISO 27001 standard is a widely recognised framework for gaining an overview of all things that needs to be considered regarding cybersecurity.
The communication in EATMN is going to increase over the coming years significantly in order to meet the objective of much higher performance of the EATMN. The communication needs to be secured, such that all information is trustworthy and comes from a reliable partner in the network. A proper PKI-implementation ensures that the administration of certificates will not turn into hazards of its own. Since certificate-chains and trusts are only as strong as the weakest link, a good strong foundation is needed in CPH.

Specific objectives:

The IP specifically aims to build a security management system based on ISO 27001 for the aeronautical part of the airport, and perform all the necessary tasks to achieve an appropriate level of maturity. The IP also specifically aims to ensure that all internal communication is protected by certificates that are issued by CPH. External interfaces will use certificates that are signed by an external CA (Certificate Authority), preferably a central EATMN PKI CA.

Tasks:

The Implementation Project consists of the following tasks:

- Task 01 – PKI. Evaluate the current and future business requirements: Since the technology behind PKI is well understood and very mature, the major challenge is to ensure that the project solves the right problems. Therefore, it is essential to map and evaluate all the current pain points and future requirements. The future requirements should be seen in a European context, coordinated with the pan-european PKI project (2017_084_AF5) run by EUROCONTROL.
- Task 02 - PKI Evaluate the current setup at CPH: This task will survey the current use of certificates in CPH and identify the drivers behind the current solution designs.
- Task 03 - PKI Design TO-BE technical PKI-architecture: Combining the two previous tasks, business requirements and current setup, this task will create a new PKI architecture based on current best practices. Furthermore coordinate with the European PKI project.
- Task 04 - PKI Identify gaps: This task will result in a detailed plan for transitioning existing procedures and IT systems from the current level to the future architecture.
- Task 05 - PKI Create governance model, including training: Even the best architecture needs maintenance and to be understood by the developers and by operations. It is therefore important that the procedures relating to daily maintenance be under proper governance. The governance shall also take the governance structure from the European PKI project into account, such the two are coordinated. This task also makes sure that all relevant employees are trained.
- Task 06 - PKI Buy and install certificate appliance: This task will perform a market survey to identify and procure the best-suited appliance for maintaining the proper security and procedures around the root-certificate and all other certificates. In addition, the process of buying and installing is included in this task.
- Task 07 - PKI Implementing of technical setup, including changes to existing systems (new certificate): After the PKI is implemented on the above-mentioned appliance, this task will install the needed certificates on all relevant servers and PC's.
- Task 08 - ISO Education and training: Education of relevant employees in information security in the ISO/IEC27001 standard ensuring that people have the right competences to success the project activities and following operation.
- Task 09 - ISO Gap analysis and plan: Conduct a gap assessment identifying the elements we need to improve or develop as part of the project activities. The gap assessment will outline the gaps between the ISO/IEC27001 standard and the current practice in the airport.
- Task 10 - ISO Develop ISMS Framework: Develop an Information Security Management System (ISMS) based on the ISO/IEC27001 standard, including policies, procedures, standards and control metrics / key security indicators (KSI).
- Task 11 - ISO Implement ISMS tools: Tool implementation supporting the Information Security Management System (ISMS), including governance, risk and compliance controls supporting audit and management reporting.
- Task 12 - ISO Implement ISMS controls: Implementing metrics to measure conformance with the Information Security Management System (ISMS) control metrics / key security indicators (KSI).

Expected Results:

- CPH is prepared to handle the increasing risks relating to cybersecurity.
- Security management system is implemented and provides the overall framework.
- CPH's infrastructure's resilience towards cyberattacks is enhanced.

Internal Achievement Points:

- Start of training - 12/04/2018
- End of training - 31/03/2021
- Parallel Operations / Operational Trials - N/A
- Cutover SW ready and successfully tested - 31/12/2020
- Cutover and fall-back period completed - 31/10/2021

Contractual Milestone:

- Project completed - 31/12/2021

Performance Benefits:

The main benefit is lower risk of outage of the services the airport is providing to the European ATM network. In addition, this project is necessary in order to meet the requirements as listed in the SWIM specifications.
It is estimated that the benefit will decrease the risk of outage by 25% and improve the services availability by 50% due to pre-certified certificates.

➢ **2017_034_AF5 Deploying Cyber Infrastructure at DSNA**

Start/end date: 12/04/2018 - 31/12/2023

Project Leader: The French State -Ministère de la Transition écologique et solidaire, DGAC (Direction générale de l'aviation civile), DSNA (Direction des services de la navigation aérienne)

Project Contributor: N.A.

Overview:

Cybersecurity is becoming a major issue for the mission of DSNA. DSNA must add a global, coordinated and coherent response to the evolution of the threat, modernisation of IT systems and the new legal environment (European NIS directive on security of network and information systems (EU/2016/1148) and its transposition into the French legal system through a law on cybersecurity, designated as CIIP, an acronym for Critical Information Infrastructures Protection).
The main objective of this IP is to provide to DSNA, in the SWIM scope, the means to control, protect, prepare and respond to a threat that is constantly evolving.
DSNA AF5 context:
Through the awarded IP 2016_141_AF5 "Deploy SWIM governance" IP (Action 2016-EU-TM-0117-M), DSNA has started to address the Common SWIM Infrastructure components. DSNA is furthermore contributing to the multi-stakeholders IP "2017_084_AF5 SWIM

Common PKI and policies & procedures for establishing a Trust framework", whose purpose is to build the future European cyber-security and PKI framework (addressing Family "5.1.4 Common SWIM PKI and cyber security"). Moreover, family 5.2.2 "Stakeholders SWIM Infrastructures Components" is addressed by IP "2017_035_AF5 Deploying SWIM infrastructure at DSNA" to deploy a SWIM Yellow Profile Infrastructure at DSNA. In addition, IP "2017_039_AF5 SEPIA - Deploying SWIM based AIM services related to French Airspace" aims at implementing a first set of Aeronautical Exchanges services (related to Family 5.3.1) enabling a first operational use of the DSNA SWIM infrastructure.
This Implementation Project relates to family "5.2.3 Stakeholders SWIM PKI and cyber security". It is named SI CYBER (an acronym for "Système d'Information pour la CYBERsécurité") and its purpose is to deploy SWIM PKI and cyber security means at DSNA.
The SI CYBER project started in the mid of 2017. The first step consisted in a cost benefit analysis. In September 2017, a global roadmap and a Work break down structure (WBS) were defined. The main objective of the SI CYBER project is to offer cybersecurity services for primary assets such as ATM services and SWIM services. The senior manager within DSNA responsible for the SI CYBER project is DSNA Chief Security Officer.
Cyber security tools will be deployed in the following 22 sites:

- All ACCs: Paris, Reims, Brest, Bordeaux and Marseille;
- The central system unit (CESNAC in Bordeaux), the AIM unit (SIA in Bordeaux), the technical branch (DTI in Toulouse);
- APP/TWR: Bordeaux, Marseille, Montpellier, Strasbourg, Orly, CDG, Clermont, Nice, Toulouse, Nantes, Bale-Mulhouse, Montpellier, Lyon, Lille.

Specific objectives:

This IP specifically aims to:

- Ensure the traceability of access to IT systems, by implementing identity and access management through a PKI infrastructure,
- Detect security incidents or attempted attacks,
- Analyse and process cybersecurity incidents,
- Build a Cartography of DSNA's IT systems,
- Define cybersecurity policy in coherence with NIS directive, CIIP law and SWIM profiles
- Define and design tools, systems and infrastructure to cover global objectives
- Deploy and implement these solutions on DSNA sites
- Define the organisation linked to the operation, maintenance and monitoring of these tools and infrastructure

The SI CYBER roadmap is as follows:

- Sequence #1 Design cybersecurity tool, infrastructure and services, including local PKI, to cover global objectives with an end date 12/2018;
- Sequence #2 Deployment of initial cybersecurity tool, infrastructure and services, including local PKI, on 3 pilot sites with an end date 06/2020;
- Sequence #3 Nationwide deployment of cybersecurity tool, infrastructure and services including PKI, on 19 sites with an end date 12/2022;
- Sequence #4 Update cybersecurity policies with an end date 12/2023.

Tasks:

The Implementation Project consists of the following tasks:

- Task 01 – SI CYBER Project Management: This task includes all activities related to the organisation and management of the IP in order to meet the project objectives. It includes planning, coordination and control of the work progress whilst ensuring the quality of the deliverables within the planned time frame.
- Task 02 – SI CYBER Studies and prototype: Define technical solutions – Evaluate and prototype the solutions.
- Task 03 – SI CYBER Operational evaluation: Deploy infrastructure and tooling, including PKI components, on 2 pilot sites.
- Task 04 – SI CYBER Full deployment: Deploy Infrastructure and tooling on all operational sites.
  Upgrade the Security Operational Centre (SOC) and integrate the SWIM services into the scope of the SOC.
- Task 05 – SI CYBER Cybersecurity policies and transition plan: Design security architecture and define the transition plan to security services (SWIM enabler).

Expected Results:

- a set of cybersecurity services is available (access management based on local PKI solution, monitoring and administration for the access management, certification of local PKI infrastructure);
- SWIM services are totally under control for cybersecurity making use of national PKI infrastructure and relying upon national governance;
- SWIM services are fully compliant with cybersecurity policy, NIS directive and CIIP law;
- Cybersecurity becomes a major asset in operational systems for DSNA.

Internal Achievement Points:

- Start of training - 01/06/2020
- End of training - 31/12/2022
- Parallel Operations / Operational Trials – N/A
- Cutover SW ready and successfully tested – N/A
- Cutover and fall-back period completed – N/A

Contractual Milestone:

- Project completed - 31/12/2023

Performance Benefits:

This IP enables DSNA to enhance the level of security of its SWIM services architecture, thus preventing DSNA ATS services from unwanted disruptions due to cyber-attacks. It participates to keeping the capacity and safety performance at their best, while preventing DSNA customers to suffer from the economic consequences of service disruption.
Due to the SI CYBER project, security incidents will be detected and analysed well ahead of an operational impact. In case of an acknowledged cyber-attack, the counter measures will be

activated quicker (minutes instead of hours) and better suited to the context.
Furthermore, the centralised administration of the incident detection tools will alleviate the tasks of the local personnel in charge of supervising the systems on each site.

➢ 2017_035_AF5 Deploying SWIM infrastructure at DSNA

Start/end date: 12/04/2018 - 05/10/2023

Project Leader: The French State -Ministère de la Transition écologique et solidaire, DGAC (Direction générale de l'aviation civile), DSNA (Direction des services de la navigation aérienne)

Project Contributor: N/A

Overview:

The main aim of this Implementation Project (IP) is to implement part of SWIM in the DSNA infrastructure. While it will be compliant with the SWIM Yellow Profile, the architecture defined will also minimise the path to achieve compliance with the Blue Profile (Costs related to SWIM blue profile (family 5.6.2) are not eligible under this Action according to the call requirements). Currently DSNA has deployed a couple of pre-SWIM services on an ad hoc and local architecture.
In full compliance with the PCP, the implementation at DSNA of a SWIM architecture aims at enabling the interconnection of service-oriented systems within DSNA, with external customers as well as with European SWIM. The definition of the optimal deployment architecture for SWIM is part of this project.
The IP will contribute to fill approximately 2/3 of the gap in family 5.2.2 (the remaining gap will be closed with the implementation of the SWIM TI Blue Profile once its specification is available).
DSNA AF5 context:
Through the awarded IP 2016_141_AF5 "Deploy SWIM governance" IP (Action 2016-EU-TM-0117-M), DSNA has started to address the Common SWIM Infrastructure components. DSNA is furthermore contributing to the multi-stakeholders IP "2017_084_AF5 SWIM Common PKI and policies & procedures for establishing a Trust framework", whose purpose is to build the future European cyber-security and PKI framework (addressing Family "5.1.4 Common SWIM PKI and cyber security"). Moreover, family "5.2.3 Stakeholders SWIM PKI and cyber security" is addressed by IP 2017_034_AF5 "Deploying Cyber Infrastructure at DSNA" which aims at deploying SWIM PKI and cyber security means at DSNA. In addition, IP "2017_039_AF5 SEPIA - Deploying SWIM based AIM services related to French Airspace" aims at implementing a first set of Aeronautical Exchanges services (related to Family 5.3.1) enabling a first operational use of the DSNA SWIM infrastructure
The present project supports family 5.2.2 "Stakeholders SWIM Infrastructures Components" and its goal is to deploy the SWIM Yellow Profile Infrastructure at DSNA.

Specific objectives:

The Implementation Project specifically aims to:

- Identify features of a middleware platform supporting SWIM with the maximum flexibility and scalability, required security and governance into the future;

- Develop the SWIM target architecture for DSNA;
- Implement infrastructure components required for SWIM Yellow Profile;
- Ensure the infrastructure meets essential security requirements and is linked to a PKI environment;
- Ensure SWIM infrastructure complies with SWIM governance recommended standards and best practices.

Tasks:

The Implementation Project consists of the following tasks:

- Task 01 – SWIM@DSNA Project Management: Task 01 will consist in coordinating the participating stakeholders ensuring sound and efficient dialogue is taking place to meet deadlines, project management requirements and project objectives. It will ensure regular coordination checkpoints between the 4 other tasks.
- Task 02 – SWIM@DSNA Develop SWIM Target Architecture: Task 02 will define the architectural setup and identify the required architecture components. Analyse the impact on the legacy architecture. Align with the established or new IT architecture of the organisation. In particular, it will define the SWIM Target Architecture by comparing different possible options, perform a safety assessment of the change stemming from the introduction of the new components into the overall operational system and establish transition patterns between the legacy and the target service oriented architecture.
- Task 03 – SWIM@DSNA Implement SWIM architecture: Task 03 consists in procuring software components and hardware infrastructure to implement the SWIM architecture on 11 sites. The 11 targeted DSNA sites, subject to further definition, are the 5 ACC (Paris, Marseille, Reims, Brest, Bordeaux), the 2 APP at Paris CDG and Orly, the central system unit (CESNAC in Bordeaux), the AIM unit (SIA in Bordeaux), the technical branch (DTI in Toulouse) and one additional site.
- Task 04 – SWIM@DSNA Perform Integration tests: Task 04 consists in performing the integration tests between the new architecture and legacy components.
- Task 05 – SWIM@DSNA Operational deployment and assessment including first set of SWIM services: Task 05 consists in the cutover of the new architecture supporting yellow profile SWIM services for DSNA.

Expected Results:

- SWIM target architecture for DSNA is developed;
- Infrastructure components required for SWIM Yellow Profile are implemented;
- SWIM infrastructure deployed at DSNA complies with SWIM governance recommended standards and best practices.

Internal Achievement Points:

- Start of training - 31/12/2021
- End of training - 17/06/2022
- Parallel Operations / Operational Trials - 08/09/2023
- Cutover SW ready and successfully tested - 30/06/2022
- Cutover and fall-back period completed - 08/09/2023

Contractual Milestone:

- Project completed - 05/10/2023

Performance Benefits:

The Implementation Project represents the basis for full SWIM compliance in future years, upon which the service implementations and system changes to implement SoA (Service Oriented Architecture) can build. DSNA is expected to be equipped with a modern, scalable, secure and resilient platform to facilitate System Wide Information Management (SWIM) to allow for future data exchange with all its partners.
This Implementation Project, by providing a transversal infrastructure for DSNA ATM/AIM/MET/Communication, Naviation, Surveillance (CNS)... components to implement and expose SWIM services, aims to:

- diminish by two the cost of implementing SWIM services, compared to the same implementation conducted for each individual component,
- diminish by at least four the timeframe needed to develop a new SWIM service, going from 2 years timeframe to around 3 to 6 months
- be able to support the provision and use of more than 30 yellow SWIM services which are to be implemented by 2025

➢ 2017_039_AF5 SEPIA - Deploying SWIM based AIM services in French Airspace

Start/end date: 12/04/2018 - 30/12/2022

Project Leader: The French State -Ministère de la Transition écologique et solidaire, DGAC (Direction générale de l'aviation civile), DSNA (Direction des services de la navigation aérienne)

Project Contributor: N/A

Overview:

The project SEPIA ("Système Evolutif de Production de l'Information Aéronautique") is targeting the replacement of DSNA current Aeronautical Information production system called NOPIA ("Nouvel Outil de Production de l'Information Aéronautique"), which is now obsolete. SEPIA aims at offering data exchange services compliant with the SWIM concept to all AIM stakeholders. Through SEPIA, SWIM exchanges will be implemented with other European AIM systems, like EAD (European AIS Database) and later EAIMS (European ATM Information Management Service), but also new services will be offered such as providing ATCOs with direct and dynamic Aeronautical Information.
SEPIA will fulfil all DSNA needs for production, broadcasting and offering of Aeronautical Information, in full compliance with applicable regulations.
SEPIA is intended to be DSNA one-stop shop to enable other high added value systems (such as SOFIA- Services Orientés Fourniture d'Informations Aéronautiques) to retrieve Aeronautical Information through B2B services and to offer B2C services to aeronautical data providers. SEPIA is a core component of SOFIA, which is an "umbrella" project led by DSNA, which aims at providing all categories of AIM stakeholders with more reliable data

thanks to SEPIA and with a best-in-class customer experience thanks to user-friendly HMIs. SOFIA will deliver new Aeronautical Information oriented services tailored to the needs of its customers, such as Pre-Flight Information Bulletins (PIB), drone maps, etc.
DSNA AF5 context:
Through the awarded IP 2016_141_AF5 "Deploy SWIM governance" IP (Action 2016-EU-TM-0117-M), DSNA has started to address the Common SWIM Infrastructure components. DSNA is furthermore contributing to the multi-stakeholders IP "2017_084_AF5 SWIM Common PKI and policies & procedures for establishing a Trust framework", whose purpose is to build the future European cyber-security and PKI framework (addressing Family "5.1.4 Common SWIM PKI and cyber security"). Moreover, family "5.2.3 Stakeholders SWIM PKI and cyber security" is addressed by IP 2017_034_AF5 "Deploying Cyber Infrastructure at DSNA" which aims at deploying SWIM PKI and cyber security means at DSNA. In addition, IP2017_035_AF5 "Deploying SWIM infrastructure at DSNA" supports family 5.2.2 "Stakeholders SWIM Infrastructures Components" and its goal is to deploy the SWIM Yellow Profile Infrastructure at DSNA.
The main objective of the IP 2017_039_AF5 "SEPIA Deploying SWIM based AIM services related to French Airspace" is to implement a first set of Aeronautical Exchanges services (related to Family 5.3.1) enabling a first operational use of the DSNA SWIM infrastructure

Specific objectives:

The IP specifically aims to:

- Make AIM an enabler to support innovation and business transformation within DSNA.
- Ease interoperability essentially between DSNA systems.
- Collaborate with other stakeholders at creating new SWIM services.
- Improve exchanges with other European systems.
- Improve performance for users.
- Limit risks and ensure security of the whole AIM process.

The SEPIA project will cover:

- the implementation of services compliant with the applicable version of the ATM Information Reference Model (AIRM), the AIRM Foundation Material and the Information Service Reference Model (ISRM) SESAR 1 Material,
- an exchange model compliant with AIXM v5.1,
- an infrastructure compliant with the SWIM Yellow Profile,
- the rationalisation and simplification of actual procedures.

It will associate data originators in order to provide seamless processing of data.
The project will provide a smooth coordination with IP "2017_035_AF5 Deploying SWIM infrastructure at DSNA" to ensure interoperability and cross domain integration (AIM, MET, ATM).
SEPIA project consists of the following steps:

- Development of an AIXM 5.1 compliant data store to store the digital aeronautical data;
- Migration of the legacy data into the new data store;
- Development of the SWIM core services for the retrieval of digital data;
- Development of quality management procedures and processes to ensure conformity with required quality assurance level of the digital data:
- Implementation of SWIM services that allow consumers to access the digital data;

- Assessment of SWIM services in relation with airspace users and validation to be recorded in the SWIM registry.

Tasks:

The Implementation Project consists of the following tasks:

- Task 01 - SEPIA Project management: This task covers the overall management of the project such as monitoring of progress, resources and budget, performing of project reviews, generation and approval of reports and coordination between work packages and parties involved.
  This task will deliver progress reports, stating the progress in the tasks, the problems encountered, the risks identified and the proposed solution to cope with the risks.
- Task 02 - SEPIA Statement of requirements: This task covers all the activities required for SOW (Statement of Work) production: listing of operational and technical business requirements, definition of data migration strategy and definition of the solution acquisition process.
  Also includes the prioritisation of requirements as well as a critical analysis of the existing and a target mapping of business processes.
- Task 03 - SEPIA Call for tender (CFT) management: This task covers all the activities required for the acquisition of the new Aeronautical Information production chain: CFT launching, solution validation, negotiations with suppliers and final choice of a solution.
  Also includes contract finalisation and provider survey.
- Task 04 - SEPIA Implementation of SWIM services: This task covers all the implementation activities of the COTS (Commercial off-the-Shelf) solution selected by DSNA as well as all related specific adaptations. This phase also includes the activities related to integration testing and user acceptance as well as the legacy system data migration.
  Are also covered the preparation for change: organisational impacts and future users training plan (with materials).
- Task 05 - SEPIA Service transition: This task covers the tool's operational service cutover as well as release of B2B and B2C services destined to end users. Also includes training sessions for users and writing of a final project assessment.

Expected Results:

Deriving directly from SEPIA implementation:

- Conformity with ADQ-IR (Aeronautical Data Quality Implementing Rule) requirements is achieved;
- SWIM SESAR concepts are deployed, notably AIXM5.1 standards;
- Consumer experience is improved for pilots, encoders, Eurocontrol, NOF (International NOTAM office);
- D-NOTAMs are provided as a service to the consumers (Airspace Users, ATM);
- Aeronautical Information is provided both as a service and as an AIM data catalogue in line with the latest amendment of ICAO Annex 15 and PANS-AIM (Procedures for Air Navigation Services – Aeronautical Information Management).

In connection with other systems SEPIA will enable:

- Compliance with ISRM services - Aerodrome mapping data and Airport Maps

including eTOD (electronic Terrain and Obstacle Data) are provided in line with the latest amendment of ICAO Annex 4;
- Access to aeronautical information data is improved and made easier for the ATM system stakeholders (ATCO, FUA….).

Internal Achievement Points:

- Start of training - 01/09/2021
- End of training - 30/12/2022
- Parallel Operations / Operational Trials – N/A
- Cutover SW ready and successfully tested - 30/08/2022
- Cutover and fall-back period completed - 30/12/2022

Contractual Milestone:

- Project completed - 31/12/2022

Performance Benefits:

- Data Integrity: reduce by 50% the number of data input
- Data completeness: increase by 50% the data coverage
- Data safety: reduce by 80% the number of published mistake on critical data
- Improvement by 30% of production schedule

➢ **2017_040_AF5 AERONET/ENET2 Interoperability**

Start/end date: 01/05/2018 - 31/12/2021

Project Leader: ENAV S.p.A.

Project Contributor: Italian Air Force (MoD)

Overview:

The main objective of this Implementation Project is to contribute to the overall ENAV and Italian Air Force preparation for SWIM through the implementation of Local SWIM infrastructure components. This Implementation Project will allow the evolution towards a new network through the transition from ENET to ENET2, as the fundamental local enabler for SWIM information exchange. BLUE Profile requirements are not part of the project (in particular related to family 5.6.2).
In particular this Implementation Project will allow to upgrade and replace local components and shared ENAV and Italian Air Force infrastructures (e.g. POINT OF PRESENCE (POP)) in order to provide an improved interoperability between civil and military networks (the ENAV Network (eNET2) and the Italian Air Force (AERONET) network). The interoperability components concerned are considered fundamental for the local multi stakeholder implementation of SWIM information exchange and SWIM-enabled systems.

Specific objectives:

Modern ATM systems design is requiring enhanced connectivity and is using more and more common and open components, services and standards. This trend exposes systems to increased cybersecurity risks, it is therefore paramount to identify these risks, assess their possible impacts and mitigate them with appropriate measures. Some components concerned by the eNET2-AERONET interoperability need to be assessed in order to identify missing gaps and capabilities as well as risks in view of the upcoming SWIM requirements. This activity will allow identifying a local plan for upgrading local components up to available SWIM standard compliance to be activated and completed in the framework of the present initiative.
In particular some of the activities to be undertaken in order to modernise the infrastructure with a view of paving the way of accommodating SWIM requirements are:

- upgrade of communication circuits;
- extension of the transmissive band;
- technological upgrade of the equipment;
- opening to new communication standards.

