



GRANT AGREEMENT

FOR MEMBERS² NUMBER — 734143 — PJ10 PROSA

This **Agreement** ('the Agreement') is **between** the following parties:

on the one part,

The Single European Sky ATM (Air Traffic Management) Research Joint Undertaking ('the JU'), a joint undertaking within the meaning of Article 187 of the Treaty on the Functioning of the European Union¹, set-up by Council Regulation (EC) No 219/2007 of 27 February 2007 on the establishment of a Joint Undertaking to develop the new generation European air traffic management system², as amended by Council Regulation (EC) No 1361/2008 of 16 December 2008³ and by Council Regulation (EU) No 721/2014 of 16 June 2014⁴

represented for the purposes of signature of this Framework Partnership Agreement by its Executive Director M. Florian GUILLERMET,

and

on the other part,

1. 'the coordinator':

DFS DEUTSCHE FLUGSICHERUNG GMBH (DFS) GMBH, HRB34977, established in AM DFS CAMPUS 10, LANGEN 63225, Germany, DE114110232 represented for the purposes of signing the Agreement by SESAR Programme Manager, Gerhard TAUSS

and the following other beneficiaries, if they sign their 'Accession Form' (see Annex 3 and Article 56):

2. **AIRBUS SAS (AIRBUS) SAS**, 383474814, established in rd point Maurice Bellonte 1, BLAGNAC 31707, France, FR89383474814

3. **NAVIAIR (Naviair/COOPANS) DK18**, 26059763, established in NAVIAIR ALLE 1, KASTRUP 2770, Denmark, DK26059763

4. **DIRECTION DES SERVICES DE LA NAVIGATION AERIENNE (DSNA)**, 120064019, established in 50 RUE HENRY FARMAN, PARIS 75720, France, FR29120064019

5. **ENTIDAD PUBLICA EMPRESARIAL ENAIRE (ENAIRE)**, established in CALLE ARTURO SORIA 109, MADRID 28043, Spain, ESQ2822001J

6. **ENAV SPA (ENAV) SPA**, 965162/CF97016000586, established in VIA SALARIA 716, ROMA 00138, Italy, IT02152021008

² 'Members' means "members of the Joint Undertaking" as defined under Article 1(2) and 1(3) of the Statutes of the JU, Annex to the SESAR Regulation.

¹ OJ C 326, 26.10.2012, p. 47–390.

² OJ L 64, 2.3.2007, p. 1–11.

³ OJ L 352, 31.12.2008, p. 12–17.

⁴ OJ L 192, 1.7.2014, p. 1–8.

7. **LEONARDO - FINMECCANICA SPA (FINMECCANICA)** SPA, 7031/CF00401990585, established in PIAZZA MONTE GRAPPA 4, ROMA 00195, Italy, IT00881841001
8. **SKYGUIDE, SA SUISSE POUR LES SERVICES DE LA NAVIGATION AERIENNE CIVILS ET MILITAIRES (SKYGUIDE)** SA, CH03530005515, established in ROUTE DE PRE BOIS 15-17, GENEVA 1215, Switzerland, CH514204
9. **SAAB AKTIEBOLAG (SAAB (NATMIG))** AB, 5560360793, established in ., LINKOPING 58188, Sweden, SE556036079301
10. **NATS (EN ROUTE) PUBLIC LIMITED COMPANY (NATS)** LTD, 04129273, established in 4000 PARKWAY WHITELEY, FAREHAM PO15 7FL, United Kingdom, GB440379456
11. **DASSAULT AVIATION (DASSAULT)** FR39, 712042456, established in 9 ROND POINT CHAMPS-ELYSEES-MARCEL DASSAULT, PARIS 75008, France, FR73712042456
12. **THALES AIR SYSTEMS SAS (THALES AIR SYS)** SAS, 319159877, established in AVENUE CHARLES LINDBERGH 3, RUNGIS 94150, France, FR15319159877
13. **INDRA SISTEMAS SA (INDRA)** SA, M11339, established in AVENIDA DE BRUSELAS 35, ALCOBENDAS MADRID 28108, Spain, ESA28599033
14. **EUROCONTROL - EUROPEAN ORGANISATION FOR THE SAFETY OF AIR NAVIGATION (EUROCONTROL)**, N/A, established in Rue de la Fusée 96, BRUXELLES 1130, Belgium, not applicable as ‘beneficiary not receiving JU funding’ (see Article 9),
15. **RIZENI LETOVEHO PROVOZU CESKE REPUBLIKY STATNI PODNIK (ANS CR (B4))** SP, 49710371, established in Navigacni 787, Jenec 25261, Czech Republic, CZ49710371
16. **FREQUENTIS AG (FRQ (FSP))** AG, FN72115B, established in Innovationsstrasse 1, WIEN 1100, Austria, ATU14715600
17. **DEUTSCHES ZENTRUM FUER LUFT - UND RAUMFAHRT EV (DLR (AT-One))** EV, VR2780, established in Linder Hoehe, KOELN 51147, Germany, DE121965658
18. **AUSTRO CONTROL OSTERREICHISCHE GESELLSCHAFT FUR ZIVILLUFTFAHRT MBH (ACG/COOPANS)** GMBH, FN71000M, established in WAGRAMER STRASSE 19, WIEN 1220, Austria, ATU37259408
19. **CROATIA CONTROL, CROATIAN AIR NAVIGATION SERVICES LTD (CCL/COOPANS)** DOO, 080328617, established in RUDOLFA FIZIRA 2, VELIKA GORICA 10410, Croatia, HR33052761319
20. **UDARAS EITLIOCHTA NA HEIREANN THE IRISH AVIATION AUTHORITY (IAA/COOPANS)** LTD, 211082, established in D'OLIER STREET 11-12 THE TIMES BUILDING, DUBLIN D02 T449, Ireland, IE8211082B
21. **LUFTFARTSVERKET (LFV/COOPANS)**, 2021000795, established in HOSPITALSGATAN 30, NORRKOPING 602 27, Sweden, SE202100079501
22. **AIRTEL ATN LIMITED (AIRTEL (NATMIG))** LTD, 287698, established in 2 HARBOUR SQUARE CROFTON ROAD, DUN LOAGHAIRE DUBLIN A96D6R0, Ireland, IE8287698U
23. **STIFTELSEN SINTEF (SINTEF (NATMIG))** NO1, 948007029, established in STRINDVEIEN 4, TRONDHEIM 7034, Norway, NO948007029MVA
24. **LETOVE PREVADZKOVE SLUZBY SLOVENSKEJ REPUBLIKY, STATNY PODNIK (LPS SR (B4))** SK9, 35778458, established in IVANSKA CESTA 93, BRATISLAVA 823 07, Slovakia, SK2020244699
25. **VALSTYBES IMONE ORO NAVIGACIJA (ON (B4))** LT7, 210060460, established in RODUNIOS KEL 2, VILNIAUS 02188, Lithuania, LT100604610

26. **POLSKA AGENCJA ZEGLUGI POWIETRZNEJ (PANSA (B4))**, 140886771, established in UL. WIEZOWA 8, WARSZAWA 02 147, Poland, PL5222838321

27. **HUNGAROCONTROL MAGYAR LEGIFORGALMI SZOLGALAT ZARTKORUEN MUKODO RESZVENYTARSASAG (HC (FSP)) RT**, 0110045570, established in IGLO UTCA 33 35, BUDAPEST 1185, Hungary, HU13851325

28. **ATOS BELGIUM (ATOS (FSP)) NV**, 401848135, established in DA VINCILAAN 5, ZAVENTEM 1930, Belgium, BE0401848135

29. **STICHTING NATIONAAL LUCHT- EN RUIMTEVAARTLABORATORIUM (NLR (AT-One)) NL6**, 41150373, established in Anthony Fokkerweg 2, AMSTERDAM 1059CM, Netherlands, NL002760551B01

Unless otherwise specified, references to ‘beneficiary’ or ‘beneficiaries’ include the coordinator.

The parties referred to above have agreed to enter into the Agreement under the terms and conditions below.

By signing the Agreement or the Accession Form , the beneficiaries accept the grant and agree to implement it under their own responsibility and in accordance with the Agreement, with all the obligations and conditions it sets out.

The Agreement is composed of:

Terms and Conditions

Annex 1 Description of the action

Annex 2 Estimated budget for the action

Annex 3 Accession Forms

3a Declaration on joint and several liability of linked third parties

Annex 4 Model for the financial statements

Annex 5 Model for the certificate on the financial statements

Annex 6 Model for the certificate on the methodology

TERMS AND CONDITIONS

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CHAPTER 1 GENERAL

ARTICLE 1 — SUBJECT OF THE AGREEMENT

This Agreement sets out the rights and obligations and the terms and conditions applicable to the grant awarded to the beneficiaries for implementing the action set out in Chapter 2.

CHAPTER 2 ACTION

ARTICLE 2 — ACTION TO BE IMPLEMENTED — COMPLEMENTARY GRANT

The grant is awarded for the action entitled ‘**Controller Tools and Team Organisation for the Provision of Separation in Air Traffic Management — PJ10 PROSA**’ (‘**action**’), as described in Annex 1.

The grant is a ‘**complementary grant**’ to the grant agreement(s) under the call(s) for proposals H2020-SESAR-2015-2.

ARTICLE 3 — DURATION AND STARTING DATE OF THE ACTION

The duration of the action will be **38 months** as of the first day of the month following the date the Agreement enters into force (see Article 58) (‘**starting date of the action**’).

ARTICLE 4 — ESTIMATED BUDGET AND BUDGET TRANSFERS

4.1 Estimated budget

The ‘**estimated budget**’ for the action is set out in Annex 2.

It contains the estimated eligible costs and the forms of costs, broken down by beneficiary (and linked third party) and budget category (see Articles 5, 6, and 14). It also contains the estimated costs of the beneficiaries not receiving JU funding (see Article 9).

4.2 Budget transfers

The estimated budget breakdown indicated in Annex 2 may be adjusted by transfers of amounts between beneficiaries or between budget categories (or both). This does not require an amendment according to Article 55, if the action is implemented as described in Annex 1.

However, the beneficiaries may not add costs relating to subcontracts not provided for in Annex 1, unless such additional subcontracts are approved by an amendment or in accordance with Article 13.

CHAPTER 3 GRANT

ARTICLE 5 — GRANT AMOUNT, FORM OF GRANT, REIMBURSEMENT RATES AND FORMS OF COSTS

5.1 Maximum grant amount

The ‘**maximum grant amount**’ is EUR **5,352,250.18** (five million three hundred and fifty two thousand two hundred and fifty EURO and eighteen eurocents).