In addition to the above, relevant pieces of infrastructure will be upgraded with a view to improve the eNET2-AERONET interoperability, with a new functional architecture which will facilitate the overall local SWIM information management.

Tasks:

The Implementation Project consists of the following tasks:

- Task 00 - WP0 - Project Management : Project management activities.
- Task 01 - WP1 - AS-IS Infrastructure Data gathering: Collection, Classification and Mapping of current services, available connectivity and existing equipments.
- Task 02 - WP2 - Infrastructure Rationalisation: Improvement and rationalisation of the selected infrastructure in order to obtain an improved and SWIM-compliant interoperability between eNET2 and AERONET.
- Task 03 - WP3 - Transition to ENET2:
    - MPLS (Multiprotocol Label Switching) network equipment;
    - Software platform for centralised management;
    - Installation, configuration and customisation;
    - Implementation of exchange mechanisms.
- Task 04 - WP4 - Transversal Cyber Security Activities: Development of a security assessment in order to secure compliance with SWIM requirements and analyse further development for eNET2-AERONET Interoperability.

Expected Results:

- local obsolete equipment and connections are improved through SWIM-compliant requirements;
- one (or more than one) interoperability node is implemented between Italian MOD and ENAV (e.g. Exchange POP Italian Air Force in Roma Ciampino and Milano Linate);
- current data exchange protocols, LoA (Letter of Agreement), are improved with a view to ensure eNET-AERONET improved interoperability and with this preserve a very important asset of the local SWIM information management chain;

- Transition is ensured from legacy protocol towards the definition of the future system architecture able to cover information exchanges in compliance with SWIM governance policies.

In particular, the following results are expected:

- MPLS network equipment is divided into core and peripheral systems;
- A software platform for centralised management is implemented;
- Installation, configuration and customisation are done.
- Secure data exchange procedures (both manual and automatic) are defined and implemented between the two involved SOCs (Security Operation Center), ENAV and Italian Air Force.

Internal Achievement Points:

- Start of training – N/A
- End of training – N/A
- Parallel Operations / Operational Trials - N/A
- Cutover SW ready and successfully tested - N/A
- Cutover and fall-back period completed - N/A

Contractual Milestone:

- Project completed - 31/12/2021

Performance Benefits:

5% of cost-savings are expected from the rationalisation of the infrastructure (e.g. saving energy with new generation equipments, by using raw materials more efficiently, recycling, and making production processes more efficient).

➢ **2017_056_AF5 Towards Shared Business Trajectory / Trajectory Based Operations**

Start/end date: 01/10/2019 - 31/12/2023

Project Leader: EUROCONTROL / Network Manager

Project Contributors:

- Deutsche Lufthansa Aktiengesellschaft;
- Lufthansa Systems GmbH & Co. KG;
- Lufthansa Systems Poland Sp. z o.o;
- Sabre Austria GmbH;
- SABRE France SARL;
- Sabre Airline Solutions GmbH;
- Sabre Polska Sp. Z.o.o.

Overview:

For NM, this project is a continuation of the CEF 2015 IPs 2015_141_AF5 and

2015_106_AF4 (stopping with NM release 24.5). It covers implementation items to be released in operations from NM Releases 25 to 27.5 for the completion of the Family 5.6.1 - Upgrade and Implement Flights Information Exchange System and Service- as described in the Deployment Programme 2017.
This project is the enabler for

- NSP Strategic Objective 2: Deploy interoperable and effective information management systems;
- NSP Strategic Objective 5: Facilitate business trajectories and cooperative traffic management.

SABRE is also continuing implementation related to Flight Planning aspects / FF_ICE/1 (Flight & Flow Information for a Collaborative Environment) started in project 2015_106_AF4.
Lufthansa Group / Lufthansa Systems are continuing implementation initiated in 2016_100_AF4 IP.
There is no redundancy between IPs 2017_002_AF5 (Aeronautical Information Exchange system for Airlines FOC at Lufthansa & Air France) / 2017_053_AF3 (Implementation of rolling ASM/ATFCM) and this IP 2017_002_AF5 addresses processes related to the exchange of Aeronautical data, 2017_053_AF3 addresses processes related to the exchange of Airspace data while this IP relates to processes related to the exchange of Flight Information.
To allow for a clear distinction between the systems' versions implemented through CEF 2015 IPs and CEF 2016 IPs referred above and the Systems' versions subsequently implemented through this IP (2017_053_AF3), NM, Sabre, Lufthansa Systems and Lufthansa Group will organise for a robust requirements and implementation management process. It will allow to clearly identify the different implementation items per different Systems' versions (hence IPs) and to make sure effort / costs can be traced and allocated to that level without any redundancy.
In a continued implementation process, the start of the implementation of a new release -i.e. the identification of concerned business requirements and development of detailed specification- is always happening quite some time before the finalisation of the implementation of a previous version. This is the reason for the overlap in time (more than one year) between CEF 2015 IPs and CEF 2016 IPs referred above and this IP.

Specific objectives:

For NM the main objective of this IP is the exchange and negotiation of 4D Trajectory (including flight performance information) between NM and airspace users and ATC (ANSPs, Airports) via the implementation of the ICAO FF-ICE (FF-ICE/1 phase 2 and Phase 3 (Planning phase) provisions, procedures and processes in compliance with the yellow SWIM TI Profile. Furthermore, NM will contribute to the definition of processes, procedures and any standard related to FF-ICE/2 (Execution phase) in relation to ICAO and with European partners. This is to serve a later implementation, i.e. in 2024-2025.
(Implementation Projects 2015_141_AF5 and 2015_106_AF4 are "limited" to deliver the FF-ICE/1 in compliance with the Yellow SWIM TI profile and according to FIXM 4, concerning the 4D trajectory exchange and negotiations processes between NM, Airspace Users and ATC in pre-departure phase. In the NM roadmap, this is also referred as FF-ICE/1 phase 1, FIXM based interoperability).
NM will adapt and deploy its systems (two releases a year) to pursue this objective.
SABRE is also continuing implementation related to Flight Planning aspects / FF_ICE/1

started in project 2015_106_AF4.
SABRE will participate in this project to adapt their Flight Planning Systems and develop operational procedures in relation to FF-ICE, FIXM, SWIM / B2B compliant with NM releases.
For Lufthansa Systems, one objective is to implement upgrades to the flight planning system Lido/Flight related to missing FF-ICE/1 components not included in a predecessor project 2016_100_AF4 (which had the focus on initial FF-ICE/1 readiness) These are special functionalities to manage the processing of flight response messages from the Network Manager to the FOC. Within the 2016 project primarily functions for the 4D trajectory filing from FOC to NM will be implemented. It is not in scope to react on the feedback from NM, e.g. automatic processing of flight reject information (RAD regulations) or profile tuning restrictions feedback, or future SID/STAR requirements based on the runway in use (actually validated in PJ18, SESAR 2020). Core new developments will include the expected Planning Service from Networkmanager to coordinate up to 24h before the flight event the reference business trajectory (RBT). Based on the SESAR 2020 research solutions, it will be required in near future to coordinate with NM the flight route considering the capacity aspects offered from Air Traffic Control. Furthermore, Lufthansa Systems will deploy the Trial Service offered from NM to synchronise the flight route with overall ATCFM regulations. Lufthansa Systems will deploy required functionalities in all relevant systems, that means covering flight planning, flight monitoring and cockpit applications. This will ensure a seamless flight information availability for involved users (flight dispatcher, flight watch officers or pilots). In addition, new functionalities for automatic processing and negotiation discussions with involved external stakeholder like NM, ATC or airports will be deployed.
The main activities performed at LH Group Airlines FOC (Flight Operational Centre) systems will be the deployment of relevant enhanced flight planning services and operational steering capabilities. The project aims in addition to enable the airlines of the Lufthansa Group to deal with the enhanced and more dynamic network information data that will be exchanged with Network Manager using the Yellow SWIM TI Profile and related to Air Traffic Flow and Capacity Management (ATFCM) –as it impacts on the Flight planning and pre-tactical and tactical operational steering.
In support to this, the implementation project at LH FOC system aims to define & develop use cases and user stories to exchange trajectory related data upon SWIM as well as to support exchanges related to ATCFM pre-tactical and tactical plans, ATFCM measures and STAM coordination upon SWIM.

Tasks:

The Implementation Project consists of the following tasks:

- Task 01 - Project Management: Task 1 Project Management
- Task 02 - NM Operational processes and user requirements: This task includes:
    - the definition of the overall operational processes involving all the impacted stakeholders, reflecting the ICAO FF-ICE provisions within the European context.
    - definition of the NM operational procedures.
    - development of training material.
    - definition of the user requirements.
    - definition of the validation activities.
    - coordination with the stakeholders in the execution of the validation activities
- Task 03 - NM systems implementation: This task includes the NM system upgrades

necessary support the trajectory sharing and negotiation processes with ANSPs via SWIM compliant services. The deliverables of this task are done according to the NM release cycle starting in release 25.0 (Spring 2021) and ending in release 27.5 (Autumn 2023)

- Task 04 - Sabre Implementation: Technical implementation including adaptation, testing and functional review of the tools linked with NM and Sabre FPM (Flight Plan Manager).
- Task 05 - Sabre deployment preparation: This task is related to all non-technical functions enabling Task 5 including:
  Technical implementation Assessment:
  - Prepare and provide technical implementation plan.

  Business assessment:
  - standard operational procedures.
  - operational guidance documentation.
  - training (documentation and courses on demand).
- Task 06 - Lufthansa Operational processes and FOC System requirements:
  - definition of the LH Group airlines operational processes.
  - development of training material.
  - definition of the user requirements.
  - definition of the system requirements.
  - definition of the validation activities.
- Task 07 - FOC Systems development: This task includes FOC system developments based on agile software development processes. It covers user manual documentation and software testing to ensure operational readiness.
- Task 08 - Preparation of phase-in at Lufthansa Group: This task includes the update of the operational procedure documents at LH Group airlines, update of the safety management system documents and the preoperational phase in of new FOC systems capabilities.
- Task 09 - FOC deployment at LH: This task includes the training of OPS staff at airline side, the system integration of all new software components of Lufthansa Group airlines FOC system.

Expected Results:

The project will provide for the deployment of NM Systems (NM Releases 25 to 27.5) allowing for the operational processes and procedures supporting the ICAO FF-ICE (FF-ICE/1 (Planning and pre-departure phases) in compliance with the yellow SWIM TI Profile.
The services provided will then be compliant with

- the ICAO provisions related to FF-ICE, following the European implementation guidelines.
- the EUROCONTROL SWIM specifications.

The services will use the FIXM data exchange model.
(Draft) FF-ICE/2 procedures will be available.
SABRE will have its System adapted and compliant with NM releases while operational procedures and training material will be available.
Lufthansa Systems will have its System adapted and compliant with NM releases while operational procedures and training material will be available.
All relevant SWIM flight services required for flight information exchange will be deployed at Lufthansa Group Airlines participating airlines ATFCM related services will also be

deployed upon SWIM.
Additionally, the NM services will continue to support the legacy messaging data exchanges in order to allow the progressive migration of the stakeholders to SWIM.
To support global customer base and operations, SABRE needs also to continue to support legacy messaging data exchange.

Internal Achievement Points:

- Start of training - 03/07/2023
- End of training - 31/10/2023
- Parallel Operations / Operational Trials - 01/09/2023
- Cutover SW ready and successfully tested - 02/05/2023
- Cutover and fall-back period completed - 30/11/2023

Contractual Milestone:

- Project completed - 31/12/2023

Performance Benefits:

The project provides for increased fidelity in the representation of the traffic demand. This leads to better capacity and route utilisation and consequent delay and fuel consumption reduction. Increased interoperability and compliancy to e-FPL (extended Flight Plan) standards across systems lead to general efficiency improvements and cost reduction. The project also enables the delivery of an increased ATCO productivity at ACC and TMA units, and the progressive dismantling of legacies (e.g. OLDI - On-Line Data Interchange) with high maintenance costs.
Based on previous CBAs, at a first estimation and under the assumption of PCP full deployment:

- The project represents the network "indirect" contribution to improve ATCO productivity at network level, which represents a gain of some €200 million (discounted value, see PCP CBA).
- A further increase of flight efficiency and capacity as of 2024 with an estimated discounted benefit of some €35 million.
- A further increase in slot management utilisation for the Lufthansa group and indirectly for Air France with an estimated discounted benefit of some €10 million.

➢ **2017_060_AF5 ADQ Components in the SWIM Infrastructure - upstream data inclusion in the full data chain solution - ANSP and Airport**

Start/end date: 12/04/2018 - 31/12/2021

Project Leader: Luftfartsverket, a state enterprise

Project Contributors:

- Naviair, a state owned company;
- Swedavia AB.

Overview:

The main objective of the Implementation Project is to establish upstream SWIM service interfaces in the domain of AIM in order to contribute to the overall ATM automation by true interoperability, in addition to and as a logical continuation of the establishment of the fully temporal Aerodrome Data Maintenance platforms. It includes design and developments, system acceptance and implementation, and finally transition, validation and commissioning.
This Implementation Project has interdependencies with the projects 2015_099_AF5, 2015_288_AF5 (both funded under Action 2015-EU-TM-0193-M), 2017_061_AF5 and 2017_075_AF5.
The 2015_099_AF5 (DK-SE FAB Aeronautical Data Quality (ADQ)) will enable migration of LFV's and Naviair's aeronautical data, with focus on analyses and requirements on the ADQ service from an ANSP point, developing core AISP production functionality including system specification, procurement and initial design of an ANSP platform and performed SAT, AISP functionality. The project will end in December 2019.
Within 2015_288_AF5, the procuring and implementation of Swedavias own platform with data models, data warehousing and system tools for sufficient data quality control according to EU 73/2010 will be addressed, wheras the integration of the AIM into the ADQ-database is taken care of in the two new projects in 2017 Call.
The implementation of Swedavias own exchange technology is taken care of within the 2017_075_AF5 project.
The IP 2017_060_AF5 will address activities related to scope extension of the ADQ service to include interaction with airport/aerodrome. Analyses and requirement from airport point of view will be identified and collected to cover full ADQ functionality requirements. Translation and validation exercises regarding the transfer of ADQ information between Swedavia and LFV and further on to Eurocontrol as well as software integration is done within project 2017_060_AF5. The project is aiming at an updated, harmonised and integrated implemented ADQ service applicable for all stakeholders, thus establishing full AIS functionality, including a performed SAT for full AIS production capability, airport view and related updates. The overlap in time will allow coordinated planning and seamless development of the ADQ service, and transparent development and exchange of information/solutions. Even though CPH airport is not part of the project, Naviair will coordinate with CPH and other airports and provide the Naviair database and ADQ environment and support them aiming implementing full ADQ functionality throughout the project.
The IP will contribute to complete the gap for family 5.3.1 for Sweden. Naviair will have closed their part of the gap just like LFV by 2021. Coordination between CPH and Naviair aims at closing the gap for Denmark.
Moreover, during the analysis phase it was identified that concerning the cyber security domain, most partners have initiated separate Cyber Security initiatives, at different levels. Therefore, this project is a standalone initiative- with a coordination function handling dependencies to national and/or local initiatives between different stakeholders related to 5.2.2/5.2.3 and in Sweden and Denmark.

Specific objectives:

This SWIM branch will be targeted to airports of larger scale in order to secure the integrity and efficiency in the data flow, by - in collaboration with airport - designing data exchange

over service interfaces. This SWIM service will include the feeding capability from an airport to AIM with standardised AIXM5.1 payload, but also as a tailored/limited data set as a GML (Geography Markup Language) profile of AIXM5.1. The direct involvement of a major airport operator is crucial for designing and validating the concepts, and reaching sufficient maturity for further nationwide implementations. In this aspect the ANSPs LFV and Naviair are cooperating in planning and preparation for the full data chain solution implementation.

Tasks:

The Implementation Project consists of the following tasks:

- Task 01 - Project Management: LFV operates an ISO accredited quality management system. In line with LFV's project management and quality procedures, directives have been issued for each activity and project management procedures are in place.
  Each project undertaken in LFV is managed by a steering group typically consisting of a project owner, a project manager and stakeholders' representatives. When a project is completed, a report is developed, submitted to the project owner, defining the work completed, any deviations from the project management plan, suggestions for improvement for future projects and lessons learned.
  Swedavia will manage their work and coordinates with LFV. Whereas Naviair's interests, involvement and planning are managed by LFV.
- Task 02 - Design and Development: This task involves the steps associated with the design finalisation regarding full Aerodrome System support and external Data Originator to AIS interface and Development of the Aerodrome systems, including:
  - Use case study of the common Aerodrome -AIS interface
  - Specfication of specific Aerodrome AIXM 5.1 GML Profile
  - Aerodrome data sourcing and gap analysis
  - Mapping of Aerodome aeronautical data to AIXM
  - Aerodrome data exchange technical solution feasibility study
  - Development of technical solutions

  For LFV and Navair this mainly relates to the Aerodrome-AIS interface in the existing design baseline, including planning, harmonisation and coordination of the above activities.
- Task 03 - System Implementation and Acceptance: This task concerns all tests, verification and acceptance of the Aerodrome system and the Aerodrome-AIS interface according to EC 73/2010 requirements. The work will be undertaken by Swedavia and LFV in association with the system providers. The task will include the following activities:
  - Development of a test schedule in association with the system provider;
  - Testing, verification and validation of the system in accordance with the test schedule;
  - Installation and deployment;
  - Testing, verification and validation of the installed system in accordance with the test schedule;
  - Identification of any failed system components and the commencement of a re-development and assessment process;
  - Final Data Migration;
  - Final System/Solution Documentation.

  For LFV and Navair this mainly relates to the Aerodrome-AIS interface, including planning, harmonisation and coordination of the above activities.

- Task 04 - Safety Assessment: Appropriate Safety Assessments of the systems implemented. For LFV and Naviair this entails follow-up and potential adjustments related to the Aerodrome-AIS functionality.
- Task 05 - Transitioning, Validation and Commissioning: This task includes all work relating to the:
    - Training of all necessary personnel;
    - Operational transitioning and commisioning of the systems;

  Coordination is required between the stakeholders in particular related to switch-over dependencies;
    - Final Acceptance of the Systems validating the solutions.

Expected Results:

- Interoperability and integrity-controlled information are assured between ANSP and aerodrome.
- A common approach both technically and legally is applied for the benefit of the ATM end users.
- A standardised upstream SWIM service is deployed for the purpose of exchanging AIM data into the full chain, via a standardised data format, AIXM 5.1. resulting in transition from part data provision to full system to system data provision.

Internal Achievement Points:

- Start of training - 03/06/2019
- End of training - 30/09/2019
- Parallel Operations / Operational Trials - 15/10/2019
- Cutover SW ready and successfully tested - 14/10/2019
- Cutover and fall-back period completed - 02/10/2021

Contractual Milestone:

- Project completed - 31/12/2021

Performance Benefits:

The implementation of these ADQ components will support achieving the increased efficiency and improved data integrity.
By allowing for more efficient exchange of data and by contributing to the implementation of SWIM, the project will, as a result from better pre-flight planning capabilities, contribute towards improvements in the following areas, in line with the PCP objectives:

- Efficiency within the AIM domain is improved by 40% through improvements in the exchange of information, and will also lead to a positive effect on efficiency within the entire ATM system. This will in turn lead to a decrease in flight time and conflicts within the DK-SE FAB, as a result from better pre-flight planning capabilities, leading to:
    - More efficient use of fuel (5% reduction)
    - Improvement in airspace capacity by 5%
- Flight safety related to Aeronautical Information will be improved by 25% through

the increased integrity and availability of more consistent information for all stakeholders - airspace users and ATM, by reducing the lead times from time of data origination to its official publication.

- Accelerated successful implementation (API), with 30% .
- Faster migration to next-generation Network (802.1x), 100 % access control on publically exposed network interfaces.
- Identity and Access Management (IAM), 100 systems linked to the Single Sign on function.
- 100 % access control on publically exposed network interfaces.
- Reduced deployment time through extensive planning and design, 40% improvement
- Streamline the information flow from a major airport operator (in this scope an 'Originator') by using interoperable exchange standards and service interfaces for efficient and integrity - controlled data transmission.
- Sustainability is improved by allowing for the acceleration of SWIM and therefore more efficient flight profiles with associated reductions in fuel burn.
- Benefits to users will be gained through the improved ATM services enabled by increases in information sharing and in the consistency and integrity of data.

➢ **2017_061_AF5 Application of cyber security to ANSP and SWIM services at LFV**

Start/end date: 12/04/2018 - 30/09/2021

Project Leader: Luftfartsverket, a state enterprise (LFV)

Project Contributor: N/A

Overview:

The overarching goal of the Implementation Project (IP) is to implement SWIM cyber security, including Identity and Access Management with Public Key Infrastructure (PKI), and SWIM infrastructure to enable initial SWIM services at LFV. The Implementation Project will implement a robust, harmonised and systematic approach to cyber security, which will cover the identified gaps. Cyber security controls are to be implemented at strategic, operational and technical levels, using a combination of top-down and bottom-up approaches to improve LFV's cyber resilience, enabling future SWIM tasks and integrations to be performed safely and securely.
This Implementation Project will be performed in close coordination with IP 2017_066_AF5 (Implementing harmonised SWIM (Y) solution in COOPANS ANSPs and general PCP compliance), which will develop a harmonised cyber-security framework across the five COOPANS ANSPs (including LFV) for the harmonised COOPANS SWIM yellow profile infrastructure. The technical capabilities covered by this project will be developed within this harmonised framework.
Though the work undertaken through IP 2017_066_AF5 will develop a COOPANS-level framework to guide the harmonised implementation of SWIM cyber-security in each COOPANS ANSP, this Implementation Project is necessary to implement robust technical and organisational capabilities to ensure the security of SWIM services within the Yellow Profile at LFV. This Implementation Project will therefore provide near-complete coverage of PCP Family 5.2.3. within Sweden (with the future introduction of the SWIM Blue Profile to close the small remaining part of the gap for 5.2.3, not funded under this Action), enabling

the implementation of safe and secure SWIM-compliant FIXM, AIXM and WIXM data exchange.
There is an additional interdependency with IP 2017_084_AF5 - SWIM Common PKI and policies & procedures for establishing a Trust framework, which is led by EUROCONTROL. This Implementation Project is dependent on consistency with the common Public Key Infrastructure (PKI), covering policies and procedures that will be established in the EUROCONTROL project.

Specific objectives:

This IP specifically aims to:

1. Develop a cybersecurity policy and roadmap to protect Swedish air navigation services, which will be performed in coordination with IP 2017_066_AF5 (Implementing harmonised SWIM (Y) solution in COOPANS ANSPs and general PCP compliance).
2. Enable initial SWIM services within the Yellow Profile at LFV.
3. Fill the gaps in PCP Family 5.2.3 in Sweden (except for those related to SWIM blue profile).
4. Enable the implementation of safe and secure SWIM-compliant FIXM, AIXM and WIXM data exchange.

Tasks:

The Implementation Project consists of the following tasks:

- Task 1 - Project Management and Reporting: LFV operates an ISO accredited quality management system. In line with LFV's project management and quality procedures, directives have been issued for each activity and project management procedures are in place. The comprehensive project management system applied to the Implementation Project includes the issuing of a 'directive' from a 'project owner' within the LFV management. The directive assigns a project manager who then develops a project management plan and has overall responsibility for the successful delivery of the project within time and budget allocated. Each of the activities is subject to this process and has already been assigned a project owner and project manager.
  Each project undertaken in LFV is managed by a steering group typically consisting of a project owner, a project manager, operational experts, financial experts, engineering experts and a system owner. When a project is completed, a report is developed, submitted to the project owner, defining the work completed, any deviations from the project management plan, suggestions for improvement for future projects and lessons learned. It is published internally on LFV's intranet.
  This Task will also cover the development of a Plan for information sharing and contribution to standardisation, which will enable LFV to share the lessons learnt as part of this Project with other stakeholders implementing SWIM cyber-security functionalities, facilitating the completion of PCP Family 5.2.3.
- Task 2 - Information security framework and procedures: The establishment of an information / cyber security framework defining how cyber-security will develop within LFV will be undertaken within IP 2017_066_AF5 (Implementing harmonised SWIM (Y) solution in COOPANS ANSPs and general PCP compliance), which will develop a harmonised cyber-security framework across the five COOPANS ANSPs

(including LFV) for the harmonised COOPANS SWIM yellow profile infrastructure. This Task will cover the coordination required between this project and the COOPANS project, which will enable the development of a cyber-security policy and roadmap to protect Swedish air navigation services that is consistent with the technical activities undertaken in this project. Each technical activity will require security instructions, and the information security framework describes the management directives for security.