5.2 Form of grant, reimbursement rates and forms of costs

The grant reimburses **70% of the action's eligible costs** (see Article 6) (‘**reimbursement of eligible costs grant**’) (see Annex 2).

The estimated eligible costs of the action are EUR **37,697,886.99** (thirty seven million six hundred and ninety seven thousand eight hundred and eighty six EURO and ninety nine eurocents).

Eligible costs (see Article 6) must be declared under the following forms (‘**forms of costs**’):

(a) for **direct personnel costs**:

- as actually incurred costs (‘**actual costs**’) or
- on the basis of an amount per unit calculated by the beneficiary in accordance with its usual cost accounting practices (‘**unit costs**’).

Personnel costs for **SME owners or beneficiaries that are natural persons** not receiving a salary (see Article 6.2, Points A.4 and A.5) must be declared on the basis of the amount per unit set out in Annex 2 (**unit costs**);

(b) for **direct costs for subcontracting**: as actually incurred costs (**actual costs**);

(c) for **direct costs of providing financial support to third parties**: not applicable;

(d) for **other direct costs**: as actually incurred costs (**actual costs**);

(e) for **indirect costs**: on the basis of a flat-rate applied as set out in Article 6.2, Point E (‘**flat-rate costs**’);

(f) **specific cost category(ies)**: not applicable.

5.3 Final grant amount — Calculation

The ‘**final grant amount**’ depends on the actual extent to which the action is implemented in accordance with the Agreement’s terms and conditions.

This amount is calculated by the JU — when the payment of the balance is made (see Article 21.4) — in the following steps:

Step 1 – Application of the reimbursement rates to the eligible costs

Step 2 – Limit to the maximum grant amount

Step 3 – Reduction due to the no-profit rule

Step 4 – Reduction due to improper implementation or breach of other obligations

5.3.1 Step 1 — Application of the reimbursement rates to the eligible costs

The reimbursement rate(s) (see Article 5.2) are applied to the eligible costs (actual costs, unit costs and flat-rate costs; see Article 6) declared by the beneficiaries and linked third parties (see Article 20) and approved by the JU (see Article 21).

5.3.2 Step 2 — Limit to the maximum grant amount

If the amount obtained following Step 1 is higher than the maximum grant amount set out in Article 5.1, it will be limited to the latter.

5.3.3 Step 3 — Reduction due to the no-profit rule

The grant must not produce a profit.

‘**Profit**’ means the surplus of the amount obtained following Steps 1 and 2 plus the action’s total receipts, over the action’s total eligible costs.

The ‘**action’s total eligible costs**’ are the consolidated total eligible costs approved by the JU.

The ‘**action’s total receipts**’ are the consolidated total receipts generated during its duration (see Article 3).

The following are considered **receipts**:

- (a) income generated by the action; if the income is generated from selling equipment or other assets purchased under the Agreement, the receipt is up to the amount declared as eligible under the Agreement;
- (b) financial contributions given by third parties to the beneficiary or to a linked third party specifically to be used for the action, and
- (c) in-kind contributions provided by third parties free of charge and specifically to be used for the action, if they have been declared as eligible costs.

The following are however not considered receipts:

- (a) income generated by exploiting the action’s results (see Article 28);
- (b) financial contributions by third parties, if they may be used to cover costs other than the eligible costs (see Article 6);
- (c) financial contributions by third parties with no obligation to repay any amount unused at the end of the period set out in Article 3.

If there is a profit, it will be deducted from the amount obtained following Steps 1 and 2.

5.3.4 Step 4 — Reduction due to improper implementation or breach of other obligations — Reduced grant amount — Calculation

If the grant is reduced (see Article 43), the JU will calculate the reduced grant amount by deducting the amount of the reduction (calculated in proportion to the improper implementation of the action or to the seriousness of the breach of obligations in accordance with Article 43.2) from the maximum grant amount set out in Article 5.1.

The final grant amount will be the lower of the following two:

- the amount obtained following Steps 1 to 3 or
- the reduced grant amount following Step 4.

5.4 Revised final grant amount — Calculation

If — after the payment of the balance (in particular, after checks, reviews, audits or investigations; see Article 22) — the JU rejects costs (see Article 42) or reduces the grant (see Article 43), it will calculate the ‘**revised final grant amount**’ for the beneficiary concerned by the findings.

This amount is calculated by the JU on the basis of the findings, as follows:

- in case of **rejection of costs**: by applying the reimbursement rate to the revised eligible costs approved by the JU for the beneficiary concerned;
- in case of **reduction of the grant**: by calculating the concerned beneficiary’s share in the grant amount reduced in proportion to its improper implementation of the action or to the seriousness of its breach of obligations (see Article 43.2).

In case of **rejection of costs and reduction of the grant**, the revised final grant amount for the beneficiary concerned will be the lower of the two amounts above.

ARTICLE 6 — ELIGIBLE AND INELIGIBLE COSTS

6.1 General conditions for costs to be eligible

‘**Eligible costs**’ are costs that meet the following criteria:

(a) for **actual costs**:

- (i) they must be actually incurred by the beneficiary;
- (ii) they must be incurred in the period set out in Article 3, with the exception of costs relating to the submission of the periodic report for the last reporting period and the final report (see Article 20);
- (iii) they must be indicated in the estimated budget set out in Annex 2;
- (iv) they must be incurred in connection with the action as described in Annex 1 and necessary for its implementation;
- (v) they must be identifiable and verifiable, in particular recorded in the beneficiary’s accounts in accordance with the accounting standards applicable in the country where the beneficiary is established and with the beneficiary’s usual cost accounting practices;

- (vi) they must comply with the applicable national law on taxes, labour and social security, and
- (vii) they must be reasonable, justified and must comply with the principle of sound financial management, in particular regarding economy and efficiency;

(b) for **unit costs**:

(i) they must be calculated as follows:

{amounts per unit set out in Annex 2 or calculated by the beneficiary in accordance with its usual cost accounting practices (see Article 6.2, Point A)

multiplied by

the number of actual units};

(ii) the number of actual units must comply with the following conditions:

- the units must be actually used or produced in the period set out in Article 3;
- the units must be necessary for implementing the action or produced by it, and
- the number of units must be identifiable and verifiable, in particular supported by records and documentation (see Article 18);

(c) for **flat-rate costs**:

(i) they must be calculated by applying the flat-rate set out in Annex 2, and

(ii) the costs (actual costs or unit costs) to which the flat-rate is applied must comply with the conditions for eligibility set out in this Article.

6.2 Specific conditions for costs to be eligible

Costs are eligible if they comply with the general conditions (see above) and the specific conditions set out below for each of the following budget categories:

- A. direct personnel costs;
- B. direct costs of subcontracting;
- C. not applicable;
- D. other direct costs;
- E. indirect costs;
- F. not applicable.

‘Direct costs’ are costs that are directly linked to the action implementation and can therefore be attributed to it directly. They must not include any indirect costs (see Point E below).

‘Indirect costs’ are costs that are not directly linked to the action implementation and therefore cannot be attributed directly to it.

A. Direct personnel costs

Types of eligible personnel costs

A.1 **Personnel costs** are eligible, if they are related to personnel working for the beneficiary under an employment contract (or equivalent appointing act) and assigned to the action (**‘costs for employees (or equivalent)’**). They must be limited to salaries (including during parental leave), social security contributions, taxes and other costs included in the **remuneration**, if they arise from national law or the employment contract (or equivalent appointing act).

Beneficiaries that are non-profit legal entities⁵ may also declare as personnel costs **additional remuneration** for personnel assigned to the action (including payments on the basis of supplementary contracts regardless of their nature), if:

- (a) it is part of the beneficiary’s usual remuneration practices and is paid in a consistent manner whenever the same kind of work or expertise is required;
- (b) the criteria used to calculate the supplementary payments are objective and generally applied by the beneficiary, regardless of the source of funding used.

Additional remuneration for personnel assigned to the action is eligible up to the following amount:

- (a) if the person works full time and exclusively on the action during the full year: up to EUR 8 000;
- (b) if the person works exclusively on the action but not full-time or not for the full year: up to the corresponding pro-rata amount of EUR 8 000, or
- (c) if the person does not work exclusively on the action: up to a pro-rata amount calculated as follows:
 - {{EUR 8 000
 - divided by
 - the number of annual productive hours (see below)},
 - multiplied by
 - the number of hours that the person has worked on the action during the year}.

A.2 The **costs for natural persons working under a direct contract** with the beneficiary other than an employment contract are eligible personnel costs, if:

- (a) the person works under the beneficiary’s instructions and, unless otherwise agreed with the beneficiary, on the beneficiary’s premises;
- (b) the result of the work carried out belongs to the beneficiary, and

⁵ For the definition, see Article 2.1(14) of the Rules for Participation Regulation No 1290/2013: ‘**non-profit legal entity**’ means a legal entity which by its legal form is non-profit-making or which has a legal or statutory obligation not to distribute profits to its shareholders or individual members.

(c) the costs are not significantly different from those for personnel performing similar tasks under an employment contract with the beneficiary.

A.3 The **costs of personnel seconded by a third party against payment** are eligible personnel costs, if the conditions in Article 11.1 are met.

A.4 **Costs of owners** of beneficiaries that are small and medium-sized enterprises (**'SME owners'**) who are working on the action and who do not receive a salary are eligible personnel costs, if they correspond to the amount per unit set out in Annex 2 multiplied by the number of actual hours worked on the action.

A.5 **Costs of 'beneficiaries that are natural persons'** not receiving a salary are eligible personnel costs, if they correspond to the amount per unit set out in Annex 2 multiplied by the number of actual hours worked on the action.

Calculation

Personnel costs must be calculated by the beneficiaries as follows:

{hourly rate
multiplied by
the number of actual hours worked on the action},
plus
for non-profit legal entities: additional remuneration to personnel assigned to the action under the conditions set out above (Point A.1)}.

The number of actual hours declared for a person must be identifiable and verifiable (see Article 18).

The total number of hours declared in JU, EU or Euratom grants, for a person for a year, cannot be higher than the annual productive hours used for the calculations of the hourly rate. Therefore, the maximum number of hours that can be declared for the grant is:

{the number of annual productive hours for the year (see below)
minus
total number of hours declared by the beneficiary for that person in that year for other JU, EU or Euratom grants}.