- Task 3 - Architecture & system design: This task will develop a design and architecture outlining how the proposed changes and technical functions will be implemented into existing technical environments, based on the zero-trust model. It will involve an analysis and mapping of existing and future security requirements, and will plan how to integrate the security design of SWIM Technical Infrastructure within LFV's architecture. A new architecture is required in order to allow legacy systems, initially designed to be shielded from internet, to exchange data in real-time in a secure manner and still ensure integrity, availability, confidentiality and safety.
  The task will include:
  - Assessment of current infrastructure, SWIM and identification of the requirements for the cyber security functions;
  - Consulting the system provider(s) to develop the operational concept;
  - Design of a scalable and defensible network based on the zero-trust model

  While the architecture and system design will be completed by the end of 2018, it may need updating to take into account developments in other tasks. Any updates to the architecture and system design due to work completed in other tasks will be undertaken within those tasks, and so this task (Task 3) is planned to finish by the end of 2018.
- Task 4 - Safety Assessments: This task covers the safety assessment of the SWIM cyber-security system and of its constituent solutions (see Tasks 5-8). As a project that is imperative for the security of LFV's SWIM services, and which will involve changes within a live network, ensuring safety is critical. This task covers safety assessments for each of the solutions identified below, and for the overall system. Each of these assessments will require an initial safety plan. For each identified change, documented safety arguments will be produced. As part of this, the LFV Safety Management System will be used, including the necessary organisational structures, accountabilities, policies and procedures. An analysis of the safety aspects of the proposed changes will be an ongoing activity during the whole project. The inter-relationship between safety and security is crucial: an insecure system cannot be assumed to be safe.
- Task 5 - IAM solution implementation: This task implements an identity and access management (IAM) solution, which will enable a secure interface/AP for parties to exchange transaction data in a secure manner that is encrypted.
  A crucial part of this task is the deployment of a X.509-based Public Key Infrastructure (PKI), as per SWIM Yellow Profile requirements, to underpin the IAM solution. This includes the technical infrastructure for the PKI and the definition of policies and procedures ensuring compliant certificate usage with respect to both common SWIM and local standards, and the implementation of local policies for authorising and mandating a local organisation to perform certificate management. The PKI will need to be compliant with the SWIM Certificate Policy as being defined in other projects.
  The IAM also gives non-repudiation and an audit trail for transaction data. Non-

repudiation is especially important in SWIM yellow-profile as it provides proof that an identified system has received the information in question, providing a barrier to unauthorised access to sensitive information exchanged within the SWIM network.

Sub task 5.1: Technical evaluation and identification of processes/procedures

This sub-task will involve evaluating the system functionality required and the process to implement the solution within this task; evaluations will be technical or in documents. It also includes the identification and definition of processes/procedures to implement the solution, such as the issue of key generation, certificate revocation, key recovery, cross-certification, etc.

Sub task 5.2: Procurements

This sub-task covers the procurement of the software and hardware necessary for the implementation of this task's solution, which will be undertaken in line with the national legislation for public authorities such as LFV. It will include the components required by the SWIM Certificate Policy, envisaged to include servers/software for a Certificate Authority and Hardware Security Module (HSM).

Sub task 5.3: Testing and implementation

This sub-task covers the system testing required pre-implementation, and the initial implementation of the system, including:

- Installation of hardware in test environment before procurement;
- Installation in virtual systems;
- The implementation and start of initial operations;
- Safety arguments for proposed solution.

Sub task 5.4: Validation and verification

This sub-task concerns the verification and acceptance of the solution installed. The work will be undertaken by LFV in association with the national telecommunications provider and equipment providers and SWIM governance mechanism.

Sub task 5.5: Training of technical personnel

This sub-task covers training of maintenance personnel and network operators that is necessary for the operation of the solution implemented. A training plan will be developed, and the training itself will take place in parallel with validation and verification, and before full operational deployment.

- Task 6 - Containers and virtualisation: This task will develop a solution for handling security shortcomings for some legacy systems where security functionality isn't available. It will test the migration of legacy systems to controlled containers and virtualised environments for increased security, which reduces the costs of service, hardware and maintenance.

  Virtualisation provides higher availability and continuity, and application control

  This task will include the following sub-tasks (see Task 5 for description of these sub-tasks):

  Sub task 6.1: Technical evaluation;

  Sub task 6.2: Procurement;

  Sub task 6.3: Testing and implementation;

  Sub task 6.4: Validation and verification;

  Sub task 6.5: Training.

- Task 7 - Installation and tuning of firewall(s): A defensible and modern network focuses on segmentation to provide added security. The Task covers the implementation of a firewall function, which provides opportunities for fine grained segmentation of systems and functions. This task will include the following sub-tasks (see Task 5 for description of these sub-tasks):

Sub task 7.1: Technical evaluation;
Sub task 7.2: Procurement;
Sub task 7.3: Testing and implementation;
Sub task 7.4: Validation and verification;
Sub task 7.5: Training of technical personnel.

- Task 8 - Logging and monitoring: Stopping an attack at the perimeter is not sufficient. A modern design assumes an attacker is already on the inside and so needs defence-in-depth and constant vigilance. Continuous monitoring is necessary, as is the capability to investigate incidents, potentially collecting forensic evidence. This task establishes:
    - a strong log policy to determine what event data should be collected, from where, how it should be reviewed and kept, etc. This needs to build upon the SESAR SWIM-Technical Infrastructure requirements for logging, and SWIM logging compliance rules once established.
    - an Intrusion Detection/Prevention System (IDS/IPS), necessary to detect and defend against malware threats and block them.
    - a logging function to collate logs, thereby which makes it possible to identify an attack in a centralized system log.
    - a Security Operations Centre for real-time monitoring of the event data above.
    - an audit programme (e.g. retrospective review of logs) to ensuring continuous compliance with common and local policies and standards."

  This task will include the following sub-tasks (see Task 5 for description of these sub-tasks):
  Sub task 8.1: Technical evaluation;
  Sub task 8.2: Procurement;
  Sub task 8.3: Testing and implementation;
  Sub task 8.4: Validation and verification;
  Sub task 8.5: Training of technical personnel.
- Task 9 - Validation/Verification of the entire SWIM cyber-security system: This task concerns the overall tests, verification and acceptance of the cyber-security infrastructure within LFV, so that it is ready to support communication between SWIM-enabled applications. It will build on the verification and validation performed within the above tasks. The work will be undertaken by LFV in association with the national telecommunications provider and equipment providers. The task will include the following activities:
    - Development of a test schedule in association with system manufacturers;
    - Testing of the integration platform in accordance with the test schedule;
    - Identification of any failed system components and the commencement of a re-development and assessment process;
    - Verification of the secure operation of the cyber-security infrastructure and integration platform within LFV, and that it is ready to support communication between SWIM-enabled applications.

Expected Results:

- A robust and secure cyber security baseline is implemented. In addition to this, overall policies, procedures and technical functionality needed to establish robust cyber resilience are implemented.
- Cyber security measures (including policies, procedures and technical functionalities

such as firewalls, network security monitoring, malware defenses and added threat intelligence capabilities) that enable the introduction of a more robust, safe and secure SWIM services for Yellow SWIM TI Profile data exchanges and SWIM, are implemented.

- The deployment of secure and safe services, conducted as part of Action 2015-EU-TM-0196-M #2015_118_AF5 is enabled. The cyber security measures will align to the upcoming EU Common PKI solution and support the following areas addressed in 2015-EU-TM-0196-M #2015_118_AF5:
  - Efficient flight planning and efficient and secure exchange of information and data within LFV, via the Yellow SWIM TI Profile;
  - Exchange of data related to other Yellow Profile SWIM services, including Aeronautical Information Management.
- Cyber security measures (at an Yellow SWIM TI Profile level) that will support and be a part of implementation of technical solutions for deployment Families 5.3.1, 5.4.1, 5.5.1, and 5.6.1 within Sweden are enabled.
- The foundations are laid in relation to design and functionality needs of cyber security baseline measures, related to demands extracted from SWIM TI profile specification. Acquisition of knowledge, experience and expertise to inform and facilitate the implementation of functionalities from the families 5.3.1, 5.4.1, 5.5.1, and 5.6.1 are ensured.

This is crucial as LFV, and European Air Traffic Management more generally, is becoming much more inter-connected, which introduces new cyber-risks to safety-critical operations. Vitally, migrating unprotected legacy systems to a network connected to the internet may introduce vulnerabilities and new risks into the overall network. The deployment of SWIM will involve the connection of legacy systems to the internet, and so the implementation of SWIM cyber security is imperative to ensure the security of both the future SWIM network and other connected systems. The performance benefit is reducing security risk, the readiness to deploy new ATM functionalities, and the flexibility to adapt further in the future.
From a SWIM perspective, the project enables safe and secure SWIM services at LFV. The near-term goal is connecting systems through SWIM services to allow for more efficient flight planning and delivering efficient exchange of information and data within LFV and its stakeholders. This project therefore is facilitating Action 2015-EU-TM-0196-M #2015_118_AF5, which involves the implementation of an Integration Platform within Swedish airspace, allowing for more efficient flight planning and delivering efficient exchange of information and data within LFV, and using the Yellow SWIM TI Profile. This action is necessary to close the gap for family 5.5.1 (Cooperative Network Information Exchange system) within Sweden. Following on from this already-defined action, the medium-term task is then to use the same secure integration platform for LFV's transition to using the Yellow Profile for other SWIM services, including Aeronautical Information Management, by enabling the ability of the platform to integrate and perform within the AIM functionality, in line with the objectives outlined in the family 5.3.1. Similarly, the platform will then support WIXM data exchange. Cyber controls need to be sufficient and robust enough to be compliance with expected SWIM Governance mechanisms.

Internal Achievement Points:

- Start of training - 01/08/2019
- End of training - 31/12/2020

- Parallel Operations / Operational Trials - 30/09/2020
- Cutover SW ready and successfully tested - 30/09/2020
- Cutover and fall-back period completed - 30/09/2021

Contractual Milestone:

- Project completed - 30/09/2021

Performance Benefits:

Overall, the expected outcomes and benefits to LFV are:

- Safe, secure and resilient services are available;
- Defence in depth is enabled;
- Costs from less legacy equipment are lower;
- Better information sharing is ensured;
- Agility to change and adapt is ensured;
- Technical assurance is ensured;
- Security risk is reduced;
- Compliance with PCP is ensured;
- Better security posture for regulatory requirements is ensured.

These expected benefits will be translated into the following performance benefits:

- Improvement of Safety – EnRoute by 10% in the DK-SE FAB;
- Improvement of Safety – TMA by 10% in the DK-SE FAB;
- Improvement of Capacity – EnRoute by 5% in the DK-SE FAB;
- Improvement of Capacity – TMA by 5% in the DK-SE FAB;
- Improvement of ANS Cost Efficiency - Airport Ground by 2% in the DK-SE FAB;
- Improvement of Flight Efficiency in Time - EnRoute by 1% in the DK-SE FAB;
- Improvement of Flight Efficiency in Time - TMA by 1% in the DK-SE FAB;
- Improvement of Flight Efficiency in Fuel- EnRoute by 1% in the DK-SE FAB;
- Improvement of Flight Efficiency in Fuel- TMA by 1% in the DK-SE FAB.

➢ **2017_065_AF5 LVNL Nation wide managed network supporting SWIM**

Start/end date: 12/04/2018 - 30/06/2021

Project Leader: Luchtverkeersleiding Nederland (Air Traffic Control The Netherlands)

Project Contributor: N/A

Overview:

The main objective of the Implementation Project (IP) is to implement nation-wide Internet Protocol (IP)-based networks (Metropolitan Area Network (MAN), Wide Area Network (WAN) and Local Area Network (LAN)) interconnecting civil airport systems in the Netherlands that can be managed from the LVNL office at Amsterdam Schiphol. The technology used for the networks ensures seamless integration with the Network 2.0 Amsterdam and NewPENS (New pan-European Network Service). The network must be

highly available, secure, centrally managed and monitored.
The LVNL Nation-wide network is a follow-up project of the 2016_143_AF5 "ATM Network 2.0 Amsterdam" project (2016-EU-TM-0117-M). Where the ATM Network 2.0 Amsterdam project aims at implementing the Local Area Network (LAN) and Campus Area Network (CAN) infrastructure for the Schiphol Main and Contingency (Annex) centre, the Nation-wide project will provide the Metro Area Network (MAN) and Wide Area Network (WAN) parts of the new centrally managed infrastructure. The project will also realise the LAN connections into the centralised infrastructure where there currently not present.

Specific objectives:

The IP specifically aims to ensure the deployment of the LVNL Nation-wide managed network including:

- An Internet Protocol-compliant (IPv6) centrally managed and secured network interconnecting all civil airports in the Netherlands (WAN) to be able to support future information exchanges through SWIM profiles.
- The components required for supervision, monitoring and control.
- Networks at the airports (MAN / LAN / Fibre cabling) areas interconnecting systems (i.e. sensors, voice communication, surveillance and other data systems).
- Every used component or technique needs to be severely tested and designed based upon common LVNL architectural standards.

Tasks:

The Implementation Project consists of the following tasks:

- Task 01 - Project management MAN networks: Project management metropolitan area network (MAN) networks.
- Task 02 - Requirements MAN networks: Requirements for the metropolitan area networks (MAN). Describe all functional and technical requirements for the network infrastructure. These requirements function as reference during the entire project.
- Task 03 - Designing MAN networks: Designing metropolitan area networks (MAN). Based on the requirements a high-level design (HLD) and low-level design (LLD) will be created.
- Task 04 - Realsation MAN networks: Fiber cabling for metropolitan area network (MAN) at Groningen Airport Eelde and Maastricht Aachen Airport and realisation of a metropolitan area network (MAN) at Groningen Airport Eelde, Maastricht Aachen Airport, Rotterdam The Hague Airport and Amsterdam Airport Schiphol.
- Task 05 - Closure MAN networks: Project closure for metropolitan area networks (MAN) for Groningen Airport Eelde, Maastricht Aachen Airport, Rotterdam The Hague Airport and Amsterdam Airport Schiphol.
- Task 06 - Project management WAN network: Project management wide area network (WAN) networks.
- Task 07 - Requirements WAN network: Requirements for the wide area networks (WAN). Describe all functional and technical requirements for the network infrastructure. These requirements function as reference during the entire project.
- Task 08 - Designing WAN network: Designing wide area networks (WAN). Based on the requirements a high-level design (HLD) and low-level design (LLD) will be created.

- Task 09 - Realisation WAN network: Realisation WAN network at Groningen Airport Eelde, Maastricht Aachen Airport, Rotterdam The Hague Airport, Lelystad Airport and Amsterdam Airport Schiphol.
- Task 10 - Closure WAN network: Project closure for wide area networks (MAN) for Groningen Airport Eelde, Maastricht Aachen Airport, Rotterdam The Hague Airport, Lelystad Airport and Amsterdam Airport Schiphol.
- Task 11 - Project Management LAN networks: Project management local area network (LAN) networks.
- Task 12 - Requirements LAN networks: Requirements for the local area networks (LAN). Describe all functional and technical requirements for the network infrastructure. These requirements function as reference during the entire project.
- Task 13 - Designing LAN networks: Designing local area networks (LAN). Based on the requirements a high-level design (HLD) and low-level design (LLD) will be created.
- Task 14 - Realisation LAN networks: Realisation of a local area network (LAN) network at Groningen Airport Eelde, Maastricht Aachen Airport and Rotterdam The Hague Airport.
- Task 15 - Closure LAN networks: Project closure for local area networks (LAN) for Groningen Airport Eelde, Maastricht Aachen Airport and Rotterdam The Hague Airport.

Expected Results:

- architecture documentation (Requirements/HLD/LLD/SRD) is created.
- Fibre Cabling is implemented on airfields where these are not present.
- MAN Infrastructure is implemented / configured.
- WAN Infrastructure is implemented / configured.
- LAN Infrastructure is implemented / configured.
- Network logging, monitoring, control and security is implemented / configured.
- Old connections are migrated to new ones.
- Documentation / Hand-over / Closure are delivered.

Internal Achievement Points:

- Start of training – N/A
- End of training – N/A
- Parallel Operations / Operational Trials - N/A
- Cutover SW ready and successfully tested - N/A
- Cutover and fall-back period completed - N/A

Contractual Milestone:

- Project completed - 30/06/2021

Performance Benefits:

- The network is a prerequisite for supporting SWIM information exchanges using the SWIM TI Profiles.

- By migrating to a central network management department and standardise on an IP based network components LVNL will reduce network maintenance by 1,25 FTE (full-time equivalent), a technology cost reduction of 1%.
- The new SWIM architecture and standardised IP network allows LVNL to deploy standard interfaces with our partners for current and future applications. This will reduce the number of dedicated interfaces drastically.

➢ 2017_066_AF5 Implementing harmonised SWIM (Y) solution in COOPANS ANSPs and general PCP compliance

Start/end date: 15/04/2018 - 01/07/2023

Project Leader: Irish Aviation Authority, limited liability company;

Project Contributors:

- Österreichische Gesellschaft für Zivilluftfahrt mit beschränkter Haftung, limited liability company;
- Croatia Control Ltd;
- Irish Aviation Authority, limited liability company;
- Luftfartsverket, a state enterprise (LFV);
- Naviair, a state owned company.

Overview:

COOPANS expects a need for a new FDP solution to cope finally with FO-IOP in January 2025. Development needs to be finished in 2023 to perform final integration and long-term tests. So, COOPANS needs to cover all PCP requirements for AF 1-4 with any relation to IOP latest by early 2023 and prepare AF 5 & AF 6 items due 2025-27. To do the final integration, COOPANS is planning a future "new FDP solution integration project" in 2023-25 (not part of this project).
To be prepared, this project builds the bases. The first SWIM integration on a test platform integrating Extended A-MAN functionality will be done to secure the needed data-communication based on SWIM also for the future "new FDP" project (besides bringing the basics for implementing Extended A-MAN via SWIM).
This will require all contracts to be defined and signed in the timeframe of 2018-19 and therefore all projects need to be clustered into one PCP programme starting early 2018 to ensure optimum planning and control of resources to cope with the challenge and minimise administrative costs.
The COOPANS ambition is to harmonise and synchronise to the extent possible to gain economy of scale during implementation and enable future savings from standardised solutions based on the LFV and AustroControl SWIM related projects already started.
This Implementation Project will implement the below mentioned capabilities either implementing SWIM or being based on SWIM in all 5 COOPANS ANSPs, and ensure timely PCP compliance for COOPANS member ANSPs in additional local exploitation projects. The SWIM items will be aligned with European wide solutions in AF 5.1. The different capabilities and interdependencies with other projects are addressed for each Work Package as follows:

- Work Package (WP) 1: Programme Management

- WP 2: SWIM yellow (Y) infrastructure: For some topics under WP 2, Austro Control and LFV are already running projects funded by previous calls (see below).
  As those projects are related to this project and parts of the work will be done under the framework of those projects by Austro Control and LFV, they have a lower calculated budget in WP2 than the other partners.
  For Austro Control and LFV WP2 contains only additional costs for maturing the already running projects of Austro Control and LFV to synchronise with the COOPANS standard solution. Those additional costs as well as the added coordination effort are the bases for the calculation of the costs.
  The 2 related projects are:
  LFV: 2015_118_AF5
  Austro Control: 2016_149_AF5
- WP 3: Cyber security & PKI: As LFV wants to go further with their cyber security program than COOPANS common, LFV IP 2017_061_AF5 "Application of Cyber Security to ANSP and SWIM at LFV" will cover that. The common gap closure for COOPANS is estimated to be 35%. Outside the scope of this IP are:
  - AIM and MET systems/services,
  - Legacy systems to be connected via SWIM,
  - SWIM blue profile.

  Furthermore, there is a dependency with 2017_084_AF5, SWIM Common PKI and policies & procedures for establishing a Trust framework which is running in parallel to our project, why we predict the need of iterations.
- WP 4: Extended AMAN as SWIM service: Extended AMAN was selected, as this component will remain in the COOPANS Flight Object solution by 2025, where the FDP itself might not. Therefore, it is not planned within this project to replace any legacy interfaces like Aeronautical Fixed Telecommunication Network (AFTN), OLDI etc. in the present FDP solution.
  COOPANS develops the bases (SWIM yellow profile) based on the implementation of Extended AMAN. This solution will then also be used for the implementation of FO-IOP which is planned, but not part of this Action. .
- WP 5: Initial TBS: This WP is relevant to all COOPANS sites, regardless of TBS regulation, to improve RWY throughput, as implementing the TBS capability and HMI, but based on distance separation. The solution is based on the technical component for TBS, to ensure a later simpler implementation at those sites obliged to implement TBS.
  The solution will be deployed at all COOPANS sites for local exploitation. Initial TBS means that the technical solution will be deployed in this step.
- WP 6: Upgrade the COOPANS capabilities to support FRA operations in even higher traffic densities: This WP addresses technical support of the already implemented FRA, in order to keep up performance and to improve capacities. Some issues occured, as neighbouring ANSP are implementing FRA and there is a need for better automation of coordination capabilities and better monitoring of traffic outside COOPAN's own Area of Responsibility (AoR). Therefore, the Area of Interest (AoI) and related functionalities and tools, will need to be expanded.
- WP 7: SWIM monitoring & Control.
- WP 8: Ensure internal capabilities to manage the SWIM solution when implemented.
- WP 9: SWIM Safety case.

Specific objectives:

The IP specifically aims to:

1. Develop and implement a COOPANS harmonised SWIM yellow profile infrastructure in all 5 participating ANSPs, based on LFV experience and connection of the common Topsky environment.
2. Develop and implement a harmonised Cyber Security and PKI Management for this harmonised SWIM infrastructure and the connection of COOPANS Topsky platform. For security reasons it can probably not be standardised but shall ensure options for future collaboration on services.
3. Develop and implement a SWIM Extended AMAN service capability, both as supplier and subscriber.
4. Develop and implement a technical baseline for a later TBS project, where required, ensuring the technical capabilities, based on SESAR standard and ensure early improvements of RWY throughput at all COOPANS sites.
5. Improve system support for Free route airspace, ensuring and increasing peak hour capacities, as FRA operations grow European wide.
6. Implement sufficient monitoring capabilities for the new SWIM technology.
7. Ensure sufficient training of in-house competence, to operate a SWIM environment, and enable a high agility in development of future services and maintenance hereof.
8. Ensure international standards during development of SWIM environment, by hiring temporary external expertise for specific tasks.

Tasks:

The Implementation Project consists of the following tasks:

- Task 01 - WP 1 Programme Management: Generel management of the project according to the COOPANS Programme Management plan.
- Task 02 - WP 2 Implement a harmonised SWIM (Y) node in all 5 ANSPs (AF5) : Design a COOPANS harmonised SWIM (Y) solution and implement in all 5 ANSP to be prepared for integration of the FO-IOP solution in 2023-24 as well as enabling a harmonised SWIM infrastructure for any other national purpose needed/supporting other projects prior end 2023.
- Task 03 - WP 3 Implement a harmonised SWIM Cyber security framework in all 5 ANSPs (AF 5): Develop and implement a common Cyber security & PKI framework in all 5 ANSPs supporting the common infrastructure and the services being planned in other national projects. The task is furthermore about harmonised strategies, policies, trust building and agreeing on common solutions and implementing those.
- Task 04 - WP 4 Develop and implement a European standard Extended AMAN SWIM service (AF1): This task is to ensure an end-to-end and 2-way solution of task 2 and Task 3. It will be based on the present harmonised COOPANS AMAN solution and are selected as being the most mature and relevant SWIM service enabling a COOPANS pilot service.