The **'hourly rate'** is one of the following:

(a) for personnel costs declared as **actual costs**: the hourly rate is the amount calculated as follows:

{actual annual personnel costs (excluding additional remuneration) for the person
divided by
number of annual productive hours}.

The beneficiaries must use the annual personnel costs and the number of annual productive hours for each financial year covered by the reporting period. If a financial year is not closed

at the end of the reporting period, the beneficiaries must use the hourly rate of the last closed financial year available.

For the ‘number of annual productive hours’, the beneficiaries may choose one of the following:

- (i) ‘fixed number of hours’: 1 720 hours for persons working full time (or corresponding pro-rata for persons not working full time);
- (ii) ‘individual annual productive hours’: the total number of hours worked by the person in the year for the beneficiary, calculated as follows:

{annual workable hours of the person (according to the employment contract, applicable collective labour agreement or national law)

plus

overtime worked

minus

absences (such as sick leave and special leave)}.

‘Annual workable hours’ means the period during which the personnel must be working, at the employer’s disposal and carrying out his/her activity or duties under the employment contract, applicable collective labour agreement or national working time legislation.

If the contract (or applicable collective labour agreement or national working time legislation) does not allow to determine the annual workable hours, this option cannot be used;

- (iii) ‘standard annual productive hours’: the ‘standard number of annual hours’ generally applied by the beneficiary for its personnel in accordance with its usual cost accounting practices. This number must be at least 90% of the ‘standard annual workable hours’.

If there is no applicable reference for the standard annual workable hours, this option cannot be used.

For all options, the actual time spent on **parental leave** by a person assigned to the action may be deducted from the number of annual productive hours;

- (b) for personnel costs declared on the basis of **unit costs**: the hourly rate is one of the following:

- (i) for SME owners or beneficiaries that are natural persons: the hourly rate set out in Annex 2 (see Points A.4 and A.5 above), or
- (ii) for personnel costs declared on the basis of the beneficiary’s usual cost accounting practices: the hourly rate calculated by the beneficiary in accordance with its usual cost accounting practices, if:
 - the cost accounting practices used are applied in a consistent manner, based on objective criteria, regardless of the source of funding;

- the hourly rate is calculated using the actual personnel costs recorded in the beneficiary's accounts, excluding any ineligible cost or costs included in other budget categories.

The actual personnel costs may be adjusted by the beneficiary on the basis of budgeted or estimated elements. Those elements must be relevant for calculating the personnel costs, reasonable and correspond to objective and verifiable information;

and

- the hourly rate is calculated using the number of annual productive hours (see above).

B. Direct costs of subcontracting (including related duties, taxes and charges such as non-deductible value added tax (VAT) paid by the beneficiary) are eligible if the conditions in Article 13.1.1 are met.

C. Direct costs of providing financial support to third parties not applicable.

D. Other direct costs

D.1 Travel costs and related subsistence allowances (including related duties, taxes and charges such as non-deductible value added tax (VAT) paid by the beneficiary) are eligible if they are in line with the beneficiary's usual practices on travel.

D.2 The depreciation costs of equipment, infrastructure or other assets (new or second-hand) as recorded in the beneficiary's accounts are eligible, if they were purchased in accordance with Article 10.1.1 and written off in accordance with international accounting standards and the beneficiary's usual accounting practices.

The **costs of renting or leasing** equipment, infrastructure or other assets (including related duties, taxes and charges such as non-deductible value added tax (VAT) paid by the beneficiary) are also eligible, if they do not exceed the depreciation costs of similar equipment, infrastructure or assets and do not include any financing fees.

The costs of equipment, infrastructure or other assets **contributed in-kind against payment** are eligible, if they do not exceed the depreciation costs of similar equipment, infrastructure or assets, do not include any financing fees and if the conditions in Article 11.1 are met.

The only portion of the costs that will be taken into account is that which corresponds to the duration of the action and rate of actual use for the purposes of the action.

D.3 Costs of other goods and services (including related duties, taxes and charges such as non-deductible value added tax (VAT) paid by the beneficiary) are eligible, if they are:

- (a) purchased specifically for the action and in accordance with Article 10.1.1 or
- (b) contributed in kind against payment and in accordance with Article 11.1.

Such goods and services include, for instance, consumables and supplies, dissemination (including open access), protection of results, certificates on the financial statements (if they are required by the Agreement), certificates on the methodology, translations and publications.

D.4 **Capitalised and operating costs of ‘large research infrastructure’⁶** directly used for the action are eligible, if:

- (a) the value of the large research infrastructure represents at least 75% of the total fixed assets (at historical value in its last closed balance sheet before the date of the signature of the Agreement or as determined on the basis of the rental and leasing costs of the research infrastructure⁷);
- (b) the beneficiary’s methodology for declaring the costs for large research infrastructure has been positively assessed by the Commission (‘**ex-ante assessment**’);
- (c) the beneficiary declares as direct eligible costs only the portion which corresponds to the duration of the action and the rate of actual use for the purposes of the action, and
- (d) they comply with the conditions as further detailed in the annotations to the H2020 grant agreements.

E. Indirect costs

Indirect costs are eligible if they are declared on the basis of the flat-rate of 25% of the eligible direct costs (see Article 5.2 and Points A to D above), from which are excluded:

- (a) costs of subcontracting and
- (b) costs of in-kind contributions provided by third parties which are not used on the beneficiary’s premises;
- (c) not applicable;
- (d) not applicable.

⁶ ‘**Large research infrastructure**’ means research infrastructure of a total value of at least EUR 20 million, for a beneficiary, calculated as the sum of historical asset values of each individual research infrastructure of that beneficiary, as they appear in its last closed balance sheet before the date of the signature of the Agreement or as determined on the basis of the rental and leasing costs of the research infrastructure.

⁷ For the definition, see Article 2(6) of Regulation (EU) No 1291/2013 of the European Parliament and of the Council of 11 December 2013 establishing Horizon 2020 - the Framework Programme for Research and Innovation (2014-2020) (OJ L 347, 20.12.2013 p.104)-(‘**Horizon 2020 Framework Programme Regulation No 1291/2013**’): ‘**Research infrastructure**’ are facilities, resources and services that are used by the research communities to conduct research and foster innovation in their fields. Where relevant, they may be used beyond research, e.g. for education or public services. They include: major scientific equipment (or sets of instruments); knowledge-based resources such as collections, archives or scientific data; e-infrastructures such as data and computing systems and communication networks; and any other infrastructure of a unique nature essential to achieve excellence in research and innovation. Such infrastructures may be ‘single-sited’, ‘virtual’ or ‘distributed’.

Beneficiaries receiving an operating grant⁸ financed by the EU or Euratom budget cannot declare indirect costs for the period covered by the operating grant.

F. Specific cost category(ies)

Not applicable

6.3 Conditions for costs of linked third parties to be eligible

Costs incurred by linked third parties are eligible if they fulfil — *mutatis mutandis* — the general and specific conditions for eligibility set out in this Article (Article 6.1 and 6.2) and Article 14.1.1.

6.4 Conditions for in-kind contributions provided by third parties free of charge to be eligible

In-kind contributions provided free of charge are eligible direct costs (for the beneficiary or linked third party), if the costs incurred by the third party fulfil — *mutatis mutandis* — the general and specific conditions for eligibility set out in this Article (Article 6.1 and 6.2) and Article 12.1.

6.5 Ineligible costs

‘**Ineligible costs**’ are:

(a) costs that do not comply with the conditions set out above (Article 6.1 to 6.4), in particular:

- (i) costs related to return on capital;
- (ii) debt and debt service charges;
- (iii) provisions for future losses or debts;
- (iv) interest owed;
- (v) doubtful debts;
- (vi) currency exchange losses;
- (vii) bank costs charged by the beneficiary’s bank for transfers from the JU;
- (viii) excessive or reckless expenditure;
- (ix) deductible VAT;
- (x) costs incurred during suspension of the implementation of the action (see Article 49);

(b) costs declared under another JU, EU or Euratom grant (including other grants awarded by the JU, grants awarded by a Member State and financed by the EU or Euratom budget and

⁸ For the definition, see Article 121(1)(b) of Regulation (EU, Euratom) No 966/2012 of the European Parliament and of the Council of 25 October 2012 on the financial rules applicable to the general budget of the Union and repealing Council Regulation (EC, Euratom) No 1605/2002 (OJ L 218, 26.10.2012, p.1) (‘**Financial Regulation No 966/2012**’): ‘**operating grant**’ means direct financial contribution, by way of donation, from the budget in order to finance the functioning of a body which pursues an aim of general EU interest or has an objective forming part of and supporting an EU policy.

grants awarded by bodies other than the JU for the purpose of implementing the EU or Euratom budget); in particular, indirect costs if the beneficiary is already receiving an operating grant financed by the EU or Euratom budget in the same period.

6.6 Consequences of declaration of ineligible costs

Declared costs that are ineligible will be rejected (see Article 42).

This may also lead to any of the other measures described in Chapter 6.

CHAPTER 4 RIGHTS AND OBLIGATIONS OF THE PARTIES

SECTION 1 RIGHTS AND OBLIGATIONS RELATED TO IMPLEMENTING THE ACTION

ARTICLE 7 — GENERAL OBLIGATION TO PROPERLY IMPLEMENT THE ACTION

7.1 General obligation to properly implement the action

The beneficiaries must implement the action as described in Annex 1 and in compliance with the provisions of the Agreement and all legal obligations under applicable EU, international and national law.

7.2 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the grant may be reduced (see Article 43).

Such breaches may also lead to any of the other measures described in Chapter 6.

ARTICLE 8 — RESOURCES TO IMPLEMENT THE ACTION — THIRD PARTIES INVOLVED IN THE ACTION

The beneficiaries must have the appropriate resources to implement the action.

If it is necessary to implement the action, the beneficiaries may:

- purchase goods, works and services (see Article 10);
- use in-kind contributions provided by third parties against payment (see Article 11);
- use in-kind contributions provided by third parties free of charge (see Article 12);
- call upon subcontractors to implement action tasks described in Annex 1 (see Article 13);
- call upon linked third parties to implement action tasks described in Annex 1 (see Article 14).

In these cases, the beneficiaries retain sole responsibility towards the JU and the other beneficiaries for implementing the action.

ARTICLE 9 — IMPLEMENTATION OF ACTION TASKS BY BENEFICIARIES NOT RECEIVING JU FUNDING

9.1 Rules for the implementation of action tasks by beneficiaries not receiving JU funding

Beneficiaries not receiving JU funding must implement the action tasks attributed to them in Annex 1 according to Article 7.1.

Their costs are estimated in Annex 2 but:

- will not be reimbursed and
- will not be taken into account for the calculation of the grant (see Articles 5.2, 5.3 and 5.4, and 21).

Chapter 3, Articles 10 to 15, 18.1.2, 20.3(b), 20.4(b), 20.6, 21, 23a, 26.4, 27.2, 28.1 (with the exception of additional exploitation obligations), 28.2, 30.3, 31.5, 40, 42, 43, 44, 47 and 48 do not apply to these beneficiaries.

They will not be subject to financial checks, reviews and audits under Article 22.

Beneficiaries not receiving JU funding may provide in-kind contributions to another beneficiary. In this case, they will be considered as a third party for the purpose of Articles 11 and 12.

9.2 Consequences of non-compliance

If a beneficiary not receiving JU funding breaches any of its obligations under this Article, its participation of the Agreement may be terminated (see Article 50).

Such breaches may also lead to any of the other measures described in Chapter 6 that are applicable to it.

ARTICLE 10 — PURCHASE OF GOODS, WORKS OR SERVICES

10.1 Rules for purchasing goods, works or services

10.1.1 If necessary to implement the action, the beneficiaries may purchase goods, works or services.

The beneficiaries must make such purchases ensuring the best value for money or, if appropriate, the lowest price. In doing so, they must avoid any conflict of interests (see Article 35).

The beneficiaries must ensure that the JU, the Commission, the European Court of Auditors (ECA) and the European Anti-Fraud Office (OLAF) can exercise their rights under Articles 22 and 23 also towards their contractors.

10.1.2 Beneficiaries that are ‘contracting authorities’ within the meaning of Directive 2004/18/EC⁹ or ‘contracting entities’ within the meaning of Directive 2004/17/EC¹⁰ must comply with the applicable national law on public procurement.

⁹ Directive 2004/18/EC of the European Parliament and of the Council of 31 March 2004 on the coordination of procedures for the award of public work contracts, public supply contracts and public service contracts (OJ L 134, 30.04.2004, p. 114).

10.2 Consequences of non-compliance

If a beneficiary breaches any of its obligations under Article 10.1.1, the costs related to the contract concerned will be ineligible (see Article 6) and will be rejected (see Article 42).

If a beneficiary breaches any of its obligations under Article 10.1.2, the grant may be reduced (see Article 43).

Such breaches may also lead to any of the other measures described in Chapter 6.

ARTICLE 11 — USE OF IN-KIND CONTRIBUTIONS PROVIDED BY THIRD PARTIES AGAINST PAYMENT

11.1 Rules for the use of in-kind contributions against payment

If necessary to implement the action, the beneficiaries may use in-kind contributions provided by third parties against payment.

The beneficiaries may declare costs related to the payment of in-kind contributions as eligible (see Article 6.1 and 6.2), up to the third parties' costs for the seconded persons, contributed equipment, infrastructure or other assets or other contributed goods and services.

The third parties and their contributions must be set out in Annex 1. The JU may however approve in-kind contributions not set out in Annex 1 without amendment (see Article 55), if:

- they are specifically justified in the periodic technical report and
- their use does not entail changes to the Agreement which would call into question the decision awarding the grant or breach the principle of equal treatment of applicants.

The beneficiaries must ensure that the JU, the Commission, the European Court of Auditors (ECA) and the European Anti-Fraud Office (OLAF) can exercise their rights under Articles 22 and 23 also towards the third parties.

11.2 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the costs related to the payment of the in-kind contribution will be ineligible (see Article 6) and will be rejected (see Article 42).

Such breaches may also lead to any of the other measures described in Chapter 6.

ARTICLE 12 — USE OF IN-KIND CONTRIBUTIONS PROVIDED BY THIRD PARTIES FREE OF CHARGE

12.1 Rules for the use of in-kind contributions free of charge

If necessary to implement the action, the beneficiaries may use in-kind contributions provided by third parties free of charge.

¹⁰ Directive 2004/17/EC of the European Parliament and of the Council of 31 March 2004 coordinating the procurement procedures of entities operating in the water, energy, transport and postal services sectors (OJ L 134, 30.04.2004, p. 1).

The beneficiaries may declare costs incurred by the third parties for the seconded persons, contributed equipment, infrastructure or other assets or other contributed goods and services as eligible in accordance with Article 6.4.

The third parties and their contributions must be set out in Annex 1. The JU may however approve in-kind contributions not set out in Annex 1 without amendment (see Article 55), if:

- they are specifically justified in the periodic technical report and
- their use does not entail changes to the Agreement which would call into question the decision awarding the grant or breach the principle of equal treatment of applicants.

The beneficiaries must ensure that the JU, the Commission, the European Court of Auditors (ECA) and the European Anti-Fraud Office (OLAF) can exercise their rights under Articles 22 and 23 also towards the third parties.

12.2 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the costs incurred by the third parties related to the in-kind contribution will be ineligible (see Article 6) and will be rejected (see Article 42).

Such breaches may also lead to any of the other measures described in Chapter 6.

ARTICLE 13 — IMPLEMENTATION OF ACTION TASKS BY SUBCONTRACTORS

13.1 Rules for subcontracting action tasks

13.1.1 If necessary to implement the action, the beneficiaries may award subcontracts covering the implementation of certain action tasks described in Annex 1.

Subcontracting may cover only a limited part of the action.

The beneficiaries must award the subcontracts ensuring the best value for money or, if appropriate, the lowest price. In doing so, they must avoid any conflict of interests (see Article 35).

The tasks to be implemented and the estimated cost for each subcontract must be set out in Annex 1 and the total estimated costs of subcontracting per beneficiary must be set out in Annex 2. The JU may however approve subcontracts not set out in Annex 1 and 2 without amendment (see Article 55), if:

- they are specifically justified in the periodic technical report and
- they do not entail changes to the Agreement which would call into question the decision awarding the grant or breach the principle of equal treatment of applicants.

The beneficiaries must ensure that the JU, the Commission, the European Court of Auditors (ECA) and the European Anti-Fraud Office (OLAF) can exercise their rights under Articles 22 and 23 also towards their subcontractors.

13.1.2 The beneficiaries must ensure that their obligations under Articles 35, 36, 38 and 46 also apply to the subcontractors.

Beneficiaries that are ‘contracting authorities’ within the meaning of Directive 2004/18/EC or ‘contracting entities’ within the meaning of Directive 2004/17/EC must comply with the applicable national law on public procurement.

13.2 Consequences of non-compliance

If a beneficiary breaches any of its obligations under Article 13.1.1, the costs related to the subcontract concerned will be ineligible (see Article 6) and will be rejected (see Article 42).

If a beneficiary breaches any of its obligations under Article 13.1.2, the grant may be reduced (see Article 43).

Such breaches may also lead to any of the other measures described in Chapter 6.

ARTICLE 14 — IMPLEMENTATION OF ACTION TASKS BY LINKED THIRD PARTIES

14.1 Rules for calling upon linked third parties to implement part of the action

14.1.1 The following **affiliated entities**¹² and **third parties with a legal link to a beneficiary**¹³ (‘**linked third parties**’) may implement the action tasks attributed to them in Annex 1:

- DEUTSCHER WETTERDIENST (DWD), affiliated or linked to DFS
- AIRBUS DEFENCE AND SPACE SAS (AI DS Space), affiliated or linked to AIRBUS, if it has accepted joint and several liability with the beneficiary (see Annex 3a)
- AIRBUS OPERATIONS SAS (AI OPS), affiliated or linked to AIRBUS, if it has accepted joint and several liability with the beneficiary (see Annex 3a)
- SAFRAN ELECTRONICS & DEFENSE (SAFRAN), affiliated or linked to DSNA
- ECOLE NATIONALE DE L AVIATION CIVILE (ENAC), affiliated or linked to DSNA
- CENTRO DE REFERENCIA INVESTIGACION DESARROLLO E INNOVACION ATM, A.I.E. (CRIDA), affiliated or linked to ENAIRE

¹² For the definition, see Article 2.1(2) of the Rules for Participation Regulation No 1290/2013: ‘**affiliated entity**’ means any legal entity that is:

- under the direct or indirect control of a participant, or
- under the same direct or indirect control as the participant, or
- directly or indirectly controlling a participant.

‘Control’ may take any of the following forms:

- (a) the direct or indirect holding of more than 50% of the nominal value of the issued share capital in the legal entity concerned, or of a majority of the voting rights of the shareholders or associates of that entity;
- (b) the direct or indirect holding, in fact or in law, of decision-making powers in the legal entity concerned.

However the following relationships between legal entities shall not in themselves be deemed to constitute controlling relationships:

- (a) the same public investment corporation, institutional investor or venture-capital company has a direct or indirect holding of more than 50% of the nominal value of the issued share capital or a majority of voting rights of the shareholders or associates;
- (b) the legal entities concerned are owned or supervised by the same public body.

¹³ ‘**Third party with a legal link to a beneficiary**’ is any legal entity which has a legal link to the beneficiary implying collaboration that is not limited to the action.

- INGENIERA DE SISTEMAS PARA LA DEFENSA DE ESPANA SA-ISDEFE (ISDEFE), affiliated or linked to ENAIRE
- INGENIERIA Y ECONOMIA DEL TRANSPORTE S.A. (INECO), affiliated or linked to ENAIRE
- I.D.S. - INGEGNERIA DEI SISTEMI - S.P.A. (I.D.S.), affiliated or linked to ENAV
- CENTRO ITALIANO RICERCHE AEROSPAZIALI SCPA (CIRA), affiliated or linked to ENAV
- MALTA AIR TRAFFIC SERVICES LIMITED (MATS), affiliated or linked to ENAV
- CONSORZIO SICTA SISTEMI INNOVATIVIPER IL CONTROLLO DELTRAFFICO AEREO (SICTA), affiliated or linked to ENAV, if it has accepted joint and several liability with the beneficiary (see Annex 3a)
- DEEP BLUE SRL (DEEP BLUE), affiliated or linked to ENAV
- DARJAVNO PREDPRIYATIE RAKOVODSTVO NA VAZDUSHNOTO DVIJENIE TPP (BULATSA), affiliated or linked to ENAV
- TELESPAZIO SPA (TELESPAZIO), affiliated or linked to FINMECCANICA
- SKYSOFT-ATM SA (SKYSOFTATM), affiliated or linked to SKYGUIDE
- THALES AUSTRALIA LIMITED (THALES-AUS), affiliated or linked to THALES AIR SYS
- KONTROLA LETENJE SRBIJE I CRNE GORES MATSA DOO BEOGRAD (SMATSA), affiliated or linked to THALES AIR SYS
- INTEGRA CONSULT AS (Integra), affiliated or linked to ANS CR (B4)
- CESKE VYSOKE UCENI TECHNICKE V PRAZE (CTU), affiliated or linked to ANS CR (B4)
- AGENTFLY TECHNOLOGIES SRO (AFT), affiliated or linked to ANS CR (B4), if it has accepted joint and several liability with the beneficiary (see Annex 3a)
- UNIWERSYTET WARSZAWSKI (UNIWARSAW), affiliated or linked to PANSА (B4), if it has accepted joint and several liability with the beneficiary (see Annex 3a)
- POLITECHNIKA RZESZOWSKA IM IGNACEGO LUKASIEWICZA PRZ (PRZ), affiliated or linked to PANSА (B4)

The linked third parties may declare as eligible the costs they incur for implementing the action tasks in accordance with Article 6.3.