  It is intended to implement it in the operational environment within this project, but only if the end-to-end solution is mature enough.
- Task 05 - WP 5 Integrate the SESAR/Thales developed Time Based separation solution into the COOPANS platform and implement Distance Based separation tool

(AF 2): As preparation for a later TBS project, the SESAR/Thales developed solution will be technically deployed for 2 purposes:

1. The TBS component includes a HMI spacing tool and is expected to increase RWY throughput even with standard ICAO distance separation, referencing a SESAR experiment on Vienna Airport.
2. The integration of the component will enable COOPANS to start maturing the concept from SESAR from V3/V4 to a V5/V6 version in the test and training environment locally. This pilot deployment does not include research activities. The starting point of the development is a TRL (technical readiness level) 5/6 Version that will be developed to a full V5/V6 version that can be deployed in operation.

- Task 06 - WP 6 Upgrade ATM system to better support the FRA and expected traffic increase towards 2025(AF3) : Based on the experience from the already implemented FRA and system support, some shortcomming will need to be solved due the predicted traffic increase towards 2025 and expanded use of cross border FRA.
  The upgrade concerns improvements to:
  - MTCD,
  - Safety nets,
  - Monitoring tools,
  - OLDI,
  - Computer Pilot Data Link Communications (CPDLC),
  - HMI and various tactical tools
- Task 07 - WP 7 SWIM Technical monitoring & control capabilities: Ensuring that technical monitoring and control are updated to handle the new SWIM infrastructures and components.
- Task 08 - WP 8 Consultancy & training of functional experts: This activity will serve to ensure harmonised understanding of all aspects of the above tasks and ensure progress according to the project timeline, as well as ensuring operational capabilities after implementation.
- Task 09 - WP 9 SWIM Safety Case: For the SWIM platform to produce:
  - Functional Hazard Analysis,
  - Preliminary system safety,
  - System Safety Analysis.

  For the Ext AMAN SWIM service:
  - Functional Hazard Analysis,
  - Preliminary system safety,
  - System Safety Analysis.

Expected Results:

- A COOPANS common SWIM infrastructure is implemented with a harmonised cyber security framework, enabling future expanded cooperation within the COOPANS group on development of future SWIM services, involving common components,

such as the Topsky ATM platform. The benefit of harmonisation is future economy of scale.

- For each COOPANS ANSP, a SWIM baseline infrastructure is implemented for development of all SWIM services, including those not of common COOPANS interest, and a work share on common COOPANS services, such as an Extended AMAN service as the pilot common SWIM service. Benefit is potential cost savings.
- For each participating ANSP, this action will be an enabler for local development of services within AF 5.3.1, 5.4.1, 5.5.1 and 5.6.1.
- Furthermore, each participating ANSP is given an in-house capability, to produce and maintain an agile organisation for future development of SWIM services, with an expert back up/support from increasing organisational liability through cooperation.
- A technical baseline is available for development of local TBS projects, as well as some initial improvements to RWY throughput, by implementing a spacing tool, based on distance, introducing the TBS HMI as a first step towards TBS, and can be used at all COOPANS sites. The benefit is improved RWY throughput, as more accurate spacing on the final has been identified under SESAR validations on Vienna airport, even only used with distance-based separation.
- Finally, peak hour en-route capacities are improved at all COOPANS ANSP as FRA airspace is becoming more widely used in Europe (if not done, the risk is actually a decrease in En-route capacities).

Internal Achievement Points:

- Start of training - 01/09/2018
- End of training - 31/03/2023
- Parallel Operations / Operational Trials - 31/03/2023
- Cutover SW ready and successfully tested - 01/04/2023
- Cutover and fall-back period completed - 01/04/2023

Contractual Milestone:

- Project completed - 01/07/2023

Performance Benefits:

The project will provide the following performance benefits, as per the performance grid:

1. Improvement of interoperability - 1% (This project is mainly an enabler)
2. Improvement of safety – En-Route by 5%
3. Improvement of capacity – En-Route by 5%
4. Improvement of resilience – En-Route by 2%
5. Improvement of capacity – TMA by 2%

➢ 2017_069_AF5 ITALIAN AIR FORCE INTEGRATED BRIEFING

Start/end date: 12/04/2018 - 31/03/2020

Project Leader: Italian Air Force (MoD)

Project Contributor: N/A

Overview:

Italian Air Force provides Air Navigation Services to both general and operational air traffic (GAT and OAT). As such the Italian Air Force has to ensure Aeronautical Information Service (AIS) to civil and military users. The management of current aeronautical information is crucial for the implementation of services distributed in accordance to System-Wide Information Management (SWIM) architecture in order to ensure the flow of aeronautical information/data necessary for safety, regularity, economy and efficiency of international air navigation. Italian Air Force needs to deploy a new Aeronautical Information Exchange System in order to enable AIS data exchange with EAD (European AIS database).

Specific objectives:

The new system is a SWIM prerequisite by joining EAD on a B2B principle sharing AIS database information. In particular this IP specifically aims to:

- proceed to the AIS and Met database integration;
- implement a distributed Web based Digital Briefing capability according to ESSIP (European Single Sky Implementation Plan) INF04 available also for mobile devices;
- implement Digital NOTAM generation and distribution;
- enable AIS data exchange with EAD;
- train all the different categories of users.

Tasks:

The Implementation Project consists of the following tasks:

- Task 01 - Project Management: Project Management activity will be conducted in order to ensure the progress of the project with timing, costs and quality standards expected. In particular, the Project Team will guarantee its know-how and commitment in:
    - Refining the detailed project organisation through the clear identification of roles and responsibilities;
    - Organising and planning technical, operational and progress status meetings;
    - Supporting the provision of the project reporting documentation (progress reports, presentations, minutes, etc.)
- Task 02 – Integration and configuration: The task includes all the envisaged activities to integrate and configure the new software that will provide the Air Force with the integrated briefing capability and exchange of AIS data and information with EAD.
- Task 03 – Training: The task includes all the envisaged activities to train operational and technical personnel on the new system. Training activities will be addressed separately towards AIS, ATS, Air Crews and technical personnel.
- Task 04 – Validation of the overall solution: This task includes all the envisaged activities to validate the overall solution before starting the operational use. During the activities a series of pre-operational tests with all the involved stakeholders (ATS Agencies, Air Crews, EUROCONTROL (EAD) will be performed.

Expected Results:

The implementation of an integrated Aeronautical Information System and of an integrated briefing capability will allow:

- an integrated and flexible provision and presentation of data which are required during the pre-flight phase for the preparation and execution of a flight;
- an enhanced access and provision of various data/information sources such as AIS, ARO (ATS Reporting Office), MET and ATFM which provide i.e. NOTAM, SNOWTAM (special NOTAM reporting hazardous conditions), MET messages, FPL and related messages or ATFM messages.

Internal Achievement Points:

- Start of training - 15/11/2018
- End of training - 31/03/2019
- Parallel Operations / Operational Trials – N/A
- Cutover SW ready and successfully tested - 31/05/2019
- Cutover and fall-back period completed – N/A

Contractual Milestone:

- Project completed - 31/03/2020

Performance Benefits:

The implementation of a new integrated Aeronautical System will:

- increase the interoperability of the EATM network by exchanging AIS data with EAD (30%);
- improve the quality of AIS services provided by Italian Air Force by providing AIS and Met data and information with an increased level of accuracy integrity and promptness (40%);
- ensure an increased level of availability of service (30%);
- increase safety levels by providing an increased availability of data and information of proved quality (30%);
- enable a rationalisation of ATS Reporting Offices from the current 20 to only 2 offices with a considerable reduction of costs (60%).

➢ **2017_075_AF5 SWIMARN - SWIM with Cyber Security at Stockholm Arlanda Airport**

Start/end date: 12/04/2018 - 31/12/2023

Project Leader: Swedavia AB

Project Contributor: N/A

Overview:

This Implementation Project (IP) consists of the implementation of local PKI infrastructure

including appropriate cyber security measures/systems in line with requirements based on the result from the ongoing work related to SWIM governance. Furthermore, it encompasses the implementation of SWIM infrastructure as basis for the implementation of ATM information exchanges according to the PCP regulation (aeronautical, meteorological, cooperative network and flight information exchange) which is vital for the air transport business. This in turn will support enhanced connectivity which is fundamental element in achieving social and economic growth.
Furthermore, this project will liaise with projects run by Eurocontrol regarding common SWIM infrastructure (Family 5.1.3) and Common SWIM PKI and cybersecurity (Family 5.1.4). This is essential for local preparation and adoption. Being part of the NM Airport network common SWIM activities will have a major effect on how local adoptions are made.
Modern ATM systems design is using more and more common and open components, services and standards. This trend exposes systems to increased cybersecurity risks, it is therefore paramount to identify these risks, assess their possible impacts and mitigate them with appropriate measures. Some components of this family are particularly exposed to these cybersecurity risks and this IP addresses this and appropriate actions to mitigate them.

Specific objectives:

The Implementation Project specifically aims at developing the systems needed to operate a PKI and its associated trust framework in order to produce and manage digital certificates, e.g. Certification Authorities, validation services such as OCSP (Online Certificate Status Protocol) or CRL (Certificate Revocation List), user interfaces, systems supporting the Registration Authority and Policy Management Authority roles.

Tasks:

The Implementation Project consists of the following tasks:

- Task 01 - Project Management / Coordination: The task covers the management and coordination of the content of the entire Implementation Project. Reporting and follow up within Swedavia.
- Task 02 - PKI Platform infrastructure: This implementation project consists of the implementation of local PKI infrastructure at Swedavia including appropriate cyber security measures/systems in line with requirements stemming from SWIM governance.
  The PKI infrastructure requires strong authentication of users, both humans and systems. The architecture will provide the mechanisms needed to achieve cross organisational trust in order for a group of organisations to securely exchange information.
- Task 03 - Implementation of Certificate Management: Public Key Infrastructure – certificate validation, underlies mutual trust across organisations.
  To establish the required trust in the other parties on a European scale, a commonly agreed set of processes, Certification Policies (CP) and Certification Practice Statements (CPS) is required especially with the aim to ensure the interoperability of Digital Certificates and Digital Signatures.

The project will implement new Identity and Access Management (IAM) with Certificate Management approaches to cyber security, which will cover the identified gaps, as well as introduce a common and harmonised cyber security approach.
PKI-IAM framework is necessary to ensure the security of SWIM Yellow-Profile services to be implemented in Swedavia.
Certificate Management implementation of a Certification Authority (CA) includes personnel training, monitoring and protecting IT/OT (Information Technology / Operational Technology) systems, the development of procedures covering degraded operations, implementation of audit programs, and definition of policies and procedures.

- Task 04 - API platform turnaround information:
  - Specific objectives: Make available turnaround information from Swedavia airports in the API platform.
  - Expected Results: API's providing reliable and relevant information at any needed time.
  - Performance benefits: Scalability, easier integration and high availability.
- Task 05 - API platform Cyber Security: Swedavia API-driven cybersecurity software integration is a step toward true enterprise cybersecurity technology architecture. This new way to share data using the API is necessary to build a security platform. It gives Swedavia flexibility for enhancements by protecting the API platforms against future sophisticated cyber security attack.
  API software integration will make it easier to gather data and take action from prevention, detection, and response features to end-to-end cybersecurity process orchestration.
  Implementing a cybersecurity platform with an API approach will avoid the complexity with feature integrations standards, updates and reducing disrupting against new cyber-attacks.
- Task 06 - Segmentations of networks:
  - Specific objectives: Creating a segment containing only resources specific to the consumers with authorised access.
  - Expected Results: An environment of least privilege.
  - Performance benefits: Boosting performance and improving security.
- Task 07 - 802.1X Protocol: This task is strongly linked to the task 2 of this IP. Without PKI infrastructure, it is not possible to implement the 802.1X / ISE protocol.
  Users and devices access (IoT) is growing rapidly and attackers are now focusing on security weakness of those devices for the way in and to get access to the corporate network.
  By implementing 802.1x identity-based network access solution (IBNS), Swedavia will gain control over connected users and devices in the future, and it will minimise the cyber security attacks and the risks Swedavia is exposed to. External people often connect their laptops to Swedavia´s network infrastructure by connecting them or/and other devices.

An authorised access to Swedavia's network infrastructure is a major challenge at the moment. Physical network segregation is currently not an option. Different system integration must be logically separated (VLAN (Virtual Local Area Networks) and VRF (Virtual Routing and Forwarding)), authenticated and authorised.

- Task 08 - Integration with ANSP:
  - Specific objectives: shared information models, data exchange, integration and API realisation between ANSP and Swedavia.
  - Expected results: efficiency, more accuracy in and faster decisions. Common ground for planning.
  - Performance benefits: higher grade of automatisation which reduces the risk of errors with less human interaction. Faster processes.
- Task 09 - SWIM Components: The primary aim is to secure SWIM technical hardware infrastructure components for Swedavia's data exchange over service interfaces for upstream and downstream AIM and will include specification, technical development, testing, validation and implementation. This SWIM service will be based on a standardized AIXM 5.1 messaging, but also as a tailored/limited data set as a GML profile of AIXM 5.1. Swedavia will also work to ensure digital aeronautical data flow as well as quality of data exchanged between Swedavia and LFV is synchronised and compliant in terms of EU regulations.
  This task will be syncronised with Swedavia contribution in IP 2017_060_AF5, where software infrastructure is beeing implemented There is a distinct difference between these projects to secure and prevent any overlap. Within 2015_288_AF5 the procurement and implementation of Swedavia's own platform with data models, data warehousing and system tools for sufficient data quality control according to EU 73/2010 is channelled wheras the integration of the AIM into the ADQ-database is taken care of with the implementation of Swedavia's own exchange technology within this project while the translation and validation exercises regarding the transfer of ADQ information between Swedavia and LFV and further on to Eurocontrol as well as software integration is done within project 2017_060_AF5.
- Task 10 - Project office CEF Call: The task covers the work from resources that are needed to take care of the project in terms of relation with INEA and SESAR Deployment Manager. Progress reporting and project follow up.

Expected Results:

- Trusted environment (PKI) is established.
- Cyber resilience requirements are implemented.
- Training, Education and Cyber Security Awareness is carried out.
- Governance structure (in alignment with SWIM governance) is defined.
- The initial Certificate Policy/Certification Practices Statement(s) is developed and approved.
- Membership Agreement is developed.
- Better integration between systems that support API Integration Solutions with the cloud services used by customers, partners or employees is ensured.

- Policy based network access restrictions and authentication of connected LAN or Wi-Fi endpoints across the Swedavia network infrastructure are improved with 802.1x/ISE.
- Implementation of 802.1x/ISE to the endpoints includes, among other information, network accessibility limitations that Swedavia wants to enforce at the endpoint.

Internal Achievement Points:

- Start of training - 01/01/2021
- End of training - 31/12/2021
- Parallel Operations / Operational Trials - 30/06/2020
- Cutover SW ready and successfully tested - 31/03/2020
- Cutover and fall-back period completed - 31/08/2020

Contractual Milestone:

- Project completed - 31/12/2023

Performance Benefits:

- Avoidance of expensive redesigns using proven methodologies::The number of approved architectural reviews is expected to be increased with 10%.
- Accelerated successful implementation (API): The number of successful API-implementations in terms of time, money with expected result, is increased with 30% per year.
- Mitigated risk during implementation: The number of successful API-implementations in terms of time, money with expected result, is increased with 30% per year.
- Improved productivity by designing proper coverage and capacity. It is expected to be 35% less point to point integrations per year (measured as API calls translated to amount of integrations needed without this design).
- Faster migration to next-generation Network (802.1x), which would mean 100 % access control on publically exposed network interfaces by 2020.
- Identity and Access Management (IAM), 100 systems linked to the Single Sign on function by the end of 2020 and 200 by the end of 2022.
- 100 % access control on publically exposed network interfaces by 2020.
- Reduced deployment time through extensive planning and design, which would lead to 40% time improvement from registered change to production by 2022.

➢ **2017_076_AF5 Meteorological Information Exchange service for Airlines Flight Operation Centre at Lufthansa & Air France**

Start/end date: 01/02/2019 - 31/03/2023

Project Leader: Lufthansa Systems GmbH & Co. KG

Project Contributors:

- Deutsche Lufthansa Aktiengesellschaft;
- Lufthansa Systems Poland Sp. z o.o;
- Société Air France.

Overview:

The main objective of the Implementation Project is to upgrade the FOC systems and required cockpit interfaces of the airlines from the Lufthansa Group and Air France to support the exchange of meteorological information as service consumer in WXXM, iWXXM (ICAO Meteorological Information Exchange Model) format. The service upgrade will comply with the Yellow SWIM TI Profile, either using the Public Internet or PENS1/NewPENS.
The Implementation Project focusses on the implementation upgrade of the FOC from LH & AF with meteorological information exchange systems and services in accordance with SWIM principles.
In particular the main activities performed are the service implementations to be compliant with the applicable version of the Information Service Reference Model (ISRM).

Specific objectives:

The Implementation Project specifically aims to

- deploy systems upgrade to support the exchange of Meteorological Information as service consumer using the IWXXM format;
- an AIXM 5.1 datastore that is able to store the digital meteorological data;
- identify and deploy the SWIM infrastructure components for the retrieval of the digital data by use of the SWIM Yellow Profile;
- ensure implementation of software components that support the users in the quality assurance of the IWXXM data;
- update all software components in the FOC using the IWXXM data for flight planning or flight Monitoring purposes;
- achieve an implementation of SWIM services that allow other consumers to access all MET Information.

Tasks:

The Implementation Project consists of the following tasks:

- Task 01 - Project Management: The Project Management task relates to all general management tasks that are required to coordinate and track the fulfillment of the related project tasks. The project management will be performed throughout the whole lifecycle of the project, including the project initialisation and finalisation.
  The Project Management task includes the following sub-tasks:
  - Initiating: Relates to the setup of the project including the appointment of project manager and project team and the definition of the project charter;
  - Planning: Refers to the approvement of all planning documents with all contributing partners and the signment of the project charter,
  - Monitoring and Controlling: Includes tracking of the progress of single tasks and sub-tasks, definition and monitoring of project risks and problems and all reporting tasks related to the project, support of takeover activities and

approving and declining of project change requests;
  - Coordination: Refers to the organisation and initialisation of the single project tasks and sub-tasks with all involved project partners and ensuring availablity of adequate resources;
  - Closing: Includes issuing of the final project report and breaking up the project team after project finalisation.
- Task 02 - Requirements Engineering: The Requirements Engineering aims at the preperation of all technical documentation and specification that are required to implement the technical systems that relate to the new operational concept.
  The Requirements Engineering task includes the following sub-tasks:
  - Analysing of Concept: Refers to the review and exploration of all V3 concept descriptions that are related to the respective operational concept, including the gathering of service and procedure descriptions provided by NM and ANSPs with regard to Direct Routing and Free Route;
  - Developing the implementation concept: Aims at the definition of a specific technical and operational concept that describes how the new operational procedure can be integrated into the technical infrastructure and the operational procedures of the airlines of the Lufthansa Group. This sub-task is performed with all participating project stakeholders and focusses on new approaches of trajectory planning, schedule adjustment/ operations control, flight lifecycle monitoring and dynamic operations control;
  - Specifying the software: Aims at the technical description on how the new concept is integrated into the target software systems. It will be used by the system and software developers to produce the new system;
  - Reviewing/ Accepting of specification: This sub-task aims at the final acceptance of the software implementation approach by the airlines of the Lufthansa Group.
- Task 03 - System Development: The System Development task aims at the provision of the complete system that fulfills all requirements defined in the Requirements Engineering task and the final acceptance of the respective system by the airlines of the Lufthansa Group.
  The System Development task includes the following sub-tasks:
  - Implementing the software: Includes all tasks that are related to the technical fulfillment of the software and system implementation;
  - Performing INT Test: Refers to testing of the new system/ software on Lufthansa Systems side as prerequisite for the acceptance test;
  - Issueing the user manual: Aims at the provision of manuals that describe the new functions, workflows, etc. to the operational system users;
  - Issueing the technical manual: Aims at the provision of manuals that describe technical prerequisites for software implementation, system administration procedures etc, as required by system admins;
  - Performing acceptance test: This sub-task aims at the final acceptance of the new system/ software by the airlines of the Lufthansa Group.
- Task 04 - Preparation of Phase-in: The Preperation of Phase-in task relates to all tasks that are required by the airlines of the Lufthansa Group to ensure that the new operational apporach can safely be intruduced to operations.
  The Preperation of Phase-in includes the following sub-tasks:
  - Analysing of gaps in operational procedures: This sub-task aims at the identification of gaps between the previous operational procedures and the

future operational procedures;
    - Assessing the impact on safety: Aims at the identification of procedural approaches that are safety relevant;
    - Updating of procedure manuals: Aims at the definition of new operational procedures that close the procedural gaps identified;
    - Updating of Safety Management System: Aims at the definition of adequate procedures that ensure the safety of operations of the new procedures/ operational concepts;
    - Issuing of training material: Aims at the preperation of user trainings that allow an efficient and frictionless phase-in of the new operational procedures and systems;
    - Issuing of phase-in plan: This sub-task refers to the scheduling and planning of the phase-in of the new operational procedures, including: User training schedule (ops procedures/ safety etc.); system integration schedule, operational phase-in schedule.
- Task 05 – Deployment: The Deployment task aims to complete integration of the new procedures and systems into the operations of the airlines of the Lufthansa Group.
  The Deployment includes the following sub-tasks:
    - Performing technical training: This sub-task aims at the training of system administrators to ensure that the new system can be monitored and operated as specified;
    - Performing operational training aims at the training of operational personell that take part in the new operational concept;
    - Performing safety trainings: Aims at the training of all personell that is involved in the new operational concept or involved in the system administration with regard to safety relevant aspects;
    - System integration: Aims at the installation and enabling of the new software on site of the airlines of the Lufthansa Group, including final on-site acceptance test;
    - Operational phase-in: Aims at the full integration of the new operational concept into the operation of the airlines of the Lufthansa Group and the finalisation of the final deployment of the new operational concept.

Expected Results:

The following results are expected:
- IWXXM METAR (Meteorological Terminal Aviation Routine Weather Report) are in the FOC;
- IWXXM TAF's (Terminal Aerodrome Forecast) are deployed in FOC;
- IWXXM met Information for natural hazard are deployed in FOC;
- FOC flight planning and Monitoring engine and EFB (Electronic Flight Bag) are upgraded to use all necessary MET Information based on IWXXM Format.

Internal Achievement Points:

- Start of training - 01/09/2022
- End of training - 28/02/2023
- Parallel Operations / Operational Trials - 01/02/2023

- Cutover SW ready and successfully tested - 01/03/2023
- Cutover and fall-back period completed - 01/03/2023

Contractual Milestone:

- Project completed - 31/03/2023

Performance Benefits:

In particular the main benefit of this project is the increase of flight safety through processing digital data instead of classical MET data.
The migration to the SWIM Yellow Profile for the retrieval and provision of the concerned data will lead to increase the level of automation during data processing and reduction of personal costs. Furthermore the migration to an IWXXM database will lead to compliance with Aeronautical Data Quality (ADQ) regulations.

➢ **2017_080_AF5 PATRUS niveau 2 - Gateway Updgrade for 4Flight compliance**

Start/end date: 01/05/2018 - 31/07/2020

Project Leader: French Ministry of the Armies/Direction General de l'Armement

Project Contributor: N/A

Overview:

Upgrading the French PATRUS (Passerelle Temps-Reel Multi Niveaux) gateway (network) will allow interoperability with the French DSNA system 4flight and will provide more performance to the EU network. This Implementation Project will finally allow the migration to IP protocol and pave the way the SWIM deployment.
This Implementation Project is essential to enabling the exchange of surveillance and control data between civil ATC system and military AD (Air Defence) system. The work will allow an initial one-way capability of data reception for the correct data processing by the AD FDPS, IP-capable and interoperable with the new ATC civil system.
2017_080_AF5, this IP, is a project adjacent to the PATRUS Gateway project (IP 2015_249_AF5, Action 2015-EU-TM-0196-M). This second part (PATRUS2) completes the Gateway requirements identified by the French Ministry of Defence for the complete and successful interoperability of the civil and military ATC systems. 2015_247_AF3 is about the implementation of the ATC Military system 4-flight, 2015_249_AF5 is the actual implementation of the Gateway, whereas this IP deals with the interfaces between the Civil and Military 4-Flight, bearing in mind the stepped approach during 2 years that will be followed in the implementation of Civil 4-flight. 2015_249_AF5 and 2017_080_AF5 are different contracts with the French Ministry of Defence.
The execution of this Implementation Project is necessary for the French Air Defence firstly, in order to be interoperable with French civil ATC and the functional evolutions brought by the deployment of 4flight for DSNA. Secondly, to prepare the infrastructure for the use of SWIM by the AD systems so, in order to maintain interoperability from the outset of 4Flight implementation plan (including test phases) military must deploy a solution enabling the interoperability between the civil and military control systems. 4Flight only way of data

exchange is under IP protocol while the military CRC (Control and Reporting Centres) systems handle these flows only under X25 protocol. PATRUS2 will enable the mapping and conversion of protocol of 4Flight flows for the benefit of the CRC systems before arrival of PATRUS (IP compliant) and also adaptation of PATRUS itself for the new need (4Flight data treatment).

Specific objectives:

This IP specifically aims to

- Adapt full interoperability of French civil and military control centres on IP_based protocol and prepare the baseline of the SWIM deployment;
- Enhance full interoperability of French military control centres and foreign civil control centres based on the new ATC civil systems to be put in service;
- Enhance ground/ground automated process coordination between civil and military control centres;
- Allow exchange of new data supported by an IP_based network between military and civil paving the way to the SWIM deployment.

Tasks:

The Implementation Project consists of the following tasks:

- Task 01 - Deployment of the 4Flight gateway for transition phase to PATRUS on the gateway sites: to allow Military CRC systems to be compliant with the civilian ATC system before arrival of final PATRUS.
- Task 02 - Updgrade of PATRUS to 4Flight: Updgrade of the PATRUS gateway to be compliant with the new data delivered by the civili ATC system.
- Task 03 - Deployment and validation on the test platform of the 4Flight evolution for PATRUS: Deployment on the test platform and validation of the adapation of the PATRUS gateway to be compliant with the new data delivered by the civil ATC system.

Expected Results:

The final result of this Implementation Project is the deployment of the new solution allowing the interoperability between civil and military ATC systems, in particular:

- the 4Flight gateway for transition phase to PATRUS on the gateway sites is deployed;
- PATRUS to 4Flight is updated;
- the 4Flight evolution for PATRUS is deployed and validated on the test platform.

Internal Achievement Points:

- Start of training - 01/07/2019
- End of training - 31/07/2020
- Parallel Operations / Operational Trials - 31/07/2020
- Cutover SW ready and successfully tested – N/A
- Cutover and fall-back period completed - 30/04/2019

Contractual Milestone:

- Project completed - 31/07/2020

Performance Benefits:

Such an improved cooperation will lead to less fuel consumption and less CO^2 emissions. Second, saving expenditures for dedicated Military ANS system will lead to save public money.
The operational burden on ATCO shoulders will diminish, which should create indirect capacity improvement. Such a capacity improvement would then benefit at FABEC Level, i.e. positive impact on FABEC Performance Plan.

➢ **2017_084_AF5 SWIM Common PKI and policies & procedures for establishing a Trust framework**

Start/end date: 13/11/2018 - 31/12/2021

Project Leader: EUROPEAN ORGANISATION FOR THE SAFETY OF AIR NAVIGATION

Project Contributors:

- Aéroports De Paris;
- Air Navigation Services Finland Oy;
- Österreichische Gesellschaft für Zivilluftfahrt mit beschränkter Haftung, limited liability company;
- BELGOCONTROL;
- State Enterprise "Air Traffic Services Authority";
- Deutsche Lufthansa Aktiengesellschaft;
- French Ministry of the Armies/Direction General de l'Armement;
- DFS Deutsche Flugsicherung GmbH;
- The French State -Ministère de la Transition écologique et solidaire, DGAC (Direction générale de l'aviation civile), DSNA (Direction des services de la navigation aérienne);
- ENAV S.p.A.;
- FABCE, letalske storitve, d.o.o. (FABCE, Aviation Services, Ltd.);
- Hellenic Civil Aviation Authority;
- HungaroControl Air Navigation Services Pte Ltd Co.;
- Københavns Lufthavne A/S;
- Luchtverkeersleiding Nederland (Air Traffic Control The Netherlands);
- Luftfartsverket, a state enterprise (LFV);
- Manchester Airport PLC;
- NATS (En Route) plc;
- Navegação Aérea de Portugal – NAV Portugal, E.P.E.;
- Naviair, a state owned company;
- Polish Air Navigation Services Agency;
- Ryanair DAC;
- Romanian Air Traffic Services Administration;

- Serbia and Montenegro Air Traffic Services LLC;
- Slovenia Control, Slovenian Air Navigation Services, Limited;
- Société Air France;
- SPANISH AIR FORCE;
- State Enterprise "Oro Navigacija";
- Letové Prevádzkové Služby SR, Štátny Podnik - LPS SR, š. p..

Overview:

The main objective of the Implementation Project (IP) is to develop and deploy a common framework for both integrating local PKI deployments in an interoperable manner as well as providing interoperable digital certificates to the users of SWIM. The resulting PKI and its associated trust framework, which will be part of the cyber security infrastructure of aviation systems, are required to sign, emit and maintain digital certificates and revocation lists as required in the family 5.1.4. The digital certificates will allow user authentication and encryption/decryption when and where needed in order to ensure that information can be securely transferred. All aviation stakeholders (ANSPs, Airspace users, military, Airport, etc ...) will benefit from the project.
The scope of the Implementation Project includes the definition and development of a dedicated common PKI and its associated trust framework for Europe, its integration and validation with some stakeholders. It will ensure the interoperability of digital certificates within Europe and with other regions.
The Implementation Project also aims at developing the systems needed to operate a PKI and its associated trust framework in order to produce and manage digital certificates, e.g. Certification Authorities, validation services such as OCSP (Online Certificate Status Protocol) or CRL (Certificate Revocation List), user interfaces, systems supporting the Registration Authority and Policy Management Authority roles. These systems will be developed through procurement (Call for Tender (CFT) in line with the applicable legal provisions) based upon specifications developed within the project. The system developments will be based on existing and mature COTS hardware and software.

Partners' contribution:
Oro Navigacija will contribute to the validation of the Deliverables:

- D2.1-Common PKI specifications.
- D3.1-Initial SWIM interfaces to Common PKI.
- D3.2-Final SWIM interfaces to Common PKI.
- D4.1-Initial Interface with SWIM governance description.
- D4.2-Final Interface with SWIM governance description.
- D6.1-Guidance for SWIM Providers.
- D6.2-Guidance for SWIM Service Consumers.

PANSA will contribute to the validation of the Deliverables:

- D2.1-Common PKI specifications.
- D3.1-Initial SWIM interfaces to Common PKI.
- D3.2-Final SWIM interfaces to Common PKI.

BELGOCONTROL will contribute to the validation of the Deliverables:

- D1.1-Initial Trust Framework.
- D1.3-Final Trust Framework.
- D2.1-Common PKI specifications.

- D3.1-Initial SWIM interfaces to Common PKI.
- D3.2-Final SWIM interfaces to Common PKI.

LPS.SR will contribute will contribute to the validation of the Deliverables:

- D1.1-Initial Trust Framework.
- D1.3-Final Trust Framework.
- D2.1-Common PKI specifications.

LUFTHANSA will contribute to the validation of the Deliverables:

- D1.1-Initial Trust Framework.
- D1.3-Final Trust Framework.
- D2.1-Common PKI specifications.
- D3.1-Initial SWIM interfaces to Common PKI.
- D3.2-Final SWIM interfaces to Common PKI.
- D4.1-Initial Interface with SWIM governance description.
- D4.2-Final Interface with SWIM governance description .
- D5.1-Draft CFT (Call For Tenders).
- D5.2-Final CFT (Call For Tenders).
- D6.1-Guidance for SWIM Provider.
- D6.2-Guidance for SWIM Service Consumers.

SMATSA will contribute to the validation of the Deliverables:

- D1.1-Initial Trust Framework.
- D1.2-Interoperability criteria with USFB.
- D2.1-Common PKI specifications.
- D3.1-Initial SWIM interfaces to Common PKI.
- D3.2-Final SWIM interfaces to Common PKI.
- D4.1-Initial Interface with SWIM governance description.
- D4.2-Final Interface with SWIM governance description.
- D5.1-Draft CFT (Call For Tenders).
- D5.2-Final CFT (Call For Tenders).
- D6.1-Guidance for SWIM Providers.
- D6.2-Guidance for SWIM Service Consumers.

Hungarocontrol will contribute to the validation of the Deliverables:

- D1.1-Initial Trust Framework.
- D1.2-Interoperability criteria with USFB.
- D1.3-Final Trust Framework.
- D2.1-Common PKI specifications.

ROMATSA will contribute to the production and completion of the Deliverables:

- D1.1-Initial Trust Framework.
- D1.3-Final Trust Framework.
- D1.2-Interoperability criteria with USFB.
- D2.1-Common PKI specifications.
- D3.1-Initial SWIM interfaces to Common PKI.
- D3.2-Final SWIM interfaces to Common PKI.
- D4.1-Initial Interface with SWIM governance description.
- D4.2-Final Interface with SWIM governance description.
- D6.1-Guidance for SWIM Providers.
- D6.2-Guidance for SWIM Service Consumers.

LFV will contribute to the production and completion of the Deliverables:

- D2.1-Common PKI specifications.
- D3.1-Initial SWIM interfaces to Common PKI.
- D3.2-Final SWIM interfaces to Common PKI.
- D4.1-Initial Interface with SWIM governance description.
- D4.2-Final Interface with SWIM governance description.

CPH will contribute to the production and completion of the Deliverables:

- D1.1-Initial Trust Framework.
- D1.2-Interoperability criteria with USFB.
- D1.3-Final Trust Framework.
- D2.1-Common PKI specifications.
- D4.1-Initial Interface with SWIM governance description.
- D4.2-Final Interface with SWIM governance description.
- D5.1-Draft CFT (Call For Tenders).
- D5.2-Final CFT (Call For Tenders).

ADP will contribute to the validation of the Deliverables:

- D1.1-Initial Trust Framework.
- D1.3-Final Trust Framework.
- D2.1-Common PKI specifications.

Air France will contribute to the validation of the Deliverables:

- D1.1-Initial Trust Framework.
- D1.2-Interoperability criteria with USFB.
- D1.3-Final Trust Framework.
- D2.1-Common PKI specifications.
- D3.1-Initial SWIM interfaces to Common PKI.
- D3.2-Final SWIM interfaces to Common PKI.

EUROCONTROL will contribute to the production and completion of the Deliverables:

- D1.1-Initial Trust Framework.
- D1.2-Interoperability criteria with USFB.
- D1.3-Final Trust Framework.
- D2.1-Common PKI specifications.
- D3.1-Initial SWIM interfaces to Common PKI.
- D3.2-Final SWIM interfaces to Common PKI.
- D4.1-Initial Interface with SWIM governance description.
- D4.2-Final Interface with SWIM governance description.
- D5.1-Draft CFT (Call For Tenders).
- D5.2-Final CFT (Call For Tenders)
- D6.1-Guidance for SWIM Providers.
- D6.2-Guidance for SWIM Service Consumers.

LVNL will contribute to the validation of the Deliverables:

- D1.1-Initial Trust Framework.
- D1.2-Interoperability criteria with USFB.
- D1.3-Final Trust Framework.
- D3.1-Initial SWIM interfaces to Common PKI.
- D3.2-Final SWIM interfaces to Common PKI.

Austrocontrol will contribute to the validation of the Deliverables:

- D1.1-Initial Trust Framework.

- D1.2-Interoperability criteria with USFB.
- D1.3-Final Trust Framework.
- D2.1-Common PKI specifications.
- D4.1-Initial Interface with SWIM governance description.
- D4.2-Final Interface with SWIM governance description.
- D6.2-Guidance for SWIM Service Consumers.

NAVIAIR will contribute without CEF funding to this project and will contribute to the validation of the Deliverables:

- D1.1-Initial Trust Framework;
- D1.2-Interoperability criteria with USFB;
- D1.1-Final Trust Framework.
- D2.1-Common PKI specifications.
- D3.1-Initial SWIM interfaces to Common PKI.
- D3.2-Final SWIM interfaces to Common PKI.
- D4.1-Initial Interface with SWIM governance description.
- D4.2-Final Interface with SWIM governance description.
- D5.1-Draft CFT (Call For Tenders).
- D5.2-Final CFT (Call For Tenders).
- D6.1-Guidance for SWIM Providers.
- D6.2-Guidance for SWIM Service Consumers.

DFS will contribute to the validation of the Deliverables:

- D2.1-Common PKI specifications.
- D3.1-Initial SWIM interfaces to Common PKI.
- D3.2-Final SWIM interfaces to Common PKI.
- D5.1-Draft CFT (Call For Tenders).
- D5.2-Final CFT (Call For Tenders).

SloveniaControl will contribute to the validation of the Deliverables:

- D1.1-Initial Trust Framework;
- D1.2-Interoperability criteria with USFB.
- D1.3-Final Trust Framework.
- D2.1-Common PKI specifications.
- D3.1-Initial SWIM interfaces to Common PKI.
- D3.2-Final SWIM interfaces to Common PKI.
- D4.1-Initial Interface with SWIM governance description.
- D4.2-Final Interface with SWIM governance description.
- D5.1-Draft CFT (Call For Tenders).
- D5.2-Final CFT (Call For Tenders).
- D6.1-Guidance for SWIM Providers .
- D6.2-Guidance for SWIM Service Consumers .

MAN will contribute to the validation of the Deliverables:

- D1.1-Initial Trust Framework;
- D1.3-Final Trust Framework.
- D4.1-Initial Interface with SWIM governance description.
- D4.2-Final Interface with SWIM governance description.

French MOD will contribute to the validation of the Deliverables:

- D1.1-Initial Trust Framework;

- D1.3-Final Trust Framework.
- D2.1-Common PKI specifications.

Spanish Air Force will contribute to the validation of the Deliverables:

- D3.1-Initial SWIM interfaces to Common PKI.
- D3.2-Final SWIM interfaces to Common PKI.
- D6.2-Guidance for SWIM Service Consumers.

FABCE will contribute to the validation of the Deliverables:

- D1.1-Initial Trust Framework;
- D1.2-Interoperability criteria with USFB;
- D1.3-Final Trust Framework.
- D2.1-Common PKI specifications.
- D3.1-Initial SWIM interfaces to Common PKI.
- D3.2-Final SWIM interfaces to Common PKI.
- D4.1-Initial Interface with SWIM governance description.
- D4.2-Final Interface with SWIM governance description.
- D5.1-Draft CFT (Call For Tenders).
- D5.2-Final CFT (Call For Tenders).
- D6.1-Guidance for SWIM Providers.
- D6.2-Guidance for SWIM Service Consumers.

HCAA will contribute to the validation of the Deliverables:

- D1.1-Initial Trust Framework;
- D1.2-Interoperability criteria with USFB.
- D1.3-Final Trust Framework.
- D2.1-Common PKI specifications.
- D4.1-Initial Interface with SWIM governance description.
- D4.2-Final Interface with SWIM governance description.

DSNA will contribute to the production and completion of the Deliverables:

- D1.1-Initial Trust Framework;
- D1.2-Interoperability criteria with USFB.
- D1.3-Final Trust Framework.
- D2.1-Common PKI specifications.
- D3.1-Initial SWIM interfaces to Common PKI.
- D3.2-Final SWIM interfaces to Common PKI.
- D4.1-Initial Interface with SWIM governance description.
- D4.2-Final Interface with SWIM governance description.
- D5.1-Draft CFT (Call For Tenders).
- D5.2-Final CFT (Call For Tenders).
- D6.1-Guidance for SWIM Providers.
- D6.2-Guidance for SWIM Service Consumers.

NAV-PT will contribute to the production and completion of the Deliverables:

- D2.1-Common PKI specifications.
- D3.1-Initial SWIM interfaces to Common PKI.
- D3.2-Final SWIM interfaces to Common PKI.
- D4.1-Initial Interface with SWIM governance description.
- D4.2-Final Interface with SWIM governance description.
- D6.1-Guidance for SWIM Providers.

- D6.2-Guidance for SWIM Service Consumers.

ANS FINLAND will contribute to the production and completion of the Deliverables:

- D1.1-Initial Trust Framework;
- D1.2-Interoperability criteria with USFB.
- D1.3-Final Trust Framework.
- D4.1-Initial Interface with SWIM governance description.
- D4.2-Final Interface with SWIM governance description.

BULATSA will contribute to the validation of the Deliverables:

- D1.1-Initial Trust Framework;
- D1.2-Interoperability criteria with USFB.
- D2.1-Common PKI specifications.
- D3.1-Initial SWIM interfaces to Common PKI.
- D3.2-Final SWIM interfaces to Common PKI.

ENAV will contribute to the validation of the Deliverables:

- D4.1-Initial Interface with SWIM governance description.
- D4.2-Final Interface with SWIM governance description.
- D6.1-Guidance for SWIM Providers.
- D6.2-Guidance for SWIM Service Consumers.

Specific objectives:

This Implementation Project specifically aims to develop and deploy means in order to:

- Secure the exchange of aviation related information;
- Provide identification and authentication of providers and consumers of aviation related information;
- Support the encryption when needed of aviation related information.

Tasks:

The Implementation Project consists of the following tasks:

- Task 01 - Develop the Trust Framework policies and procedures: This task includes:
  - Analyse the future business objectives the PKI shall contribute to
  - Define the Policy Management Authority (PMA) (Terms Of Reference (ToR), procedures).
  - Develop/approve the initial Certificate Policy/Certification Practices Statement(s).
  - Develop the Membership Agreement.
  - Develop interoperability/ cross-certification framework (criteria, checklist).
  - Ensure interoperability with others PKIs, e.g. USFB (US Federal Bureaus).
- Task 02 - Develop Common PKI specifications (for both development and operations): This task includes:
  - Develop high-level architecture.
  - Functional Technical Specifications (including certificates specifications).
- Task 03 - Define the (SWIM) interfaces to the Common PKI: This task includes:
  - Define Users interface;
  - Define validation interfaces (e.g. OCSP interface (Online Certificate Status Protocol), CRL interface (Certification Revocation List)).
- Task 04 - Interface with SWIIM governance: This task includes:

  - Interaction with SWIM governance project deliverables.
- Task 05 - Prepare the material for the potential launch of a CFT (scope still to be defined): This task includes:
  - Develop the draft of technical and contractual specifications.
- Task 06 - Prepare all necessary material for operations: This task includes:
  - Develop guidance for SWIM service providers;
  - Develop guidance for SWIM service consumers.
- Task 07 - Project Management: Manage the project.

Expected Results:

- The technical and administrative elements are defined to launch a Call for Tender to develop and deploy a solution complying with the requirements as defined by the project. Only the preparation of the Call for Tender is part of the scope of this project.
- The elements necessary to govern and manage the solution are defined (e.g. Terms of Reference and procedures to operate the Policy Management Authority, the Membership Agreement, Procedures to operate the Registration Authority).
- The elements needed to demonstrate and validate the ability to cross-certify the solution with a solution of another region (e.g. Federal Aviation Authority - FAA) are defined in order to ensure the interoperability of the solution.

Internal Achievement Points:

- Start of training - 30/11/2018
- End of training - 29/12/2021
- Parallel Operations / Operational Trials - N/A
- Cutover SW ready and successfully tested - N/A
- Cutover and fall-back period completed - N/A

Contractual Milestone:

- Project completed - 31/12/2021

Performance Benefits:

The expected benefits are:

- Improving the security of the exchange of information which should reduce the likelihood to get some disruption of services mainly due to corruption of information.
- Facilitating and accelerating the provision and use of SWIM services by providing a solution that increases the security of the services.
- Facilitating and accelerating the use of certificates to secure the exchange of information other than SWIM services.
- The buy-in of a solution by many aviation stakeholders that will facilitate its future deployment and the performance/credibility/integrity of the solution as the rules to operate the solution and to use certificates appropriately will be known and accepted by a significant number of users.

Activity 7: AF6 Implementation (50% co-funded)

Initial Trajectory Information Sharing (i4D) consists of the improved use of target times and trajectory information, including where available the use of on-board 4D trajectory data by the ground ATC system and Network Manager Systems, implying fewer tactical interventions and improved de-confliction situation.

It is composed of the following technical families:
S-AF 6.1 – Initial Trajectory Information Sharing:
- Family 6.1.1: ATN B1 based services in ATSP domain;
- Family 6.1.2: ATN B2 based services in ATSP domain;
- Family 6.1.3: A/G and G/G Multi Frequency DL Network in defined European Service Areas;
- Family 6.1.4: ATN B1 capability in Multi Frequency environment in aircraft domain;
- Family 6.1.5: Implementation of ATN B2 in Aircraft domain.

Within the objective of the Action, the following families are addressed:
Family 6.1.3 - A/G and G/G Multi Frequency DL Network in defined European Service Areas; and
Family 6.1.4 - ATN B1 capability in Multi Frequency environment in Aircraft domain.

Sub - Activity 7.1 Activity 7 Coordination

Leader: SESAR Deployment Alliance
Start Date: 12/04/2018
End Date: 31/12/2023

The Activity aims at coordinating the implementing initiatives within the scope of the AF6 and its sub AFs, for those projects with a co-financing rate of 50%. According to Deployment Programme Methodology, each Implementing Partner will support SDM during Cost Benefit Analysis (CBA) finalisation at Action Level. The SDM will steer the Implementing Partners to provide all contributions needed to prepare CBA according to the INEA guidelines.

Deliverables:
- 7.1.1 Action Status Report (ASR) – IP Level – submitted as an Annex to Action Status Report (del. 1.2.4) every year until 2023
- 7.1.2 Risks and Issues, and mitigation Actions Registry – AF6 level – submitted 2 times per year (30/04; 30/09) until 2023 starting from 2019
- 7.1.3 Final Report (technical content) – 31/12/2023

Sub - Activity 7.2: AF6 Implementation Projects

- **2017_008_AF6_GND Air France Group Datalink upgrade to best in class avionics - Lot2**

Start/end date: 12/04/2018 - 31/01/2020

Project Leader: Société Air France

Project Contributor: Transavia France

Overview:

The main objective of this Implementation Project (IP) is to deploy ATN B1 capability to "Best in Class" avionics configuration on the remaining Air France Group Fleet. It concerns the upgrade of 40 Transavia B737 aircraft and the training of the remaining Air France Group pilots (B787 and A350 Air France pilots and Transavia pilots).
EC IR 29/2009 and its amendment 310/2015 lay down requirements for the introduction of datalink services in Europe. Aircraft operators shall ensure that their aircraft have the capability to operate the datalink service above FL 285 by 05 February 2020.
The Air France Group comprises Air France, HOP and Transavia France. The datalink upgrade for Air France (A320 fleet) and HOP (EJET and CRJ Fleets) aircraft and pilots training are already covered by project IP 2016_165_AF6 (funded under Action 2016-EU-TM-0117-M).

Specific objectives:

This IP specifically aims to:
- deploy ATN (Aeronautical Telecommunication Network) B1 capability to "Best in Class" avionics configuration on the remaining Air France Group Fleet i.e. Transavia Fleet that consists of 33 B737 (expected 40 by 2020, the 7 coming will be 2nd hand aircraft). These 40 B737 aircraft are already fitted with Datalink technology.
The avionic configurations are considered as the set of airborne equipment to comply with the ATN/VDL2 (Very High Frequency Digital Link 2) performance expectations in multi-frequency (MF) environment following ELSA recommendations as identified in Annex 2 of the Datalink Services (DLS) Recovery Plan: ELSA reference IDs Avionics 01 and 02.
Testing of avionic software will be performed on vendor side. For all Transavia aircraft, the DLS avionics are already installed in on-board systems of the aircraft. The implementation project only includes the efforts for upgrading the avionics recommended by ELSA study (i.e CMU ACARS (Communication Management Unit Aircraft Communications Addressing and Reporting System) and the 3 VDR (Very High Frequency Data Radio).
The datalink upgrade will only focus on the 40 Transavia B737 aircraft types. Considering that the initially defined deadline to demonstrate compliance with Commission Regulation (EC) No 29/2009 was 5 February 2015 (airborne part), Transavia B737 aircraft already fulfilled the mandate since 2014. These aircraft were already retrofitted by February 2015 in order to comply with the 29/2009 mandate.
- train the pilots through e-learning.