The beneficiaries must ensure that the JU, the Commission, the European Court of Auditors (ECA) and the European Anti-Fraud Office (OLAF) can exercise their rights under Articles 22 and 23 also towards their linked third parties.

14.1.2 The beneficiaries must ensure that their obligations under Articles 18, 20, 35, 36 and 38 also apply to their linked third parties.

14.2 Consequences of non-compliance

If any obligation under Article 14.1.1 is breached, the costs of the linked third party will be ineligible (see Article 6) and will be rejected (see Article 42).

If any obligation under Article 14.1.2 is breached, the grant may be reduced (see Article 43).

Such breaches may also lead to any of the other measures described in Chapter 6.

ARTICLE 15 — FINANCIAL SUPPORT TO THIRD PARTIES

15.1 Rules for providing financial support to third parties

Not applicable

15.2 Financial support in the form of prizes

Not applicable

15.3 Consequences of non-compliance

Not applicable

ARTICLE 16 — PROVISION OF TRANS-NATIONAL OR VIRTUAL ACCESS TO RESEARCH INFRASTRUCTURE

16.1 Rules for providing trans-national access to research infrastructure

Not applicable

16.2 Rules for providing virtual access to research infrastructure

Not applicable

16.3 Consequences of non-compliance

Not applicable

SECTION 2 RIGHTS AND OBLIGATIONS RELATED TO THE GRANT ADMINISTRATION

ARTICLE 17 — GENERAL OBLIGATION TO INFORM

17.1 General obligation to provide information upon request

The beneficiaries must provide — during implementation of the action or afterwards and in accordance with Article 41.2 — any information requested in order to verify eligibility of the costs, proper implementation of the action and compliance with any other obligation under the Agreement.

17.2 Obligation to keep information up to date and to inform about events and circumstances likely to affect the Agreement

Each beneficiary must keep information stored in the 'Beneficiary Register' (via the electronic exchange system; see Article 52) up to date, in particular, its name, address, legal representatives, legal form and organisation type.

Each beneficiary must immediately inform the coordinator — which must immediately inform the JU and the other beneficiaries — of any of the following:

- (a) **events** which are likely to affect significantly or delay the implementation of the action or the EU's or JU's financial interests, in particular:
 - (i) changes in its legal, financial, technical, organisational or ownership situation or those of its linked third parties and
 - (ii) changes in the name, address, legal form, organisation type of its linked third parties;
- (b) **circumstances** affecting:
 - (i) the decision to award the grant or
 - (ii) compliance with requirements under the Agreement.

17.3 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the grant may be reduced (see Article 43).

Such breaches may also lead to any of the other measures described in Chapter 6.

ARTICLE 18 — KEEPING RECORDS — SUPPORTING DOCUMENTATION

18.1 Obligation to keep records and other supporting documentation

The beneficiaries must — for a period of five years after the payment of the balance — keep records and other supporting documentation in order to prove the proper implementation of the action and the costs they declare as eligible.

They must make them available upon request (see Article 17) or in the context of checks, reviews, audits or investigations (see Article 22).

If there are on-going checks, reviews, audits, investigations, litigation or other pursuits of claims under the Agreement (including the extension of findings; see Articles 22), the beneficiaries must keep the records and other supporting documentation until the end of these procedures.

The beneficiaries must keep the original documents. Digital and digitalised documents are considered originals if they are authorised by the applicable national law. The JU or the Commission may accept non-original documents if it considers that they offer a comparable level of assurance.

18.1.1 Records and other supporting documentation on the scientific and technical implementation

The beneficiaries must keep records and other supporting documentation on scientific and technical implementation of the action in line with the accepted standards in the respective field.

18.1.2 Records and other documentation to support the costs declared

The beneficiaries must keep the records and documentation supporting the costs declared, in particular the following:

- (a) for **actual costs**: adequate records and other supporting documentation to prove the costs declared, such as contracts, subcontracts, invoices and accounting records. In addition, the beneficiaries' usual cost accounting practices and internal control procedures must enable direct reconciliation between the amounts declared, the amounts recorded in their accounts and the amounts stated in the supporting documentation;
- (b) for **unit costs**: adequate records and other supporting documentation to prove the number of units declared. Beneficiaries do not need to identify the actual eligible costs covered or to keep or provide supporting documentation (such as accounting statements) to prove the amount per unit.

In addition, for **direct personnel costs declared as unit costs calculated in accordance with the beneficiary's usual cost accounting practices**, the beneficiaries must keep adequate records and documentation to prove that the cost accounting practices used comply with the conditions set out in Article 6.2, Point A.

The beneficiaries and linked third parties may submit to the JU, for approval by the Commission, a certificate (drawn up in accordance with Annex 6) stating that their usual cost accounting practices comply with these conditions (**'certificate on the methodology'**). If the certificate is approved, costs declared in line with this methodology will not be challenged subsequently, unless the beneficiaries have concealed information for the purpose of the approval.

- (c) for **flat-rate costs**: adequate records and other supporting documentation to prove the eligibility of the costs to which the flat-rate is applied. The beneficiaries do not need to identify the costs covered or provide supporting documentation (such as accounting statements) to prove the amount declared at a flat-rate.

In addition, for **personnel costs** (declared as actual costs or on the basis of unit costs), the beneficiaries must keep **time records** for the number of hours declared. The time records must be in writing and approved by the persons working on the action and their supervisors, at least monthly. In the absence of reliable time records of the hours worked on the action, the JU or the Commission may accept alternative evidence supporting the number of hours declared, if it considers that it offers an adequate level of assurance.

As an exception, for **persons working exclusively on the action**, there is no need to keep time records, if the beneficiary signs a **declaration** confirming that the persons concerned have worked exclusively on the action.

For costs declared by linked third parties (see Article 14), it is the beneficiary that must keep the originals of the financial statements and the certificates on the financial statements of the linked third parties.

18.2 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, costs insufficiently substantiated will be ineligible (see Article 6) and will be rejected (see Article 42), and the grant may be reduced (see Article 43).

Such breaches may also lead to any of the other measures described in Chapter 6.

ARTICLE 19 — SUBMISSION OF DELIVERABLES

19.1 Obligation to submit deliverables

The coordinator must submit the ‘**deliverables**’ identified in Annex 1, in accordance with the timing and conditions set out in it.

19.2 Consequences of non-compliance

If the coordinator breaches any of its obligations under this Article, the JU may apply any of the measures described in Chapter 6.

ARTICLE 20 — REPORTING — PAYMENT REQUESTS

20.1 Obligation to submit reports

The coordinator must submit to the JU (see Article 52) the technical and financial reports set out in this Article. These reports include requests for payment and must be drawn up using the forms and templates provided in the electronic exchange system (see Article 52).

20.2 Reporting periods

The action is divided into the following ‘**reporting periods**’:

- RP1: from month 1 to month 14
- RP2: from month 15 to month 26
- RP3: from month 27 to month 38

20.3 Periodic reports — Requests for interim payments

The coordinator must submit a periodic report within 60 days following the end of each reporting period.

The **periodic report** must include the following:

(a) a ‘**periodic technical report**’ containing:

- (i) an **explanation of the work carried out** by the beneficiaries;
- (ii) an **overview of the progress** towards the objectives of the action, including milestones and deliverables identified in Annex 1.

This report must include explanations justifying the differences between work expected to be carried out in accordance with Annex 1 and that actually carried out.

The report must also detail the exploitation and dissemination of the results and — if required in Annex 1 — an updated ‘**plan for the exploitation and dissemination of the results**’;

(iii) a **summary** for publication by the JU;

(iv) the answers to the ‘**questionnaire**’, covering issues related to the action implementation and the economic and societal impact, notably in the context of the key performance indicators and monitoring requirements of Horizon 2020 and the JU;

(b) a ‘**periodic financial report**’ containing:

(i) an ‘**individual financial statement**’ (see Annex 4) from each beneficiary and from each linked third party, for the reporting period concerned.

The individual financial statement must detail the eligible costs (actual costs, unit costs and flat-rate costs; see Article 6) for each budget category (see Annex 2).

The beneficiaries and linked third parties must declare all eligible costs, even if — for actual costs, unit costs and flat-rate costs — they exceed the amounts indicated in the estimated budget (see Annex 2). Amounts which are not declared in the individual financial statement will not be taken into account by the JU.

If an individual financial statement is not submitted for a reporting period, it may be included in the periodic financial report for the next reporting period.

The individual financial statements of the last reporting period must also detail the **receipts of the action** (see Article 5.3.3).

Each beneficiary and each linked third party must **certify** that:

- the information provided is full, reliable and true;
- the costs declared are eligible (see Article 6);
- the costs can be substantiated by adequate records and supporting documentation (see Article 18) that will be produced upon request (see Article 17) or in the context of checks, reviews, audits and investigations (see Article 22), and
- for the last reporting period: that all the receipts have been declared (see Article 5.3.3);

(ii) an **explanation of the use of resources** and the information on subcontracting (see Article 13) and in-kind contributions provided by third parties (see Articles 11 and 12) from each beneficiary and from each linked third party, for the reporting period concerned;

(iii) not applicable;

(iv) a ‘**periodic summary financial statement**’ (see Annex 4), created automatically by the electronic exchange system, consolidating the individual financial statements for the

reporting period concerned and including — except for the last reporting period — the **request for interim payment**.

20.4 Final report — Request for payment of the balance

In addition to the periodic report for the last reporting period, the coordinator must submit the final report within 60 days following the end of the last reporting period.