Tasks:

The Implementation Project consists of the following tasks:

- Task 01 – Project Management (50% co-funded): Activity Status Report (technical, financial and contractual).
- Task 02 – Operational Coordination (50% co-funded): Internal coordination within the Flight Operations: safety case, operational procedure adaptations, Flight Crew Operating Manual (FCOM) update, communications to pilots.
- Task 04 – Air France & Transavia crew training (50% co-funded):
    - AFR: 200 A350 fleet pilots and 200 B787 fleet pilots.
    - TO B737 fleet: 400 pilots.

- e-learning will be prepared.

Expected Results:

- ATN B1 capability to "Best in Class" avionics configuration are deployed on 40 Transavia B737. Thus Air France Group is fully equipped.
- the number of pilots trained is:
  - For Air France: 200 A350 and 200 B787 (Long-Haul fleet) pilots. The training of these long-haul pilots was not included in the previous project 2016_165_AF6.
  - For Transavia: 400 (B737 fleet) pilots.

Internal Achievement Points:

- Start of training - 01/10/2018
- End of training - 31/01/2020
- Parallel Operations / Operational Trials - N/A
- Cutover SW ready and successfully tested - N/A
- Cutover and fall-back period completed - N/A

Contractual Milestone:

- Project completed - 31/01/2020

Performance Benefits:

Based on the Air France Group flight network:

- Improve En-route capacity at European ACC. Traffic demand is steadily growing and more and more En-route ACC reach their capacity limit during the summer period. The use of datalink will allow increasing En-Route ACC capacity above FL 285 and thus alleviate ATC workload and ATC frequencies.
- Reduce ATC delays. As a consequence, of the En-Route ACC capacity increase, En-Route ACC will reduce their ATC delays.
- Improve safety. As a second positive result, digital communication helps to avoid confusion compared to radio messages and therefore, will improve safety.

CPDLC (Controller Pilot Datalink Communications) will contribute to a capacity gain in European airspace and thus reducing ATC delays and improving flight efficiency due to fewer restrictions. The project is relevant to and consistent with the Pilot Common Project (PCP), whose positive impact has been demonstrated through a Cost Benefit Analysis.

➢ **2017_083_AF6_GND Portugalia E195 - Deployment of ATN B1 capability**

Start/end date: 12/04/2018 - 15/12/2019

Project Leader: PORTUGÁLIA – COMPANHIA PORTUGUESA DE TRANSPORTES AÉREOS S.A.

Project Contributor: N/A

Overview:

The Implementation Project (IP) fully deploys ATN B1 capability on Portugália E195 fleet. Considering the deployment approach of family 6.1.4, as specified in the Deployment Program (DP), the steps to be considered are described below.
The upgrade of the remaining Portugalia fleet (4 E195 aircraft) is covered by IP 2016_061_AF6 (2016-EU-TM-0117-M).

Specific objectives:

The Implementation Project specifically aims to upgrade four E195 that are part of Portugália Airlines fleet for Datalink Services capability.

Tasks:

The Implementation Project consists of the following tasks:

- Task 01 - Project Management (50% co-funded): This task includes all envisaged activities related to coordination and management of the project. To be noted that this task is the continuation of the Project Management activities already in place since the beginning of the overall Datalink Project.
- Task 05 - Flight Crew Training (50% co-funded): Definition of training needs, development of the training package and provision of training to selected flight crews.

Expected Results:

Portugalia fleet is fully equipped with ATN B1 capability.
Regular operations using datalink services, as specified in the DLS IR can start.

Internal Achievement Points:

- Start of training - 01/01/2019
- End of training – 15/12/2019
- Parallel Operations / Operational Trials – N/A
- Cutover SW ready and successfully tested – N/A
- Cutover and fall-back period completed – N/A

Contractual Milestone:

- Project completed - 15/12/2019

Performance Benefits:

The following performance benefits are expected, among others:

- Fewer loss of communication events;
- Decrease in communication errors;
- Reduction in the communication workload;
- Estimation that datalink services can reduce total controller workload by up to 29%.

➢ 2017_089_AF6 IP1 - DLS European Target Solution assessment

Start/end date: 16/04/2018 - 30/09/2019

Project Leader: ENAV S.p.A.

Project Contributors:

- Airtel ATN Limited;
- ALTYS Technologies S.A.S.;
- Arinc incorporated;
- Österreichische Gesellschaft für Zivilluftfahrt mit beschränkter Haftung, limited liability company;
- State Enterprise "Air Traffic Services Authority";
- Croatia Control Ltd;
- DFS Deutsche Flugsicherung GmbH;
- The French State -Ministère de la Transition écologique et solidaire, DGAC (Direction générale de l'aviation civile), DSNA (Direction des services de la navigation aérienne);
- ENTIDAD PÚBLICA EMPRESARIAL ENAIRE;
- European Satellite Services Provider;
- EUROCONTROL / Network Manager;
- HungaroControl Air Navigation Services Pte Ltd Co.;
- INMARSAT NAVIGATION VENTURES LIMITED;
- LEONARDO - SOCIETA' PER AZIONI;
- Luftfartsverket, a state enterprise;
- NATS (En Route) plc;
- Navegação Aérea de Portugal – NAV Portugal, E.P.E.;
- Polish Air Navigation Services Agency;
- Paris Lodron Universität Salzburg;
- SITA Information Networking Computing BV;
- SITA IT Services France;
- SITA INC BV Canada Branch;
- SITA OnAir SARL (Switzerland);
- Thales LAS France SAS.

Overview:

The main objective of this Implementation Project (IP) is the design of a Common ATN Backbone at European Level, as a first step towards the target solution, and at the same time, the performing of a detailed analysis on the technical and non-technical elements needed to ensure a full DLS implementation in Europe, based on previous technical studies and on the inputs stemming from the Capacity Assessment. This Project will perform activities strictly correlated with the works undertaken in 2016_159_AF6 (Action 2016-EU-TM-0117-M) "DLS Implementation Project Path II Project", enhancing the scope of works and developing further technical and non-technical solutions for DLS provision.

Specific objectives:

The IP's main objectives are the following:

- Design for a Common European ATN Ground Network;
- Detailed analysis and definition on:
  - VME (Very High Frequency Digital Link Management Entity) requirements;
  - System support interfaces requirements;
  - Frequency planning scheme;
  - VGS (Very High Frequency Ground Stations) requirements;
  - The non-economical elements for the business case elaboration;
- support to SDM for the scenarios definition for the capacity assessment of Model B and Model D;
- evaluation of the performance of Model C versus Model B based on analysis of real data.

Tasks:

The Implementation Project consists of the following tasks:

- Task 01 - WP0 - Project Management: Project management activities (including planning, execution, monitoring, control and closing) will ensure timely and adequate support to SDM towards the implementation of the mandate received by the EC (European Commission) and a specific support to SDM in the overall set-up, steering and coordination of the technical approach.
- Task 02 - WP1 - Design for a Common European ATN Ground Network: This WP1 contains all activities associated with the design of the common ground-ground ATN network. In particular, it is structured as follows:
  - WP1.0 - Coordination activities.
  - WP1.1 - Design of the European ATN backbone.
    - Design of the technical Ground ATN infrastructure to be deployed throughout Europe for the provision of the DL Services.
  - WP1.2 - Common A/G (Air/Ground) router – VGS interface requirements definition.
    - Identification and specification of the A/G and VGS interface, in order to ensure a common definition at European level.
  - WP1.3 - Specification and assessment of ATN A/G router hot stand-by algorithm.
    - Intended to be commonly adopted for the improvement of the DL system availability.
  - WP1.4 - Specification and assessment of complementary A/G technologies interfaces.
    - Intended to be commonly adopted for the improvement of the DL system capacity.
  - WP1.5 - Specification of test and validation concept.
    - For the common ATN ground network components.
  - WP1.6 - Project design documents finalisation.
    - Design documents finalisation on the basis of the outcomes stemming from the previous tasks.
  - WP1.7 - Resolution of ATN Routing problems.
    - WP1.7 - Resolution of ATN Routing problems. - This WP includes

two sub-items:

- Implementation and validation status of the solution for the ATN routing ambiguity issue of hand-off of an aircraft from a VGS connected to an A/G router to another VGS connected to another A/G router in a different or the same routing domain.
- Recommendations and validation regarding the resolution of the ATN routing domain transition issue of hand-off of an aircraft from a VGS connected to an A/G router to another VGS connected to a different A/G router within the same or different routing domain.

- Task 03 - WP2 - Analysis and definition of the technical open points identified in Path 2 Project: This WP2 is dedicated to the need of further analysis and definition of the technical open points identified in WP2 of 2016_159_AF6 - DLS Implementation Project - Path 2. In particular, it is structured as follows:
  - WP2.0 - Coordination activities.
  - WP2.1 - VME requirements definition.
    - Definition of the requirements for the design and adoption of VHF Management Entity in terms of functionalities to be implemented. In doing so, it will be taken duly into account the need of defining the frequency management general principles.
  - WP2.2 - Support system interfaces requirements definition.
    - Identification of the interfaces to be provided to overall network in order to permit the link and the exploitation of support systems, which aim at performing collateral activities and functionalities (for example the interfaces towards the Performance monitoring function).
  - WP2.3 - Frequency planning scheme definition.
    - Definition of the frequency scheme to be adopted for the implementation/management of the available frequencies.
  - WP2.4 - VGS requirements definition.
    - Definition of the requirements for the design and adoption of the VGS for Model D implementation. Note: Common ATN A/G router to VGS interface requirements definition is part of WP3.
  - WP2.5
    - Support to SDM for the Scenarios definition for the capacity assessment of Model B and Model D. - Supporting activities aimed to strengthen the management role of SDM, in leading the identification of scenarios to be assessed in capacity study.
  - WP2.6 - Evaluation of the performance of Model D versus Model B based on real data.
    - Performance trade-off analysis of Models B and D Radio Frequency (RF) Layers, on the basis of real data coming from Model B (already implemented) and data gathered within the Model D already pre-implemented in a limited portion of the European Airspace (the IP – 2 could provide data for this scope). Areas for the comparison shall have similar traffic loads. In case of lacking of IP-2, they could be used data stemming from the Model C/MF implementation, considering that Model C/MF and Model D share the same major functionalities for what concerns the RF layer.
  - WP2.7 - Architecture finalisation.

        - Completion of the overall technical architecture definition, already started within 2016_159_AF6 - DLS Implementation Project - Path 2 – WP2, in the basis of the outcomes stemming from the previous tasks.
    - WP2.8 - Support to SDM in its activities with relevant bodies (EASA, NM, EUROCAE, ETSI).
        - Support to SDM in its activities with relevant bodies. These activities consider also the certification, standardisation and testing process definition for the target model.
- Task 04 - WP3 - Analysis and definition of the non- technical open points identified in Path 2 Project: This WP3 is dedicated to the need of further analysis and definition of the non-technical open points identified in WP3 of 2016_159_AF6 - DLS Implementation Project - Path 2. In particular, it is structured as follows :
    - WP3.0 - Coordination activities.
    - WP3.1 - Consolidation of open points already identified.
        - This task includes the activities aimed at ensuring the proper coordination on three different levels:
            - Internal, with WP1 and WP2;
            - External, with 2016_159_AF6 interested WPs (Path II).
    - WP3.2 - Business case finalisation.
        - European target solution business case finalisation in the basis of the outcomes stemming from the previous task.

Expected Results:

The project has a double perspective, the first has to be considered as the continuation of Path II project, through which all open points, raised during the activities of this initiative, will be completed and clarified, while the second one is correlated with the need to deepen and complete the analysis of the preparatory activities for the implementation of the DLS European Target Solution identified in ELSA Project (so called Model D).
At the end of the project, it is expected to have a clear view on future European Target Solution, with its strengths and weaknesses, together with a well-defined assessment of performances of the current deployed infrastructures.
In particular, the following results are expected:

- during the activities of this initiative, possible gaps will be identified and covered;
- to correlate and complete the analysis of the preparatory activities for the implementation of the DLS European Target Solution identified in ELSA Project (so called Model D);
- to define both strengths and weaknesses of the architectures identified in Path II project;
- a well-defined assessment of performances of the current deployed infrastructures.

Internal Achievement Points:

- Start of training – N/A
- End of training – N/A
- Parallel Operations / Operational Trials – N/A
- Cutover SW ready and successfully tested – N/A
- Cutover and fall-back period completed – N/A

Contractual Milestone:

- Project completed - 30/09/2019

Performance Benefits:

The Implementation Project will contribute to a successful implementation of Datalink Services in all European Airspace, promoting solutions able to cope with the increasing air traffic demand and issues encountered so far. Thanks to the implementation of the project outcomes, the provision of Datalink Services in particular and the Air Traffic Management in general, will:

- increase in safety and efficiency levels,
- be able to cope with the scarce RF spectrum resources,
- perform a more efficient deployment of ground infrastructure,
- be able to provide more reliable services (e.g. by solving interoperability and provider abort issues).

After the completion of the project, it will be possible to have a clear view on some significant technical and non-technical aspects of DLS infrastructures and related services, such as the understanding of the true performance of Model B and D - measured in real environments - and the economic impact of the proposed European Target Solution.

Activity 8: AF6 Implementation (20% co-funded)

Initial Trajectory Information Sharing (i4D) consists of the improved use of target times and trajectory information, including where available the use of on-board 4D trajectory data by the ground ATC system and Network Manager Systems, implying fewer tactical interventions and improved de-confliction situation.

It is composed of the following technical families:
S-AF 6.1 – Initial Trajectory Information Sharing:

- Family 6.1.1: ATN B1 based services in ATSP domain;
- Family 6.1.2: ATN B2 based services in ATSP domain;
- Family 6.1.3: A/G and G/G Multi Frequency DL Network in defined European Service Areas;
- Family 6.1.4: ATN B1 capability in Multi Frequency environment in aircraft domain;
- Family 6.1.5: Implementation of ATN B2 in Aircraft domain.

Within the objective of the Action, the following family is addressed:
Family 6.1.4 - ATN B1 capability in Multi Frequency environment in Aircraft domain.

Sub - Activity 8.1 Activity 8 coordination

Leader: SESAR Deployment Alliance
Start Date: 12/04/2018
End Date: 31/12/2023

The Activity aims at coordinating the implementing initiatives within the scope of the AF6

and its sub AFs, for those projects with a co-financing rate of 20%. According to Deployment Programme Methodology, each Implementing Partner will support SDM during Cost Benefit Analysis (CBA) finalisation at Action Level. The SDM will steer the Implementing Partners to provide all contributions needed to prepare CBA according to the INEA guidelines

Deliverables:

8.1.1 Action Status Report (ASR) – IP Level – submitted as an Annex to Action Status Report (del. 1.2.4) every year until 2023

8.1.2 Risks and Issues, and mitigation Actions Registry – AF6 level – submitted 2 times per year (30/04; 30/09) until 2023 starting from 2019

8.1.3 Final Report (technical content) – 31/12/2023

Sub - Activity 8.2 AF6 Implementation Projects

- **2017_008_AF6_AIR Air France Group Datalink upgrade to best in class avionics - Lot2**

Start/end date: 01/10/2018 - 31/12/2019

Project Leader: Société Air France

Project Contributor: Transavia France

Overview:

The main objective of this Implementation Project (IP) is to deploy ATN B1 capability to "Best in Class" avionics configuration on the remaining Air France Group Fleet. It concerns the upgrade of 40 Transavia B737 aircraft and the training of the remaining Air France Group pilots (B787 and A350 Air France pilots and Transavia pilots).
EC IR 29/2009 and its amendment 310/2015 lay down requirements for the introduction of datalink services in Europe. Aircraft operators shall ensure that their aircraft have the capability to operate the datalink service above FL 285 by 05 February 2020.
The Air France Group comprises Air France, HOP and Transavia France. The datalink upgrade for Air France (A320 fleet) and HOP (EJET and CRJ Fleets) aircraft and pilots training are already covered by project IP 2016_165_AF6 (funded under Action 2016-EU-TM-0117-M).

Specific objectives:

This IP specifically aims to:

- Deploy ATN (Aeronautical Telecommunication Network) B1 capability to "Best in Class" avionics configuration on the remaining Air France Group Fleet i.e. Transavia Fleet that consists of 33 B737 (expected 40 by 2020, the 7 coming will be 2nd hand aircraft). These 40 B737 aircraft are already fitted with Datalink technology.

The avionic configurations are considered as the set of airborne equipment to comply with the ATN/VDL2 (Very High Frequency Digital Link 2) performance expectations in multi-frequency (MF) environment following ELSA recommendations as identified in Annex 2 of the Datalink Services (DLS) Recovery Plan: ELSA reference IDs Avionics 01 and 02.
Testing of avionic software will be performed on vendor side. For all Transavia aircraft, the

DLS avionics are already installed in on-board systems of the aircraft. The implementation project only includes the efforts for upgrading the avionics recommended by ELSA study (i.e CMU ACARS (Communication Management Unit Aircraft Communications Addressing and Reporting System) and the 3 VDR (Very High Frequency Data Radio).
The datalink upgrade will only focus on the 40 Transavia B737 aircraft types. Considering that the initially defined deadline to demonstrate compliance with Commission Regulation (EC) No 29/2009 was 5 February 2015 (airborne part), Transavia B737 aircraft already fulfilled the mandate since 2014. These aircraft were already retrofitted by February 2015 in order to comply with the 29/2009 mandate.

- To train the pilots through e-learning.

Tasks:

The Implementation Project consists of the following tasks:

- Task 03 - Transavia Fleet equipage (20% co-funded): 40 B737 to be Retrofit in Best in Class.
  *Activities: Procurement for retrofit and the retrofit itself by the Engineering Department.

Expected Results:

- ATN B1 capability to "Best in Class" avionics configuration are deployed on 40 Transavia B737. Thus Air France Group is fully equipped.
- the number of pilots trained is:
  - For Air France: 200 A350 and 200 B787 (Long-Haul fleet) pilots. The training of these long-haul pilots was not included in the previous project 2016_165_AF6.
  - For Transavia: 400 (B737 fleet) pilots.

Internal Achievement Points:

- Start of training – N/A
- End of training – N/A
- Parallel Operations / Operational Trials - N/A
- Cutover SW ready and successfully tested - N/A
- Cutover and fall-back period completed - N/A

Contractual Milestone:

- Project completed - 31/12/2019

Performance Benefits:

Based on the Air France Group flight network:

- Improve En-route capacity at European ACC. Traffic demand is steadily growing and more and more En-route ACC reach their capacity limit during the summer period. The use of datalink will allow increasing En-Route ACC capacity above FL 285 and thus alleviate ATC workload and ATC frequencies.

- Reduce ATC delays. As a consequence, of the En-Route ACC capacity increase, En-Route ACC will reduce their ATC delays.
- Improve safety. As a second positive result, digital communication helps to avoid confusion compared to radio messages and therefore, will improve safety.

CPDLC (Controller Pilot Datalink Communications) will contribute to a capacity gain in European airspace and thus reducing ATC delays and improving flight efficiency due to fewer restrictions. The project is relevant to and consistent with the Pilot Common Project (PCP), whose positive impact has been demonstrated through a Cost Benefit Analysis.

➢ **2017_083_AF6_AIR Portugalia E195 - Deployment of ATN B1 capability**

Start/end date: 12/04/2018 - 15/12/2019

Project Leader: PORTUGÁLIA – COMPANHIA PORTUGUESA DE TRANSPORTES AÉREOS S.A.

Project Contributor: N/A

Overview:

The Implementation Project (IP) fully deploys ATN B1 capability on Portugália E195 fleet. Considering the deployment approach of family 6.1.4, as specified in the Deployment Program (DP), the steps to be considered are described below.
The upgrade of the remaining Portugalia fleet (four E195 aircraft) is covered by IP 2016_061_AF6 (2016-EU-TM-0117-M).

Specific objectives:

The Implementation Project specifically aims to upgrade four E195 that are part of Portugália Airlines fleet for Datalink Services capability.

Tasks:

The Implementation Project consists of the following tasks:

- Task 02 - Equipment Procurement (20% co-funded): Proposed implementation solution in accordance with OEM and Honeywell's latest updates in avionics standards, complying with "Best-in Class" avionics upgrade. This task consists of equipment procurement for the following modifications:
  - Upgrade of the already installed 3rd VHF data radio to include VDL Mode 2 through embodiment of Embraer Service Bulletin as an hardware change;
  - In order to be able to benefit of VDL Mode 2, a software change is required via embodiment of Embraer Service Bulletin. This will allow the existing basic EPIC CMF functions to be updated with a new Air Traffic Control Database via APM Options modification. These changes shall be implemented in four E195 aircraft.
- Task 03 - Aircraft Modification for ATN B1 Baseline (20% co-funded): This task consists of the following actions on four aircraft:
  - VHF Radio – Modification to allow 3rd VHF radio upgrade from Mode A to VDL Mode 2;

  - VHF Radio software change – Installation of APM Options and dedicated Air Traffic Control database software.
- Task 04 - Portuguese NAA Approval (20% co-funded): Detailed analysis of the existing acceptable means of compliance in order to define all the required information to be included in the relevant operational documentation. The relevant documentation will then be revised and submitted to the Portuguese Aviation Authority (ANAC) for approval. This task shall result in approved operational documentation, as well as revised AOC to introduce this type of operation.

Expected Results:

Portugalia fleet is fully equipped with ATN B1 capability.
Regular operations using datalink services, as specified in the DLS IR can start.

Internal Achievement Points:

- Start of training – N/A
- End of training – N/A
- Parallel Operations / Operational Trials – N/A
- Cutover SW ready and successfully tested – N/A
- Cutover and fall-back period completed – N/A

Contractual Milestone:

- Project completed - 15/12/2019

Performance Benefits:

The following performance benefits are expected, among others:
- Fewer loss of communication events;
- Decrease in communication errors;
- Reduction in the communication workload;
- Estimation that datalink services can reduce total controller workload by up to 29%.

ARTICLE I.5 – MILESTONES AND MEANS OF VERIFICATION

Milestone number	Milestone description	Indicative completion date	Means of verification
1	M.1.1.1 Launch of the Action	31/12/2018	Framework Partnership Agreement (FPA) and Specific Grant Agreement (SGA) signature
2	M.1.1.2 Action Work Breakdown Structure (WBS) and Organisational Breakdown Structure (OBS) yearly updating up 2023 starting from 2019 (First release 31/03/2019)	31/03/2023	Action WBS and OBS
3	M.1.1.3 Action GANTT yearly updating up 2023 starting from 2019 (First release 31/03/2019)	31/03/2023	Action GANTT at activity level
4	M.1.1.4 Guidelines for Action Execution	31/01/2019	Guidelines for Action Execution
5	M.1.2.1 Action Execution Progress Dashboard – 2 Reporting gates per year (04/03; 30/11) until 2023 starting from 2019	30/11/2023	Action Execution Progress Dashboard
6	M.1.2.2 Action Quality Plan	31/05/2019	Quality Plan
7	M.1.2.3 Action Performance Report – submitted every year until 2023 starting from 2019 (First release 30/11/2019) (one reporting gate per year (15/09)	30/11/2023	Action Performance Report
8	M.1.2.4 Action Status Report (ASR) – submitted every year until 2023 starting from 2019 (First release 31/03/2019)	31/03/2023	Action Status Report (ASR)
9	M.1.2.5 Final Report	31/12/2023	Final Report
10	M.1.3.1 Payments (pre-financing, interim and balance)	31/12/2023	Request for payments (pre-financing, interim and balance)
11	M.1.4.1 Action Communication Plan	31/05/2019	Communication Plan
12	M.2.1.1 Risks and Issues, and mitigation - Actions Registry – AF1 level – submitted 2 times per year (30/04; 30/09) until 2023 starting from 2019	30/09/2023	Risks and Issues, and mitigation - Actions Registry – AF1 level
13	M.2.2.1 Action Status Report (ASR) - IP level (as Annex to the ASR at Action Level) - submitted every year until 2023 starting from 2019 (First release 15/01/2019)	15/01/2023	Action Status Report (ASR) - IP level

14	M.2.2.2 IP periodical reporting (Technical and Financial progress) – 2 times per year (15/01; 15/09) until 2023 starting from 2019	15/09/2023	IP periodical reporting for AF1
15	M.2.2.3 Contribution to Final Report (Technical Content) – IP level	31/12/2023	Contribution to Final Report – IP level
16	M.3.1.1 Risks and Issues, and mitigation - Actions Registry – AF2 level – submitted 2 times per year (30/04; 30/09) until 2023 starting from 2019	30/09/2023	Risks and Issues, and mitigation - Actions Registry – AF2 level
17	M.3.2.1 Action Status Report (ASR) - IP level (as Annex to the ASR at Action Level) - submitted every year until 2023 starting from 2019 (First release 15/01/2019)	15/01/2023	Action Status Report (ASR) - IP level
18	M.3.2.2 IP periodical reporting (Technical and Financial progress) – 2 times per year (15/01; 15/09) until 2023 starting from 2019	15/09/2023	IP periodical reporting for AF2
19	M.3.2.3 Contribution to Final Report (Technical Content) – IP level	31/12/2023	Contribution to Final Report – IP level
20	M.4.1.1 Risks and Issues, and mitigation - Actions Registry – AF3 level – submitted 2 times per year (30/04; 30/09) until 2023 starting from 2019	30/09/2023	Risks and Issues, and mitigation - Actions Registry – AF3 level
21	M.4.2.1 Action Status Report (ASR) - IP level (as Annex to the ASR at Action Level) - submitted every year until 2023 starting from 2019 (First release 15/01/2019)	15/01/2023	Action Status Report (ASR) - IP level
22	M.4.2.2 IP periodical reporting (Technical and Financial progress) – 2 times per year (15/01; 15/09) until 2023 starting from 2019	15/09/2023	IP periodical reporting for AF3
23	M.4.2.3 Contribution to Final Report (Technical Content) – IP level	31/12/2023	Contribution to Final Report – IP level
24	M.5.1.1 Risks and Issues, and mitigation - Actions Registry – AF4 level – submitted 2 times per year (30/04; 30/09) until 2023 starting from 2019	30/09/2023	Risks and Issues, and mitigation - Actions Registry – AF4 level
25	M.5.2.1 Action Status Report (ASR) - IP level (as Annex to the ASR at Action Level) - submitted every year until 2023 starting from 2019 (First release 15/01/2019)	15/01/2023	Action Status Report (ASR) - IP level
26	M.5.2.2 IP periodical reporting (Technical and Financial progress) – 2 times per year (15/01; 15/09) until 2023 starting from 2019	15/09/2023	IP periodical reporting for AF4

27	M.5.2.3 Contribution to Final Report (Technical Content) – IP level	31/12/2023	Contribution to Final Report – IP level
28	M.6.1.1 Risks and Issues, and mitigation - Actions Registry – AF5 level – submitted 2 times per year (30/04; 30/09) until 2023 starting from 2019	30/09/2023	Risks and Issues, and mitigation - Actions Registry – AF5 level
29	M.6.2.1 Action Status Report (ASR) - IP level (as Annex to the ASR at Action Level) - submitted every year until 2023 starting from 2019 (First release 15/01/2019)	15/01/2023	Action Status Report (ASR) - IP level
30	M.6.2.2 IP periodical reporting (Technical and Financial progress) – 2 times per year (15/01; 15/09) until 2023 starting from 2019	15/09/2023	IP periodical reporting for AF5
31	M.6.2.3 Contribution to Final Report (Technical Content) – IP level	31/12/2023	Contribution to Final Report – IP level
32	M.7.1.1 Risks and Issues, and mitigation - Actions Registry – AF6 level – submitted 2 times per year (30/04; 30/09) until 2023 starting from 2019	30/09/2023	Risks and Issues, and mitigation - Actions Registry – AF6 level
33	M.7.2.1 Action Status Report (ASR) - IP level (as Annex to the ASR at Action Level) - submitted every year until 2023 starting from 2019 (First release 15/01/2019)	15/01/2023	Action Status Report (ASR) - IP level
34	M.7.2.2 IP periodical reporting (Technical and Financial progress) – 2 times per year (15/01; 15/09) until 2023 starting from 2019	15/09/2023	IP periodical reporting for AF6
35	M.7.2.3 Contribution to Final Report (Technical Content) – IP level	31/12/2023	Contribution to Final Report – IP level
36	M.8.1.1 Risks and Issues, and mitigation - Actions Registry – AF6 level – submitted 2 times per year (30/04; 30/09) until 2023 starting from 2019	30/09/2023	Risks and Issues, and mitigation - Actions Registry – AF6 level
37	M.8.2.1 Action Status Report (ASR) - IP level (as Annex to the ASR at Action Level) - submitted every year until 2023 starting from 2019 (First release 15/01/2019)	15/01/2023	Action Status Report (ASR) - IP level
38	M.8.2.2 IP periodical reporting (Technical and Financial progress) – 2 times per year (15/01; 15/09) until 2023 starting from 2019	15/09/2023	IP periodical reporting for AF6
39	M.8.2.3 Contribution to Final Report (Technical Content) – IP level	31/12/2023	Contribution to Final Report – IP level

ANNEX II

ESTIMATED BUDGET OF THE ACTION

Table 1: Planned sources of financing of the eligible costs of the action

Financing sources	Amount of financial contribution to the action eligible costs (EUR) SDA	Amount of financial contribution to the action eligible costs (EUR) Côte d'Azur	Amount of financial contribution to the action eligible costs (EUR) ADP	Amount of financial contribution to the action eligible costs (EUR) ADR	Amount of financial contribution to the action eligible costs (EUR) Airtel
1. CEF-Transport financing	939,592	9,505,855	4,422,100	6,810,799	288,750
2. Beneficiary's own resources	939,592	9,505,855	4,422,100	6,810,799	288,750
of which: (a) EIB loan	0	0	0	0	0
3. State budget(s)	0	0	0	0	0
4. Regional/ local budget(s)	0	0	0	0	0
5. Income generated by the action	0	0	0	0	0
6. Other sources	0	0	0	0	0
TOTAL	1,879,184	19,011,710	8,844,200	13,621,598	577,500

Financing sources	Amount of financial contribution to the action eligible costs (EUR) ALTYS	Amount of financial contribution to the action eligible costs (EUR) ANS Finland	Amount of financial contribution to the action eligible costs (EUR) Arinc	Amount of financial contribution to the action eligible costs (EUR) Austro Control	Amount of financial contribution to the action eligible costs (EUR) Belgocontrol
1. CEF-Transport financing	276,018	90,000	73,000	5,642,132	688,704
2. Beneficiary's own resources	276,018	90,000	73,000	5,642,132	688,704
of which:	0	0	0	0	0
(a) EIB loan					
3. State budget(s)	0	0	0	0	0
4. Regional/ local budget(s)	0	0	0	0	0
5. Income generated by the action	0	0	0	0	0
6. Other sources	0	0	0	0	0
TOTAL	552,036	180,000	146,000	11,284,264	1,377,408

Financing sources	Amount of financial contribution to the action eligible costs (EUR) BR&TE	Amount of financial contribution to the action eligible costs (EUR) BAC	Amount of financial contribution to the action eligible costs (EUR) BULATSA	Amount of financial contribution to the action eligible costs (EUR) Croatia Control	Amount of financial contribution to the action eligible costs (EUR) Lufthansa
1. CEF-Transport financing	519,250	11,094,640	52,755	5,219,825	11,705,267
2. Beneficiary's own resources	519,250	11,094,639.5	52,755	5,219,825	11,705,267
of which:	0	0	0	0	0
(a) EIB loan					
3. State budget(s)	0	0	0	0	0
4. Regional/ local budget(s)	0	0	0	0	0
5. Income generated by the action	0	0	0	0	0
6. Other sources	0	0	0	0	0
TOTAL	1,038,500	22,189,279.5	105,510	10,439,650	23,410,534

Financing sources	Amount of financial contribution to the action eligible costs (EUR) DFS	Amount of financial contribution to the action eligible costs (EUR) DSNA	Amount of financial contribution to the action eligible costs (EUR) ENAIRE	Amount of financial contribution to the action eligible costs (EUR) ENAV	Amount of financial contribution to the action eligible costs (EUR) ESSP
1. CEF-Transport financing	21,027,474	29,931,148	20,996,197	17,340,200	112,389
2. Beneficiary's own resources	21,027,473.5	0	20,996,196.5	17,340,199.5	112,388.5
of which:	0	0	0	3,487,035	0
(a) EIB loan					
3. State budget(s)	0	29,931,147.5	0	0	0
4. Regional/ local budget(s)	0	0	0	0	0
5. Income generated by the action	0	0	0	0	0
6. Other sources	0	0	0	0	0
TOTAL	42,054,947.5	59,862,295.5	41,992,393.5	34,680,399.5	224,777.5

Financing sources	Amount of financial contribution to the action eligible costs (EUR) EUROCONTROL	Amount of financial contribution to the action eligible costs (EUR) FABCE	Amount of financial contribution to the action eligible costs (EUR) FDG	Amount of financial contribution to the action eligible costs (EUR) FMG	Amount of financial contribution to the action eligible costs (EUR) Fraport
1. CEF-Transport financing	9,198,262	197,050	188,000	1,132,500	673,500
2. Beneficiary's own resources	9,198,262	197,050	188,000	1,132,500	673,500
of which:	0	0	0	0	0
(a) EIB loan					
3. State budget(s)	0	0	0	0	0
4. Regional/ local budget(s)	0	0	0	0	0
5. Income generated by the action	0	0	0	0	0
6. Other sources	0	0	0	0	0
TOTAL	18,396,524	394,100	376,000	2,265,000	1,347,000

Financing sources	Amount of financial contribution to the action eligible costs (EUR) DGA	Amount of financial contribution to the action eligible costs (EUR) HCAA	Amount of financial contribution to the action eligible costs (EUR) HungaroControl	Amount of financial contribution to the action eligible costs (EUR) Inmarsat	Amount of financial contribution to the action eligible costs (EUR) IAA
1. CEF-Transport financing	1,062,310	4,500	1,212,897	154,000	5,776,049
2. Beneficiary's own resources	1,062,310	4,500	1,212,897	154,000	5,776,048.5
of which:	0	0	0	0	0
(a) EIB loan					
3. State budget(s)	0	0	0	0	0
4. Regional/ local budget(s)	0	0	0	0	0
5. Income generated by the action	0	0	0	0	0
6. Other sources	0	0	0	0	0
TOTAL	2,124,620	9,000	2,425,794	308,000	11,552,097.5

Financing sources	Amount of financial contribution to the action eligible costs (EUR) MoD Italy	Amount of financial contribution to the action eligible costs (EUR) CPH	Amount of financial contribution to the action eligible costs (EUR) Leonardo	Amount of financial contribution to the action eligible costs (EUR) LFV	Amount of financial contribution to the action eligible costs (EUR) LPS
1. CEF-Transport financing	3,234,934	1,538,494	509,995	7,261,011	51,926
2. Beneficiary's own resources	0	1,538,493.5	509,994.5	7,261,011	51,926
of which:	0	0	0	0	0
(a) EIB loan					
3. State budget(s)	3,234,934	0	0	0	0
4. Regional/ local budget(s)	0	0	0	0	0
5. Income generated by the action	0	0	0	0	0
6. Other sources	0	0	0	0	0
TOTAL	6,469,868	3,076,987.5	1,019,989.5	14,522,022	103,852

Financing sources	Amount of financial contribution to the action eligible costs (EUR) LVNL	Amount of financial contribution to the action eligible costs (EUR) MAN	Amount of financial contribution to the action eligible costs (EUR) Météo FR	Amount of financial contribution to the action eligible costs (EUR) NAV Portugal	Amount of financial contribution to the action eligible costs (EUR) NAVIAIR
1. CEF-Transport financing	17,723,294	4,569,978	320,000	487,913	6,229,049
2. Beneficiary's own resources	17,723,293.5	4,569,978	320,000	487,913	6,229,048.5
of which:	0	0	0	0	0
(a) EIB loan					
3. State budget(s)	0	0	0	0	0
4. Regional/ local budget(s)	0	0	0	0	0
5. Income generated by the action	0	0	0	0	0
6. Other sources	0	0	0	0	0
TOTAL	35,446,587.5	9,139,956	640,000	975,826	12,458,097.5

Financing sources	Amount of financial contribution to the action eligible costs (EUR) PANSA	Amount of financial contribution to the action eligible costs (EUR) PORTUGÁLIA	Amount of financial contribution to the action eligible costs (EUR) ROMATSA	Amount of financial contribution to the action eligible costs (EUR) Ryanair	Amount of financial contribution to the action eligible costs (EUR) Sabre
1. CEF-Transport financing	972,584	128,055	163,197	770,297	2,422,000
2. Beneficiary's own resources	972,584	464,219.2	163,197	770,297	2,422,000
of which:	0	0	0	0	0
(a) EIB loan					
3. State budget(s)	0	0	0	0	0
4. Regional/ local budget(s)	0	0	0	0	0
5. Income generated by the action	0	0	0	0	0
6. Other sources	0	0	0	0	0
TOTAL	1,945,168	592,274.2	326,394	1,540,594	4,844,000

Financing sources	Amount of financial contribution to the action eligible costs (EUR) S.E.A.	Amount of financial contribution to the action eligible costs (EUR) SITA	Amount of financial contribution to the action eligible costs (EUR) SCL (KZPS)	Amount of financial contribution to the action eligible costs (EUR) SMATSA	Amount of financial contribution to the action eligible costs (EUR) Air France
1. CEF-Transport financing	3,735,000	398,700	75,300	64,400	2,356,387
2. Beneficiary's own resources	3,735,000	398,700	75,300	64,400	3,352,386.5
of which:	0	0	0	0	0
(a) EIB loan					
3. State budget(s)	0	0	0	0	0
4. Regional/ local budget(s)	0	0	0	0	0
5. Income generated by the action	0	0	0	0	0
6. Other sources	0	0	0	0	0
TOTAL	7,470,000	797,400	150,600	128,800	5,708,773.5

Financing sources	Amount of financial contribution to the action eligible costs (EUR) ES AF	Amount of financial contribution to the action eligible costs (EUR) STAL	Amount of financial contribution to the action eligible costs (EUR) ORO NAVIGACIJA	Amount of financial contribution to the action eligible costs (EUR) Swedavia	Amount of financial contribution to the action eligible costs (EUR) Thales
1. CEF-Transport financing	116,811	1,187,333	276,500	2,381,221	75,457
2. Beneficiary's own resources	0	1,187,332.5	276,500	2,381,221	75,457
of which:	0	0	0	0	0
(a) EIB loan					
3. State budget(s)	116,810.5	0	0	0	0
4. Regional/ local budget(s)	0	0	0	0	0
5. Income generated by the action	0	0	0	0	0
6. Other sources	0	0	0	0	0
TOTAL	233,621.5	2,374,665.5	553,000	4,762,442	150,914

Financing sources	Amount of financial contribution to the action eligible costs (EUR) DAA PLC	Amount of financial contribution to the action eligible costs (EUR) VIE	Amount of financial contribution to the action eligible costs (EUR) PLUS	Amount of financial contribution to the action eligible costs (EUR) NATS	Amount of financial contribution to the action eligible costs (EUR) British Airways
1. CEF-Transport financing	3,950,000	400,000	84,135	281,851	42,613
2. Beneficiary's own resources	3,950,000	400,000	84,134.5	281,851	42,612.5
of which:	0	0	0	0	0
(a) EIB loan					
3. State budget(s)	0	0	0	0	0
4. Regional/ local budget(s)	0	0	0	0	0
5. Income generated by the action	0	0	0	0	0
6. Other sources	0	0	0	0	0
TOTAL	7,900,000	800,000	168,269.5	563,702	85,225.5

Financing sources	Amount of financial contribution to the action eligible costs (EUR) easyJet	Amount of financial contribution to the action eligible costs (EUR) SDAG
1. CEF-Transport financing	11,414	198,571
2. Beneficiary's own resources	11,413.5	198,571
of which:		
(a) EIB loan	0	0
3. State budget(s)	0	0
4. Regional/ local budget(s)	0	0
5. Income generated by the action	0	0
6. Other sources	0	0
TOTAL	22,827.5	397,142

Table 2: Indicative breakdown per activity and per beneficiary of estimated eligible costs of the action (EUR)

Activities	2018	2019	2020	2021	2022	2023	Total	Pro-rata share of the estimated eligible costs (%)
ELIGIBLE DIRECT COSTS								
Activity 1	**743,713**	**1,208,404**	**1,075,516**	**1,033,591**	**419,642**	**130,737**	**4,611,603**	**1.01**
SDA	**303,056**	**492,413**	**438,263**	**421,176**	**171,001**	**53,275**	**1,879,184**	**0.41**
Austro Control	**4,284**	**6,961**	**6,195**	**5,954**	**2,417**	**753**	**26,564**	**0.01**
Croatia Control	**279**	**453**	**403**	**388**	**157**	**49**	**1,729**	**0**
Lufthansa	**57,702**	**93,755**	**83,445**	**80,192**	**32,558**	**10,143**	**357,795**	**0.08**
DFS	**31,566**	**51,289**	**45,648**	**43,869**	**17,811**	**5,549**	**195,732**	**0.04**
DSNA	**24,234**	**39,377**	**35,046**	**33,680**	**13,674**	**4,260**	**150,271**	**0.03**
ENAIRE	**21,134**	**34,339**	**30,563**	**29,371**	**11,925**	**3,715**	**131,047**	**0.03**
ENAV	**30,184**	**49,044**	**43,650**	**41,949**	**17,031**	**5,306**	**187,164**	**0.04**
HungaroControl	**8,482**	**13,781**	**12,266**	**11,788**	**4,786**	**1,491**	**52,594**	**0.01**
IAA	**14,502**	**23,564**	**20,973**	**20,155**	**8,183**	**2,549**	**89,926**	**0.02**
LFV	**15,242**	**24,765**	**22,042**	**21,183**	**8,600**	**2,679**	**94,511**	**0.02**
NAVIAIR	**7,447**	**12,100**	**10,769**	**10,349**	**4,202**	**1,309**	**46,176**	**0.01**
PANSA	**1,621**	**2,634**	**2,345**	**2,253**	**915**	**285**	**10,053**	**0**
ROMATSA	**8,482**	**13,781**	**12,266**	**11,788**	**4,786**	**1,491**	**52,594**	**0.01**
Ryanair	**8,482**	**13,781**	**12,266**	**11,788**	**4,786**	**1,491**	**52,594**	**0.01**
Air France	**34,636**	**56,278**	**50,089**	**48,137**	**19,544**	**6,089**	**214,773**	**0.05**

NATS	90,908	147,710	131,466	126,342	51,295	15,981	563,702	0.12
British Airways	13,744	22,332	19,876	19,102	7,755	2,416	85,225	0.02
easyJet	3,681	5,982	5,324	5,116	2,077	647	22,827	0
SDAG	64,047	104,065	92,621	89,011	36,139	11,259	397,142	0.09
Activity 2	919,459	1,369,267	1,152,405	636,684	236,965	42,720	4,357,500	0.95
Lufthansa	874,500	809,500	695,500	451,500	135,500	41,000	3,007,500	0.66
LVNL	8,000	62,000	121,000	63,000	46,000	0	300,000	0.07
MAN	36,959	497,767	335,905	122,184	55,465	1,720	1,050,000	0.23
Activity 3	20,813,553	42,743,532	34,849,321	415,500	0	0	98,821,906	21.57
Côte d'Azur	2,877,480	7,881,980	7,339,530	0	0	0	18,098,990	3.95
ADP	2,249,600	3,285,600	2,511,000	0	0	0	8,046,200	1.76
ADR	2,705,479	6,858,019	2,719,255	0	0	0	12,282,753	2.68
Austro Control	191,500	238,300	0	0	0	0	429,800	0.09
Belgocontrol	28,000	114,000	117,000	0	0	0	259,000	0.06
BAC	6,405,271	8,031,674	7,752,334	0	0	0	22,189,279	4.84
DFS	412,461	2,335,504	0	0	0	0	2,747,965	0.6
DSNA	20,000	824,000	944,000	212,000	0	0	2,000,000	0.44
ENAV	847,000	794,000	374,000	0	0	0	2,015,000	0.44
EUROCONTROL	188,568	412,756	91,500	0	0	0	692,824	0.15
FMG	455,000	755,000	1,055,000	0	0	0	2,265,000	0.49
Fraport	0	392,000	955,000	0	0	0	1,347,000	0.29
CPH	40,000	270,000	285,000	0	0	0	595,000	0.13
LVNL	66,000	841,600	868,000	185,500	0	0	1,961,100	0.43
MAN	1,147,194	3,448,999	1,386,137	0	0	0	5,982,330	1.31

Météo FR	0	353,000	269,000	18,000	0	0	640,000	0.14
S.E.A.	2,980,000	3,335,000	710,000	0	0	0	7,025,000	1.53
STAL	0	972,100	1,022,565	0	0	0	1,994,665	0.44
Swedavia	0	100,000	250,000	0	0	0	350,000	0.08
DAA PLC	200,000	1,500,000	6,200,000	0	0	0	7,900,000	1.72
Activity 4	17,786,396	14,545,851	23,098,514	58,139,403	21,122,677	1,677,097	136,369,938	29.77
Lufthansa	0	564,800	1,344,800	1,946,300	0	0	3,855,900	0.84
DFS	446,162	2,886,525	2,406,988	23,868,583	7,891,604	1,188,808	38,688,670	8.45
DSNA	7,404,070	175,000	0	0	0	0	7,579,070	1.65
ENAIRE	1,783,000	9,074,140	16,472,203	14,290,243	0	0	41,619,586	9.09
ENAV	7,481,216	392,186	1,016,223	2,868,072	1,219,380	36,000	13,013,077	2.84
EUROCONTROL	183,000	228,000	528,000	1,450,000	0	0	2,389,000	0.52
HungaroControl	39,800	843,200	682,800	646,550	0	0	2,212,350	0.48
MoD Italy	449,148	369,000	188,500	20,000	260,000	0	1,286,648	0.28
LVNL	0	0	0	11,755,655	11,751,693	452,289	23,959,637	5.23
Sabre	0	0	256,000	778,000	0	0	1,034,000	0.23
Air France	0	13,000	203,000	516,000	0	0	732,000	0.16
Activity 5	3,278,557	6,267,063	7,225,896	7,627,483	162,000	0	24,560,999	5.36
Côte d'Azur	0	136,990	418,740	356,990	0	0	912,720	0.2
ADP	2,000	301,500	286,500	36,000	0	0	626,000	0.14
ADR	0	82,533	267,455	13,359	0	0	363,347	0.08
Belgocontrol	530,857	374,351	0	0	0	0	905,208	0.2
DSNA	2,300,000	2,550,000	2,500,000	2,150,000	0	0	9,500,000	2.07
ENAV	245,200	570,000	738,300	924,500	0	0	2,478,000	0.54

EUROCONTROL	0	620,189	1,345,401	2,579,134	0	0	4,544,724	0.99
FDG	0	43,000	137,000	196,000	0	0	376,000	0.08
MAN	0	60,000	35,000	285,000	0	0	380,000	0.08
PANSA	127,000	840,000	440,000	140,000	147,000	0	1,694,000	0.37
S.E.A.	0	169,000	257,000	19,000	0	0	445,000	0.1
Air France	48,000	282,000	344,000	89,000	0	0	763,000	0.17
STAL	0	60,000	35,000	285,000	0	0	380,000	0.08
ORO NAVIGACIJA	25,500	37,500	41,500	273,500	15,000	0	393,000	0.09
VIE	0	140,000	380,000	280,000	0	0	800,000	0.17
Activity 6	16,242,848	43,504,090	44,412,652	39,323,838	23,177,673	11,430,458	178,091,559	38.88
ADP	45,400	45,400	45,400	35,800	0	0	172,000	0.04
ADR	272,575	399,262	303,661	0	0	0	975,498	0.21
ANS Finland	45,000	45,000	45,000	45,000	0	0	180,000	0.04
Austro Control	1,041,550	1,894,000	3,007,693	3,192,621	1,159,493	491,743	10,787,100	2.36
Belgocontrol	49,790	61,460	63,560	38,390	0	0	213,200	0.05
BR&TE	0	428,000	367,000	158,000	66,000	19,500	1,038,500	0.23
BULATSA	5,660	14,400	22,500	1,900	0	0	44,460	0.01
Croatia Control	960,450	2,750,421	2,449,793	2,742,421	1,048,093	486,743	10,437,921	2.28
Lufthansa	300,000	956,940	2,607,745	4,400,693	4,844,617	3,079,344	16,189,339	3.53
DFS	38,499	67,499	62,502	84,000	0	0	252,500	0.06
DSNA	4,346,630	8,996,999	6,679,978	9,570,869	8,441,087	2,572,391	40,607,954	8.87
ENAV	389,458	6,243,780	6,223,039	1,969,518	0	0	14,825,795	3.24
EUROCONTROL	973,738	1,653,238	2,014,000	2,474,500	1,328,000	1,374,000	9,817,476	2.14
FABCE	53,150	130,300	130,300	80,350	0	0	394,100	0.09