The **final report** must include the following:

- (a) a ‘**final technical report**’ with a **summary** for publication containing:
 - (i) an overview of the results and their exploitation and dissemination;
 - (ii) the conclusions on the action, and
 - (iii) the socio-economic impact of the action;
- (b) a ‘**final financial report**’ containing:
 - (i) a ‘**final summary financial statement**’ (see Annex 4), created automatically by the electronic exchange system, consolidating the individual financial statements for all reporting periods and including the **request for payment of the balance** and
 - (ii) a ‘**certificate on the financial statements**’ (drawn up in accordance with Annex 5) for each beneficiary and for each linked third party, if it requests a total contribution of EUR 325 000 or more, as reimbursement of actual costs and unit costs calculated on the basis of its usual cost accounting practices (see Article 5.2 and Article 6.2, Point A).

20.5 Information on cumulative expenditure incurred

Not applicable

20.6 Currency for financial statements and conversion into euro

Financial statements must be drafted in euro.

Beneficiaries and linked third parties with accounting established in a currency other than the euro must convert the costs recorded in their accounts into euro, at the average of the daily exchange rates published in the C series of the *Official Journal of the European Union*, calculated over the corresponding reporting period.

If no daily euro exchange rate is published in the *Official Journal of the European Union* for the currency in question, they must be converted at the average of the monthly accounting rates published on the Commission’s website, calculated over the corresponding reporting period.

Beneficiaries and linked third parties with accounting established in euro must convert costs incurred in another currency into euro according to their usual accounting practices.

20.7 Language of reports

All reports (technical and financial reports, including financial statements) must be submitted in the language of the Agreement.

20.8 Consequences of non-compliance — Suspension of the payment deadline — Termination

If the reports submitted do not comply with this Article, the JU may suspend the payment deadline (see Article 47) and apply any of the other measures described in Chapter 6.

If the coordinator breaches its obligation to submit the reports and if it fails to comply with this obligation within 30 days following a written reminder sent by the JU, the Agreement may be terminated (see Article 50).

ARTICLE 21 — PAYMENTS AND PAYMENT ARRANGEMENTS

21.1 Payments to be made

The following payments will be made to the coordinator:

- one **pre-financing payment**;
- one or more **interim payments**, on the basis of the request(s) for interim payment (see Article 20), and
- one **payment of the balance**, on the basis of the request for payment of the balance (see Article 20).

21.2 Pre-financing payment — Amount — Amount retained for the Guarantee Fund

The aim of the pre-financing is to provide the beneficiaries with a float.

It remains the property of the JU until the payment of the balance.

The amount of the pre-financing payment will be EUR **4,281,800.14** (four million two hundred and eighty one thousand eight hundred EURO and fourteen eurocents).

The JU will — except if Article 48 applies — make the pre-financing payment to the coordinator within 30 days either from the entry into force of the Agreement (see Article 58) or from 10 days before the starting date of the action (see Article 3), whichever is the latest.

An amount of EUR **267,612.51** (two hundred and sixty seven thousand six hundred and twelve EURO and fifty one eurocents), corresponding to 5% of the maximum grant amount (see Article 5.1), is retained by the JU from the pre-financing payment and transferred into the ‘**Guarantee Fund**’.

21.3 Interim payments — Amount — Calculation

Interim payments reimburse the eligible costs incurred for the implementation of the action during the corresponding reporting periods.

The JU will pay to the coordinator the amount due as interim payment within 90 days from receiving the periodic report (see Article 20.3), except if Articles 47 or 48 apply.

Payment is subject to the approval of the periodic report. Its approval does not imply recognition of the compliance, authenticity, completeness or correctness of its content.

The **amount due as interim payment** is calculated by the JU in the following steps:

Step 1 – Application of the reimbursement rates

Step 2 – Limit to 90% of the maximum grant amount

21.3.1 Step 1 — Application of the reimbursement rates

The reimbursement rate(s) (see Article 5.2) are applied to the eligible costs (actual costs, unit costs and flat-rate costs ; see Article 6) declared by the beneficiaries and the linked third parties (see Article 20) and approved by the JU (see above) for the concerned reporting period.

21.3.2 Step 2 — Limit to 90% of the maximum grant amount

The total amount of pre-financing and interim payments must not exceed 90% of the maximum grant amount set out in Article 5.1. The maximum amount for the interim payment will be calculated as follows:

{90% of the maximum grant amount (see Article 5.1)

minus

{pre-financing and previous interim payments}}.

21.4 Payment of the balance — Amount — Calculation — Release of the amount retained for the Guarantee Fund

The payment of the balance reimburses the remaining part of the eligible costs incurred by the beneficiaries for the implementation of the action.

If the total amount of earlier payments is greater than the final grant amount (see Article 5.3), the payment of the balance takes the form of a recovery (see Article 44).

If the total amount of earlier payments is lower than the final grant amount, the JU will pay the balance within 90 days from receiving the final report (see Article 20.4), except if Articles 47 or 48 apply.

Payment is subject to the approval of the final report. Its approval does not imply recognition of the compliance, authenticity, completeness or correctness of its content.

The **amount due as the balance** is calculated by the JU by deducting the total amount of pre-financing and interim payments (if any) already made, from the final grant amount determined in accordance with Article 5.3:

{final grant amount (see Article 5.3)

minus

{pre-financing and interim payments (if any) made}}.

At the payment of the balance, the amount retained for the Guarantee Fund (see above) will be released and:

- if the balance is positive: the amount released will be paid in full to the coordinator together with the amount due as the balance;
- if the balance is negative (payment of the balance taking the form of recovery): it will be deducted from the amount released (see Article 44.1.2). If the resulting amount:
 - is positive, it will be paid to the coordinator
 - is negative, it will be recovered.

The amount to be paid may however be offset — without the beneficiary's consent — against any other amount owed by the beneficiary to the JU up to the maximum JU contribution indicated, for that beneficiary, in the estimated budget (see Annex 2).

21.5 Notification of amounts due

When making payments, the JU will formally notify to the coordinator the amount due, specifying whether it concerns an interim payment or the payment of the balance.

For the payment of the balance, the notification will also specify the final grant amount.

In the case of reduction of the grant or recovery of undue amounts, the notification will be preceded by the contradictory procedure set out in Articles 43 and 44.

21.6 Currency for payments

The JU will make all payments in euro.

21.7 Payments to the coordinator — Distribution to the beneficiaries

Payments will be made to the coordinator.

Payments to the coordinator will discharge the JU from its payment obligation.

The coordinator must distribute the payments between the beneficiaries without unjustified delay.

Pre-financing may however be distributed only:

- (a) if the minimum number of beneficiaries set out in the call for proposals has acceded to the Agreement (see Article 56) and
- (b) to beneficiaries that have acceded to the Agreement (see Article 56).

21.8 Bank account for payments

All payments will be made to the following bank account:

Name of bank: DEUTSCHE BANK AG
Address of branch: 12, TAUNUSANLAGE FRANKFURT AM MAIN, Germany
Full name of the account holder: DEUTSCHE FLUGSICHERUNG DFS GMBH
Full account number (including bank codes):
IBAN code: DE66500700100091673400

21.9 Costs of payment transfers

The cost of the payment transfers is borne as follows:

- the JU bears the cost of transfers charged by its bank;
- the beneficiary bears the cost of transfers charged by its bank;
- the party causing a repetition of a transfer bears all costs of the repeated transfer.

21.10 Date of payment

Payments by the JU are considered to have been carried out on the date when they are debited to its account.

21.11 Consequences of non-compliance

21.11.1 If the JU does not pay within the payment deadlines (see above), the beneficiaries are entitled to **late-payment interest** at the rate applied by the European Central Bank (ECB) for its main refinancing operations in euros ('reference rate'), plus three and a half points. The reference rate is the rate in force on the first day of the month in which the payment deadline expires, as published in the C series of the *Official Journal of the European Union*.

If the late-payment interest is lower than or equal to EUR 200, it will be paid to the coordinator only upon request submitted within two months of receiving the late payment.

Late-payment interest is not due if all beneficiaries are EU Member States (including regional and local government authorities or other public bodies acting on behalf of a Member State for the purpose of this Agreement).

Suspension of the payment deadline or payments (see Articles 47 and 48) will not be considered as late payment.

Late-payment interest covers the period running from the day following the due date for payment (see above), up to and including the date of payment.

Late-payment interest is not considered for the purposes of calculating the final grant amount.

21.11.2 If the coordinator breaches any of its obligations under this Article, the grant may be reduced (see Article 43) and the Agreement or the participation of the coordinator may be terminated (see Article 50).

Such breaches may also lead to any of the other measures described in Chapter 6.

ARTICLE 22 — CHECKS, REVIEWS, AUDITS AND INVESTIGATIONS — EXTENSION OF FINDINGS

22.1 Checks, reviews and audits by the JU and the Commission

22.1.1 Right to carry out checks

The JU will — during the implementation of the action or afterwards — check the proper implementation of the action and compliance with the obligations under the Agreement, including assessing deliverables and reports.

For this purpose the JU may be assisted by external persons or bodies.

The JU may also request additional information in accordance with Article 17. The JU may request beneficiaries to provide such information to it directly.

Information provided must be accurate, precise and complete and in the format requested, including electronic format.

22.1.2 Right to carry out reviews

The JU may — during the implementation of the action or afterwards — carry out reviews on the proper implementation of the action (including assessment of deliverables and reports), compliance with the obligations under the Agreement and continued scientific or technological relevance of the action.

Reviews may be started **up to two years after the payment of the balance**. They will be formally notified to the coordinator or beneficiary concerned and will be considered to have started on the date of the formal notification.

If the review is carried out on a third party (see Articles 10 to 16), the beneficiary concerned must inform the third party.

The JU may carry out reviews directly (using its own staff) or indirectly (using external persons or bodies appointed to do so). It will inform the coordinator or beneficiary concerned of the identity of the external persons or bodies. They have the right to object to the appointment on grounds of commercial confidentiality.

The coordinator or beneficiary concerned must provide — within the deadline requested — any information and data in addition to deliverables and reports already submitted (including information on the use of resources). The JU may request beneficiaries to provide such information to it directly.

The coordinator or beneficiary concerned may be requested to participate in meetings, including with external experts.

For **on-the-spot** reviews, the beneficiaries must allow access to their sites and premises, including to external persons or bodies, and must ensure that information requested is readily available.