DGA	**368,288**	**1,742,832**	**9,000**	**4,500**	**0**	**0**	**2,124,620**	**0.46**
HCAA	**1,200**	**2,600**	**2,600**	**2,600**	**0**	**0**	**9,000**	**0**
HungaroControl	**32,875**	**33,575**	**25,575**	**16,825**	**0**	**0**	**108,850**	**0.02**
IAA	**1,097,700**	**2,930,421**	**2,629,793**	**2,922,421**	**1,228,093**	**653,743**	**11,462,171**	**2.5**
MoD Italy	**1,347,320**	**2,066,900**	**1,669,000**	**100,000**	**0**	**0**	**5,183,220**	**1.13**
CPH	**208,311**	**561,616**	**1,514,822**	**197,238**	**0**	**0**	**2,481,987**	**0.54**
LFV	**1,371,524**	**2,896,368**	**3,684,681**	**4,342,392**	**1,350,123**	**682,373**	**14,327,461**	**3.13**
LPS	**19,135**	**35,202**	**27,055**	**22,460**	**0**	**0**	**103,852**	**0.02**
LVNL	**478,500**	**3,514,400**	**5,198,450**	**34,500**	**0**	**0**	**9,225,850**	**2.01**
MAN	**747,119**	**439,697**	**413,319**	**127,491**	**0**	**0**	**1,727,626**	**0.38**
NAV Portugal	**64,098**	**64,098**	**64,098**	**54,086**	**0**	**0**	**246,380**	**0.05**
NAVIAIR	**1,071,650**	**3,021,021**	**3,081,293**	**3,586,721**	**1,159,493**	**491,743**	**12,411,921**	**2.71**
PANSA	**27,950**	**27,000**	**27,000**	**19,565**	**0**	**0**	**101,515**	**0.02**
ROMATSA	**28,533**	**98,096**	**98,096**	**49,075**	**0**	**0**	**273,800**	**0.06**
Ryanair	**0**	**644,000**	**218,000**	**520,000**	**65,000**	**41,000**	**1,488,000**	**0.32**
Sabre	**0**	**40,000**	**270,000**	**1,200,000**	**1,200,000**	**1,100,000**	**3,810,000**	**0.83**
SCL (KZPS)	**17,650**	**51,675**	**47,300**	**33,975**	**0**	**0**	**150,600**	**0.03**
SMATSA	**33,600**	**33,600**	**33,600**	**28,000**	**0**	**0**	**128,800**	**0.03**
Air France	**28,000**	**120,000**	**207,000**	**348,500**	**963,500**	**317,000**	**1,984,000**	**0.43**
ES AF	**15,596**	**72,675**	**72,675**	**72,675**	**0**	**0**	**233,621**	**0.05**
ORO NAVIGACIJA	**39,000**	**39,000**	**41,000**	**41,000**	**0**	**0**	**160,000**	**0.03**
Swedavia	**722,899**	**1,382,615**	**1,056,124**	**805,752**	**324,174**	**120,878**	**4,412,442**	**0.96**
Activity 7	**3,768,786**	**5,208,748**	**28,000**	**0**	**0**	**0**	**9,005,534**	**1.97**
Airtel	**282,750**	**294,750**	**0**	**0**	**0**	**0**	**577,500**	**0.13**

ALTYS	**260,517**	**291,519**	**0**	**0**	**0**	**0**	**552,036**	**0.12**
Arinc	**21,000**	**125,000**	**0**	**0**	**0**	**0**	**146,000**	**0.03**
Austro Control	**21,200**	**19,600**	**0**	**0**	**0**	**0**	**40,800**	**0.01**
BULATSA	**30,425**	**30,625**	**0**	**0**	**0**	**0**	**61,050**	**0.01**
DFS	**63,700**	**106,380**	**0**	**0**	**0**	**0**	**170,080**	**0.04**
DSNA	**12,500**	**12,500**	**0**	**0**	**0**	**0**	**25,000**	**0.01**
ENAIRE	**96,900**	**144,860**	**0**	**0**	**0**	**0**	**241,760**	**0.05**
ENAV	**790,269**	**1,371,094**	**0**	**0**	**0**	**0**	**2,161,363**	**0.47**
ESSP	**97,154**	**127,623**	**0**	**0**	**0**	**0**	**224,777**	**0.05**
EUROCONTROL	**440,500**	**512,000**	**0**	**0**	**0**	**0**	**952,500**	**0.21**
HungaroControl	**26,000**	**26,000**	**0**	**0**	**0**	**0**	**52,000**	**0.01**
Inmarsat	**107,000**	**201,000**	**0**	**0**	**0**	**0**	**308,000**	**0.07**
Leonardo	**443,355**	**576,634**	**0**	**0**	**0**	**0**	**1,019,989**	**0.22**
LFV	**44,370**	**55,680**	**0**	**0**	**0**	**0**	**100,050**	**0.02**
NAV Portugal	**362,318**	**367,128**	**0**	**0**	**0**	**0**	**729,446**	**0.16**
PANSA	**54,900**	**84,700**	**0**	**0**	**0**	**0**	**139,600**	**0.03**
PORTUGÁLIA	**8,000**	**24,000**	**0**	**0**	**0**	**0**	**32,000**	**0.01**
SITA	**391,789**	**405,611**	**0**	**0**	**0**	**0**	**797,400**	**0.17**
Air France	**81,000**	**246,000**	**28,000**	**0**	**0**	**0**	**355,000**	**0.08**
Thales	**84,044**	**66,870**	**0**	**0**	**0**	**0**	**150,914**	**0.03**
PLUS	**49,095**	**119,174**	**0**	**0**	**0**	**0**	**168,269**	**0.04**
Activity 8	**760,364**	**1,459,910**	**0**	**0**	**0**	**0**	**2,220,274**	**0.48**
PORTUGÁLIA	**137,864**	**422,410**	**0**	**0**	**0**	**0**	**560,274**	**0.12**
Air France	**622,500**	**1,037,500**	**0**	**0**	**0**	**0**	**1,660,000**	**0.36**

TOTAL ELIGIBLE DIRECT COSTS	64,313,676	116,306,865	111,842,304	107,176,499	45,118,957	13,281,012	458,039,313	100
SDA	303,056	492,413	438,263	421,176	171,001	53,275	1,879,184	0.41
Côte d'Azur	2,877,480	8,018,970	7,758,270	356,990	0	0	19,011,710	4.15
ADP	2,297,000	3,632,500	2,842,900	71,800	0	0	8,844,200	1.93
ADR	2,978,054	7,339,814	3,290,371	13,359	0	0	13,621,598	2.97
Airtel	282,750	294,750	0	0	0	0	577,500	0.13
ALTYS	260,517	291,519	0	0	0	0	552,036	0.12
ANS Finland	45,000	45,000	45,000	45,000	0	0	180,000	0.04
Arinc	21,000	125,000	0	0	0	0	146,000	0.03
Austro Control	1,258,534	2,158,861	3,013,888	3,198,575	1,161,910	492,496	11,284,264	2.46
Belgocontrol	608,647	549,811	180,560	38,390	0	0	1,377,408	0.3
BR&TE	0	428,000	367,000	158,000	66,000	19,500	1,038,500	0.23
BAC	6,405,271	8,031,674	7,752,334	0	0	0	22,189,279	4.84
BULATSA	36,085	45,025	22,500	1,900	0	0	105,510	0.02
Croatia Control	960,729	2,750,874	2,450,196	2,742,809	1,048,250	486,792	10,439,650	2.28
Lufthansa	1,232,202	2,424,995	4,731,490	6,878,685	5,012,675	3,130,487	23,410,534	5.11
DFS	992,388	5,447,197	2,515,138	23,996,452	7,909,415	1,194,357	42,054,947	9.18
DSNA	14,107,434	12,597,876	10,159,024	11,966,549	8,454,761	2,576,651	59,862,295	13.07
ENAIRE	1,901,034	9,253,339	16,502,766	14,319,614	11,925	3,715	41,992,393	9.17
ENAV	9,783,327	9,420,104	8,395,212	5,804,039	1,236,411	41,306	34,680,399	7.57
ESSP	97,154	127,623	0	0	0	0	224,777	0.05
EUROCONTROL	1,785,806	3,426,183	3,978,901	6,503,634	1,328,000	1,374,000	18,396,524	4.02
FABCE	53,150	130,300	130,300	80,350	0	0	394,100	0.09
FDG	0	43,000	137,000	196,000	0	0	376,000	0.08

FMG	**455,000**	**755,000**	**1,055,000**	**0**	**0**	**0**	**2,265,000**	**0.49**
Fraport	**0**	**392,000**	**955,000**	**0**	**0**	**0**	**1,347,000**	**0.29**
DGA	**368,288**	**1,742,832**	**9,000**	**4,500**	**0**	**0**	**2,124,620**	**0.46**
HCAA	**1,200**	**2,600**	**2,600**	**2,600**	**0**	**0**	**9,000**	**0**
HungaroControl	**107,157**	**916,556**	**720,641**	**675,163**	**4,786**	**1,491**	**2,425,794**	**0.53**
Inmarsat	**107,000**	**201,000**	**0**	**0**	**0**	**0**	**308,000**	**0.07**
IAA	**1,112,202**	**2,953,985**	**2,650,766**	**2,942,576**	**1,236,276**	**656,292**	**11,552,097**	**2.52**
MoD Italy	**1,796,468**	**2,435,900**	**1,857,500**	**120,000**	**260,000**	**0**	**6,469,868**	**1.41**
CPH	**248,311**	**831,616**	**1,799,822**	**197,238**	**0**	**0**	**3,076,987**	**0.67**
Leonardo	**443,355**	**576,634**	**0**	**0**	**0**	**0**	**1,019,989**	**0.22**
LFV	**1,431,136**	**2,976,813**	**3,706,723**	**4,363,575**	**1,358,723**	**685,052**	**14,522,022**	**3.17**
LPS	**19,135**	**35,202**	**27,055**	**22,460**	**0**	**0**	**103,852**	**0.02**
LVNL	**552,500**	**4,418,000**	**6,187,450**	**12,038,655**	**11,797,693**	**452,289**	**35,446,587**	**7.74**
MAN	**1,931,272**	**4,446,463**	**2,170,361**	**534,675**	**55,465**	**1,720**	**9,139,956**	**2**
Météo FR	**0**	**353,000**	**269,000**	**18,000**	**0**	**0**	**640,000**	**0.14**
NAV Portugal	**426,416**	**431,226**	**64,098**	**54,086**	**0**	**0**	**975,826**	**0.21**
NAVIAIR	**1,079,097**	**3,033,121**	**3,092,062**	**3,597,070**	**1,163,695**	**493,052**	**12,458,097**	**2.72**
PANSA	**211,471**	**954,334**	**469,345**	**161,818**	**147,915**	**285**	**1,945,168**	**0.42**
PORTUGÁLIA	**145,864**	**446,410**	**0**	**0**	**0**	**0**	**592,274**	**0.13**
ROMATSA	**37,015**	**111,877**	**110,362**	**60,863**	**4,786**	**1,491**	**326,394**	**0.07**
Ryanair	**8,482**	**657,781**	**230,266**	**531,788**	**69,786**	**42,491**	**1,540,594**	**0.34**
Sabre	**0**	**40,000**	**526,000**	**1,978,000**	**1,200,000**	**1,100,000**	**4,844,000**	**1.06**
S.E.A.	**2,980,000**	**3,504,000**	**967,000**	**19,000**	**0**	**0**	**7,470,000**	**1.63**
SITA	**391,789**	**405,611**	**0**	**0**	**0**	**0**	**797,400**	**0.17**

SCL (KZPS)	17,650	51,675	47,300	33,975	0	0	150,600	0.03
SMATSA	33,600	33,600	33,600	28,000	0	0	128,800	0.03
Air France	814,136	1,754,778	832,089	1,001,637	983,044	323,089	5,708,773	1.25
ES AF	15,596	72,675	72,675	72,675	0	0	233,621	0.05
STAL	0	1,032,100	1,057,565	285,000	0	0	2,374,665	0.52
ORO NAVIGACIJA	64,500	76,500	82,500	314,500	15,000	0	553,000	0.12
Swedavia	722,899	1,482,615	1,306,124	805,752	324,174	120,878	4,762,442	1.04
Thales	84,044	66,870	0	0	0	0	150,914	0.03
DAA PLC	200,000	1,500,000	6,200,000	0	0	0	7,900,000	1.72
VIE	0	140,000	380,000	280,000	0	0	800,000	0.17
PLUS	49,095	119,174	0	0	0	0	168,269	0.04
NATS	90,908	147,710	131,466	126,342	51,295	15,981	563,702	0.12
British Airways	13,744	22,332	19,876	19,102	7,755	2,416	85,225	0.02
easyJet	3,681	5,982	5,324	5,116	2,077	647	22,827	0
SDAG	64,047	104,065	92,621	89,011	36,139	11,259	397,142	0.09
Annual instalments of maximum CEF contribution	89,644,188.3	0	55,921,152	53,588,249.5	22,559,478.5	6,640,506	228,353,574.3	49.85
SDA	397,734.5	0	219,131.5	210,588	85,500.5	26,637.5	939,592	0.21
Côte d'Azur	5,448,225	0	3,879,135	178,495	0	0	9,505,855	2.08
ADP	2,964,750	0	1,421,450	35,900	0	0	4,422,100	0.97
ADR	5,158,934	0	1,645,185.5	6,679.5	0	0	6,810,799	1.49
Airtel	288,750	0	0	0	0	0	288,750	0.06
ALTYS	276,018	0	0	0	0	0	276,018	0.06

ANS Finland	**45,000**	**0**	**22,500**	**22,500**	**0**	**0**	**90,000**	**0.02**
Arinc	**73,000**	**0**	**0**	**0**	**0**	**0**	**73,000**	**0.02**
Austro Control	**1,708,697.5**	**0**	**1,506,944**	**1,599,287.5**	**580,955**	**246,248**	**5,642,132**	**1.23**
Belgocontrol	**579,229**	**0**	**90,280**	**19,195**	**0**	**0**	**688,704**	**0.15**
BR&TE	**214,000**	**0**	**183,500**	**79,000**	**33,000**	**9,750**	**519,250**	**0.11**
BAC	**7,218,472.5**	**0**	**3,876,167**	**0**	**0**	**0**	**11,094,639.5**	**2.42**
BULATSA	**40,555**	**0**	**11,250**	**950**	**0**	**0**	**52,755**	**0.01**
Croatia Control	**1,855,801.5**	**0**	**1,225,098**	**1,371,404.5**	**524,125**	**243,396**	**5,219,825**	**1.14**
Lufthansa	**1,828,598.5**	**0**	**2,365,745**	**3,439,342.5**	**2,506,337.5**	**1,565,243.5**	**11,705,267**	**2.56**
DFS	**3,219,792.5**	**0**	**1,257,569**	**11,998,226**	**3,954,707.5**	**597,178.5**	**21,027,473.5**	**4.59**
DSNA	**13,352,655**	**0**	**5,079,512**	**5,983,274.5**	**4,227,380.5**	**1,288,325.5**	**29,931,147.5**	**6.53**
ENAIRE	**5,577,186.5**	**0**	**8,251,383**	**7,159,807**	**5,962.5**	**1,857.5**	**20,996,196.5**	**4.58**
ENAV	**9,601,715.5**	**0**	**4,197,606**	**2,902,019.5**	**618,205.5**	**20,653**	**17,340,199.5**	**3.79**
ESSP	**112,388.5**	**0**	**0**	**0**	**0**	**0**	**112,388.5**	**0.02**
EUROCONTROL	**2,605,994.5**	**0**	**1,989,450.5**	**3,251,817**	**664,000**	**687,000**	**9,198,262**	**2.01**
FABCE	**91,725**	**0**	**65,150**	**40,175**	**0**	**0**	**197,050**	**0.04**
FDG	**21,500**	**0**	**68,500**	**98,000**	**0**	**0**	**188,000**	**0.04**
FMG	**605,000**	**0**	**527,500**	**0**	**0**	**0**	**1,132,500**	**0.25**
Fraport	**196,000**	**0**	**477,500**	**0**	**0**	**0**	**673,500**	**0.15**
DGA	**1,055,560**	**0**	**4,500**	**2,250**	**0**	**0**	**1,062,310**	**0.23**
HCAA	**1,900**	**0**	**1,300**	**1,300**	**0**	**0**	**4,500**	**0**
HungaroControl	**511,856.5**	**0**	**360,320.5**	**337,581.5**	**2,393**	**745.5**	**1,212,897**	**0.26**
Inmarsat	**154,000**	**0**	**0**	**0**	**0**	**0**	**154,000**	**0.03**
IAA	**2,033,093.5**	**0**	**1,325,383**	**1,471,288**	**618,138**	**328,146**	**5,776,048.5**	**1.26**

MoD Italy	**2,116,184**	**0**	**928,750**	**60,000**	**130,000**	**0**	**3,234,934**	**0.71**
CPH	**539,963.5**	**0**	**899,911**	**98,619**	**0**	**0**	**1,538,493.5**	**0.34**
Leonardo	**509,994.5**	**0**	**0**	**0**	**0**	**0**	**509,994.5**	**0.11**
LFV	**2,203,974.5**	**0**	**1,853,361.5**	**2,181,787.5**	**679,361.5**	**342,526**	**7,261,011**	**1.59**
LPS	**27,168.5**	**0**	**13,527.5**	**11,230**	**0**	**0**	**51,926**	**0.01**
LVNL	**2,485,250**	**0**	**3,093,725**	**6,019,327.5**	**5,898,846.5**	**226,144.5**	**17,723,293.5**	**3.87**
MAN	**3,188,867.5**	**0**	**1,085,180.5**	**267,337.5**	**27,732.5**	**860**	**4,569,978**	**1**
Météo FR	**176,500**	**0**	**134,500**	**9,000**	**0**	**0**	**320,000**	**0.07**
NAV Portugal	**428,821**	**0**	**32,049**	**27,043**	**0**	**0**	**487,913**	**0.11**
NAVIAIR	**2,056,109**	**0**	**1,546,031**	**1,798,535**	**581,847.5**	**246,526**	**6,229,048.5**	**1.36**
PANSA	**582,902.5**	**0**	**234,672.5**	**80,909**	**73,957.5**	**142.5**	**972,584**	**0.21**
PORTUGÁLIA	**128,054.8**	**0**	**0**	**0**	**0**	**0**	**128,054.8**	**0.03**
ROMATSA	**74,446**	**0**	**55,181**	**30,431.5**	**2,393**	**745.5**	**163,197**	**0.04**
Ryanair	**333,131.5**	**0**	**115,133**	**265,894**	**34,893**	**21,245.5**	**770,297**	**0.17**
Sabre	**20,000**	**0**	**263,000**	**989,000**	**600,000**	**550,000**	**2,422,000**	**0.53**
S.E.A.	**3,242,000**	**0**	**483,500**	**9,500**	**0**	**0**	**3,735,000**	**0.82**
SITA	**398,700**	**0**	**0**	**0**	**0**	**0**	**398,700**	**0.09**
SCL (KZPS)	**34,662.5**	**0**	**23,650**	**16,987.5**	**0**	**0**	**75,300**	**0.02**
SMATSA	**33,600**	**0**	**16,800**	**14,000**	**0**	**0**	**64,400**	**0.01**
Air France	**786,457**	**0**	**416,044.5**	**500,818.5**	**491,522**	**161,544.5**	**2,356,386.5**	**0.51**
ES AF	**44,135.5**	**0**	**36,337.5**	**36,337.5**	**0**	**0**	**116,810.5**	**0.03**
STAL	**516,050**	**0**	**528,782.5**	**142,500**	**0**	**0**	**1,187,332.5**	**0.26**
ORO NAVIGACIJA	**70,500**	**0**	**41,250**	**157,250**	**7,500**	**0**	**276,500**	**0.06**
Swedavia	**1,102,757**	**0**	**653,062**	**402,876**	**162,087**	**60,439**	**2,381,221**	**0.52**

Thales	**75,457**	**0**	**0**	**0**	**0**	**0**	**75,457**	**0.02**
DAA PLC	**850,000**	**0**	**3,100,000**	**0**	**0**	**0**	**3,950,000**	**0.86**
VIE	**70,000**	**0**	**190,000**	**140,000**	**0**	**0**	**400,000**	**0.09**
PLUS	**84,134.5**	**0**	**0**	**0**	**0**	**0**	**84,134.5**	**0.02**
NATS	**119,309**	**0**	**65,733**	**63,171**	**25,647.5**	**7,990.5**	**281,851**	**0.06**
British Airways	**18,038**	**0**	**9,938**	**9,551**	**3,877.5**	**1,208**	**42,612.5**	**0.01**
easyJet	**4,831.5**	**0**	**2,662**	**2,558**	**1,038.5**	**323.5**	**11,413.5**	**0**
SDAG	**84,056**	**0**	**46,310.5**	**44,505.5**	**18,069.5**	**5,629.5**	**198,571**	**0.04**

Table 3: Indicative breakdown per beneficiary of the maximum CEF contribution (EUR)

	Estimated contribution	Pro-rata share of the maximum CEF contribution (%)
SDA	939,592	0.41%
Côte d'Azur	9,505,855	4.16%
ADP	4,422,100	1.94%
ADR	6,810,799	2.98%
Airtel	288,750	0.13%
ALTYS	276,018	0.12%
ANS Finland	90,000	0.04%
Arinc	73,000	0.03%
Austro Control	5,642,132	2.47%
Belgocontrol	688,704	0.3%
BR&TE	519,250	0.23%
BAC	11,094,640	4.86%
BULATSA	52,755	0.02%
Croatia Control	5,219,825	2.29%
Lufthansa	11,705,267	5.13%
DFS	21,027,474	9.21%
DSNA	29,931,148	13.11%
ENAIRE	20,996,197	9.19%
ENAV	17,340,200	7.59%
ESSP	112,389	0.05%
EUROCONTROL	9,198,262	4.03%
FABCE	197,050	0.09%
FDG	188,000	0.08%
FMG	1,132,500	0.5%
Fraport	673,500	0.29%
DGA	1,062,310	0.47%
HCAA	4,500	0%
HungaroControl	1,212,897	0.53%
Inmarsat	154,000	0.07%

IAA	**5,776,049**	**2.53%**
MoD Italy	**3,234,934**	**1.42%**
CPH	**1,538,494**	**0.67%**
Leonardo	**509,995**	**0.22%**
LFV	**7,261,011**	**3.18%**
LPS	**51,926**	**0.02%**
LVNL	**17,723,294**	**7.76%**
MAN	**4,569,978**	**2%**
Météo FR	**320,000**	**0.14%**
NAV Portugal	**487,913**	**0.21%**
NAVIAIR	**6,229,049**	**2.73%**
PANSA	**972,584**	**0.43%**
PORTUGÁLIA	**128,055**	**0.06%**
ROMATSA	**163,197**	**0.07%**
Ryanair	**770,297**	**0.34%**
Sabre	**2,422,000**	**1.06%**
S.E.A.	**3,735,000**	**1.64%**
SITA	**398,700**	**0.17%**
SCL (KZPS)	**75,300**	**0.03%**
SMATSA	**64,400**	**0.03%**
Air France	**2,356,387**	**1.03%**
ES AF	**116,811**	**0.05%**
STAL	**1,187,333**	**0.52%**
ORO NAVIGACIJA	**276,500**	**0.12%**
Swedavia	**2,381,221**	**1.04%**
Thales	**75,457**	**0.03%**
DAA PLC	**3,950,000**	**1.73%**
VIE	**400,000**	**0.18%**
PLUS	**84,135**	**0.04%**
NATS	**281,851**	**0.12%**
British Airways	**42,613**	**0.02%**
easyJet	**11,414**	**0%**
SDAG	**198,571**	**0.09%**

Total	**228,353,574**	**100%**