Information provided must be accurate, precise and complete and in the format requested, including electronic format.

On the basis of the review findings, a **‘review report’** will be drawn up.

The JU will formally notify the review report to the coordinator or beneficiary concerned, which has 30 days to formally notify observations (**‘contradictory review procedure’**).

Reviews (including review reports) are in the language of the Agreement.

22.1.3 Right to carry out audits

The JU or the Commission may — during the implementation of the action or afterwards — carry out audits on the proper implementation of the action and compliance with the obligations under the Agreement.

Audits may be started **up to two years after the payment of the balance**. They will be formally notified to the coordinator or beneficiary concerned and will be considered to have started on the date of the formal notification.

If the audit is carried out on a third party (see Articles 10 to 16), the beneficiary concerned must inform the third party.

The JU or the Commission may carry out audits directly (using its own staff) or indirectly (using external persons or bodies appointed to do so). It will inform the coordinator or beneficiary concerned of the identity of the external persons or bodies. They have the right to object to the appointment on grounds of commercial confidentiality.

The coordinator or beneficiary concerned must provide — within the deadline requested — any information (including complete accounts, individual salary statements or other personal data) to verify compliance with the Agreement. The JU or the Commission may request beneficiaries to provide such information to it directly.

For **on-the-spot** audits, the beneficiaries must allow access to their sites and premises, including to external persons or bodies, and must ensure that information requested is readily available.

Information provided must be accurate, precise and complete and in the format requested, including electronic format.

On the basis of the audit findings, a ‘**draft audit report**’ will be drawn up.

The JU or the Commission will formally notify the draft audit report to the coordinator or beneficiary concerned, which has 30 days to formally notify observations (‘**contradictory audit procedure**’). This period may be extended by the JU or the Commission in justified cases.

The ‘**final audit report**’ will take into account observations by the coordinator or beneficiary concerned. The report will be formally notified to it.

Audits (including audit reports) are in the language of the Agreement.

The JU or the Commission may also access the beneficiaries’ statutory records for the periodical assessment of unit costs or flat-rate amounts.

22.2 Investigations by the European Anti-Fraud Office (OLAF)

Under Regulations No 883/2013¹⁸ and No 2185/96¹⁹, Article 110 of the Financial Rules of the JU²⁰ (and in accordance with their provisions and procedures), the European Anti-Fraud Office (OLAF)

¹⁸ Regulation (EU, Euratom) No 883/2013 of the European Parliament and of the Council of 11 September 2013 concerning investigations conducted by the European Anti-Fraud Office (OLAF) and repealing Regulation (EC) No 1073/1999 of the European Parliament and of the Council and Council Regulation (Euratom) No 1074/1999 (OJ L 248, 18.09.2013, p. 1).

may — at any moment during implementation of the action or afterwards — carry out investigations, including on-the-spot checks and inspections, to establish whether there has been fraud, corruption or any other illegal activity affecting the financial interests of the EU.

22.3 Checks and audits by the European Court of Auditors (ECA)

Under Article 287 of the Treaty on the Functioning of the European Union (TFEU) and Article 110 of the Financial Rules of the JU, the European Court of Auditors (ECA) may — at any moment during implementation of the action or afterwards — carry out audits.

The ECA has the right of access for the purpose of checks and audits.

22.4 Checks, reviews, audits and investigations for international organisations

In conformity with its financial regulations, the European Union, including the European Anti-Fraud Office (OLAF) and the European Court of Auditors (ECA), may undertake, including on the spot, checks, reviews audits and investigations.

This Article will be applied in accordance with any specific agreement concluded in this respect by the international organisation and the European Union.

22.5 Consequences of findings in checks, reviews, audits and investigations — Extension of findings

22.5.1 Findings in this grant

Findings in checks, reviews, audits or investigations carried out in the context of this grant may lead to the rejection of ineligible costs (see Article 42), reduction of the grant (see Article 43), recovery of undue amounts (see Article 44) or to any of the other measures described in Chapter 6.

Rejection of costs or reduction of the grant after the payment of the balance will lead to a revised final grant amount (see Article 5.4).

Findings in checks, reviews, audits or investigations may lead to a request for amendment for the modification of Annex 1 (see Article 55).

Checks, reviews, audits or investigations that find systemic or recurrent errors, irregularities, fraud or breach of obligations may also lead to consequences in other JU, EU or Euratom grants awarded under similar conditions (**‘extension of findings from this grant to other grants’**).

Moreover, findings arising from an OLAF investigation may lead to criminal prosecution under national law.

22.5.2 Findings in other grants

The JU or the Commission may extend findings from other grants to this grant (**‘extension of findings from other grants to this grant’**), if:

¹⁹ Council Regulation (Euratom, EC) No 2185/1996 of 11 November 1996 concerning on-the-spot checks and inspections carried out by the Commission in order to protect the European Communities' financial interests against fraud and other irregularities (OJ L 292, 15.11.1996, p. 2).

²⁰ The SESAR JU Financial Rules are made publicly available on the SESAR JU official website.

- (a) the beneficiary concerned is found, in other JU, EU or Euratom grants awarded under similar conditions, to have committed systemic or recurrent errors, irregularities, fraud or breach of obligations that have a material impact on this grant and
- (b) those findings are formally notified to the beneficiary concerned — together with the list of grants affected by the findings — no later than two years after the payment of the balance of this grant.

The extension of findings may lead to the rejection of costs (see Article 42), reduction of the grant (see Article 43), recovery of undue amounts (see Article 44), suspension of payments (see Article 48), suspension of the action implementation (see Article 49) or termination (see Article 50).

22.5.3 Procedure

The JU or the Commission will formally notify the beneficiary concerned the systemic or recurrent errors and its intention to extend these audit findings, together with the list of grants affected.

22.5.3.1 If the findings concern **eligibility of costs**: the formal notification will include:

- (a) an invitation to submit observations on the list of grants affected by the findings;
- (b) the request to submit **revised financial statements** for all grants affected;
- (c) the **correction rate for extrapolation** established by the JU or the Commission on the basis of the systemic or recurrent errors, to calculate the amounts to be rejected if the beneficiary concerned:
 - (i) considers that the submission of revised financial statements is not possible or practicable or
 - (ii) does not submit revised financial statements.

The beneficiary concerned has 90 days from receiving notification to submit observations, revised financial statements or to propose a duly substantiated **alternative correction method**. This period may be extended by the JU or the Commission in justified cases.

The amounts to be rejected will be determined on the basis of the revised financial statements, subject to their approval.

If the JU or the Commission does not receive any observations or revised financial statements, does not accept the observations or the proposed alternative correction method or does not approve the revised financial statements, it will formally notify the beneficiary concerned the application of the initially notified correction rate for extrapolation.

If the JU or the Commission accepts the alternative correction method proposed by the beneficiary concerned, it will formally notify the application of the accepted alternative correction method.

22.5.3.2 If the findings concern **improper implementation** or a **breach of another obligation**: the formal notification will include:

- (a) an invitation to submit observations on the list of grants affected by the findings and

(b) the flat-rate the JU or the Commission intends to apply according to the principle of proportionality.

The beneficiary concerned has 90 days from receiving notification to submit observations or to propose a duly substantiated alternative flat-rate.

If the JU or the Commission does not receive any observations or does not accept the observations or the proposed alternative flat-rate, it will formally notify the beneficiary concerned the application of the initially notified flat-rate.

If the JU or the Commission accepts the alternative flat-rate proposed by the beneficiary concerned, it will formally notify the application of the accepted alternative flat-rate.

22.6 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, any insufficiently substantiated costs will be ineligible (see Article 6) and will be rejected (see Article 42).

Such breaches may also lead to any of the other measures described in Chapter 6.

ARTICLE 23 — EVALUATION OF THE IMPACT OF THE ACTION

23.1 Right to evaluate the impact of the action

The JU or the Commission may carry out interim and final evaluations of the impact of the action measured against the objective of the EU programme.

Evaluations may be started during implementation of the action and up to five years after the payment of the balance. The evaluation is considered to start on the date of the formal notification to the coordinator or beneficiaries.

The JU or the Commission may make these evaluations directly (using its own staff) or indirectly (using external bodies or persons it has authorised to do so).

The coordinator or beneficiaries must provide any information relevant to evaluate the impact of the action, including information in electronic format.

23.2 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the JU may apply the measures described in Chapter 6.

SECTION 3 RIGHTS AND OBLIGATIONS RELATED TO BACKGROUND AND RESULTS

SUBSECTION 1 GENERAL

²¹ Commission Recommendation C (2008) 1329 of 10.4.2008 on the management of intellectual property in knowledge transfer activities and the Code of Practice for universities and other public research institutions attached to this recommendation.

ARTICLE 23a — MANAGEMENT OF INTELLECTUAL PROPERTY

23a.1 Obligation to take measures to implement the Commission Recommendation on the management of intellectual property in knowledge transfer activities

Beneficiaries that are universities or other public research organisations must take measures to implement the principles set out in Points 1 and 2 of the Code of Practice annexed to the Commission Recommendation on the management of intellectual property in knowledge transfer activities²¹.

This does not change the obligations set out in Subsections 2 and 3 of this Section.

The beneficiaries must ensure that researchers and third parties involved in the action are aware of them.

23a.2 Consequences of non-compliance

If a beneficiary breaches its obligations under this Article, the JU may apply any of the measures described in Chapter 6.

SUBSECTION 2 RIGHTS AND OBLIGATIONS RELATED TO BACKGROUND

ARTICLE 24 — AGREEMENT ON BACKGROUND

24.1 Agreement on background

The beneficiaries must identify and agree (in writing) on the background for the action (**‘agreement on background’**).

‘Background’ means any data, know-how or information — whatever its form or nature (tangible or intangible), including any rights such as intellectual property rights — that:

- (a) is held by the beneficiaries before they acceded to the Agreement, and
- (b) is needed to implement the action or exploit the results.

24.2 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the grant may be reduced (see Article 43).

Such breaches may also lead to any of the other measures described in Chapter 6.

ARTICLE 25 — ACCESS RIGHTS TO BACKGROUND

25.1 Exercise of access rights — Waiving of access rights — No sub-licensing

To exercise access rights, this must first be requested in writing (**‘request for access’**).

‘Access rights’ means rights to use results or background under the terms and conditions laid down in this Agreement.

Waivers of access rights are not valid unless in writing.

Unless agreed otherwise, access rights do not include the right to sub-license.

25.2 Access rights for other beneficiaries, for implementing their own tasks under the action

The beneficiaries must give each other access — on a royalty-free basis — to background needed to implement their own tasks under the action, unless the beneficiary that holds the background has — before acceding to the Agreement —:

- (a) informed the other beneficiaries that access to its background is subject to legal restrictions or limits, including those imposed by the rights of third parties (including personnel), or
- (b) agreed with the other beneficiaries that access would not be on a royalty-free basis.

25.3 Access rights for other beneficiaries, for exploiting their own results

The beneficiaries must give each other access — under fair and reasonable conditions — to background needed for exploiting their own results, unless the beneficiary that holds the background has — before acceding to the Agreement — informed the other beneficiaries that access to its background is subject to legal restrictions or limits, including those imposed by the rights of third parties (including personnel).

‘**Fair and reasonable conditions**’ means appropriate conditions, including possible financial terms or royalty-free conditions, taking into account the specific circumstances of the request for access, for example the actual or potential value of the results or background to which access is requested and/or the scope, duration or other characteristics of the exploitation envisaged.

Requests for access may be made — unless agreed otherwise — up to one year after the period set out in Article 3.

25.4 Access rights for affiliated entities

Unless otherwise agreed in the consortium agreement, access to background must also be given — under fair and reasonable conditions (see above; Article 25.3) and unless it is subject to legal restrictions or limits, including those imposed by the rights of third parties (including personnel) — to affiliated entities²² established in an EU Member State or ‘**associated country**’²³, if this is needed to exploit the results generated by the beneficiaries to which they are affiliated.

Unless agreed otherwise (see above; Article 25.1), the affiliated entity concerned must make the request directly to the beneficiary that holds the background.

Requests for access may be made — unless agreed otherwise — up to one year after the period set out in Article 3.

²² For the definition, see ‘affiliated entity’ footnote (Article 14.1).

²³ For the definition, see Article 2.1(3) of the Rules for Participation Regulation No 1290/2013: ‘**associated country**’ means a third country which is party to an international agreement with the Union, as identified in Article 7 of Horizon 2020 Framework Programme Regulation No 1291/2013. Article 7 sets out the conditions for association of non-EU countries to Horizon 2020.

25.5 Access rights for third parties

The beneficiaries must give - under the conditions set out in Article 25.2 - access to their background to the complementary beneficiary²⁴ (see Article 2).

Not applicable

25.6 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the grant may be reduced (see Article 43).

Such breaches may also lead to any of the other measures described in Chapter 6.

SUBSECTION 3 RIGHTS AND OBLIGATIONS RELATED TO RESULTS

ARTICLE 26 — OWNERSHIP OF RESULTS

26.1 Ownership by the beneficiary that generates the results

Results are owned by the beneficiary that generates them.

‘**Results**’ means any (tangible or intangible) output of the action such as data, knowledge or information — whatever its form or nature, whether it can be protected or not — that is generated in the action, as well as any rights attached to it, including intellectual property rights.

26.2 Joint ownership by several beneficiaries

Two or more beneficiaries own results jointly if:

- (a) they have jointly generated them and
- (b) it is not possible to:
 - (i) establish the respective contribution of each beneficiary, or
 - (ii) separate them for the purpose of applying for, obtaining or maintaining their protection (see Article 27).

The joint owners must agree (in writing) on the allocation and terms of exercise of their joint ownership (**‘joint ownership agreement’**), to ensure compliance with their obligations under this Agreement.

Unless otherwise agreed in the joint ownership agreement, each joint owner may grant non-exclusive licences to third parties to exploit jointly-owned results (without any right to sub-license), if the other joint owners are given:

- (a) at least 45 days advance notice and
- (b) fair and reasonable compensation.

²⁴ ‘**Complementary beneficiary**’ means a beneficiary of the complementary grant agreement.

Once the results have been generated, joint owners may agree (in writing) to apply another regime than joint ownership (such as, for instance, transfer to a single owner (see Article 30) with access rights for the others).

26.3 Rights of third parties (including personnel)

If third parties (including personnel) may claim rights to the results, the beneficiary concerned must ensure that it complies with its obligations under the Agreement.

If a third party generates results, the beneficiary concerned must obtain all necessary rights (transfer, licences or other) from the third party, in order to be able to respect its obligations as if those results were generated by the beneficiary itself.

If obtaining the rights is impossible, the beneficiary must refrain from using the third party to generate the results.

26.4 JU ownership, to protect results

26.4.1 The JU may — with the consent of the beneficiary concerned — assume ownership of results to protect them, if a beneficiary intends — up to four years after the period set out in Article 3 — to disseminate its results without protecting them, except in any of the following cases:

- (a) the lack of protection is because protecting the results is not possible, reasonable or justified (given the circumstances);
- (b) the lack of protection is because there is a lack of potential for commercial or industrial exploitation, or
- (c) the beneficiary intends to transfer the results to another beneficiary or third party established in an EU Member State or associated country, which will protect them.

Before the results are disseminated and unless any of the cases above under Points (a), (b) or (c) applies, the beneficiary must formally notify the JU and at the same time inform it of any reasons for refusing consent. The beneficiary may refuse consent only if it can show that its legitimate interests would suffer significant harm.

If the JU decides to assume ownership, it will formally notify the beneficiary concerned within 45 days of receiving notification.

No dissemination relating to these results may before the end of this period or, if the JU takes a positive decision, until it has taken the necessary steps to protect the results.

26.4.2 The JU may — with the consent of the beneficiary concerned — assume ownership of results to protect them, if a beneficiary intends — up to four years after the period set out in Article 3 — to stop protecting them or not to seek an extension of protection, except in any of the following cases:

- (a) the protection is stopped because of a lack of potential for commercial or industrial exploitation;
- (b) an extension would not be justified given the circumstances.

A beneficiary that intends to stop protecting results or not seek an extension must — unless any of the cases above under Points (a) or (b) applies — formally notify the JU at least 60 days before the

protection lapses or its extension is no longer possible and at the same time inform it of any reasons for refusing consent. The beneficiary may refuse consent only if it can show that its legitimate interests would suffer significant harm.

If the JU decides to assume ownership, it will formally notify the beneficiary concerned within 45 days of receiving notification.

26.5 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the grant may be reduced (see Article 43).

Such breaches may also lead to the any of the other measures described in Chapter 6.

ARTICLE 27 — PROTECTION OF RESULTS — VISIBILITY OF FUNDING

27.1 Obligation to protect the results

Each beneficiary must examine the possibility of protecting its results and must adequately protect them — for an appropriate period and with appropriate territorial coverage — if:

- (a) the results can reasonably be expected to be commercially or industrially exploited and
- (b) protecting them is possible, reasonable and justified (given the circumstances).

When deciding on protection, the beneficiary must consider its own legitimate interests and the legitimate interests (especially commercial) of the other beneficiaries.

27.2 JU ownership, to protect the results

If a beneficiary intends not to protect its results, to stop protecting them or not seek an extension of protection, the JU may — under certain conditions (see Article 26.4) — assume ownership to ensure their (continued) protection.

27.3 Information on funding

Applications for protection of results (including patent applications) filed by or on behalf of a beneficiary must — unless the JU requests or agrees otherwise or unless it is impossible — include the following:

“The project leading to this application has received funding from the SESAR Joint Undertaking under grant agreement No 734143 under European Union’s Horizon 2020 research and innovation programme”.

27.4 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the grant may be reduced (see Article 43).

Such a breach may also lead to any of the other measures described in Chapter 6.

ARTICLE 28 — EXPLOITATION OF RESULTS

28.1 Obligation to exploit the results

Each beneficiary must — up to four years after the period set out in Article 3 — take measures aiming to ensure ‘**exploitation**’ of its results (either directly or indirectly, in particular through transfer or licensing; see Article 30) by:

- (a) using them in further research activities (outside the action);
- (b) developing, creating or marketing a product or process;
- (c) creating and providing a service, or
- (d) using them in standardisation activities.

In addition, the beneficiaries must — up to four years after the period set out in Article 3 — comply with the additional exploitation obligations set out in Annex 1.

This does not change the security obligations in Article 37, which still apply.

28.2 Results that could contribute to European or international standards — Information on funding

If results could reasonably be expected to contribute to European or international standards, the beneficiary concerned must — up to four years after the period set out in Article 3 — inform the JU.

If results are incorporated in a standard, the beneficiary concerned must — unless the JU requests or agrees otherwise or unless it is impossible — ask the standardisation body to include the following statement in (information related to) the standard:

“Results incorporated in this standard received funding from the SESAR Joint Undertaking under grant agreement No 734143 under European Union’s Horizon 2020 research and innovation programme”.

28.3 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the grant may be reduced in accordance with Article 43.

Such a breach may also lead to any of the other measures described in Chapter 6.

ARTICLE 29 — DISSEMINATION OF RESULTS — OPEN ACCESS — VISIBILITY OF FUNDING

29.1 Obligation to disseminate results

Unless it goes against their legitimate interests, each beneficiary must — as soon as possible — ‘**disseminate**’ its results by disclosing them to the public by appropriate means (other than those resulting from protecting or exploiting the results), including in scientific publications (in any medium).

In addition, the beneficiaries must comply with the additional dissemination obligations set out in Annex 1.

Moreover, the beneficiaries must — up to four years after the period set out in Article 3 — disseminate any technical specifications of the results that are needed for interoperability.

Moreover, the beneficiaries must — up to four years after the period set out in Article 3 — disseminate the deliverables relating to cross-border interoperability (see Annex 1) and any results needed for cross-border interoperability (in particular common technical specifications and software components).

This does not change the obligation to protect results in Article 27, the confidentiality obligations in Article 36, the security obligations in Article 37 or the obligations to protect personal data in Article 39, all of which still apply.

A beneficiary that intends to disseminate its results must give advance notice to the other beneficiaries of — unless agreed otherwise — at least 45 days, together with sufficient information on the results it will disseminate.

Any other beneficiary may object within — unless agreed otherwise — 30 days of receiving notification, if it can show that its legitimate interests in relation to the results or background would be significantly harmed. In such cases, the dissemination may not take place unless appropriate steps are taken to safeguard these legitimate interests.

If a beneficiary intends not to protect its results, it may — under certain conditions (see Article 26.4.1) — need to formally notify the JU before dissemination takes place.

29.2 Open access to scientific publications

Each beneficiary must ensure open access (free of charge online access for any user) to all peer-reviewed scientific publications relating to its results.

In particular, it must:

- (a) as soon as possible and at the latest on publication, deposit a machine-readable electronic copy of the published version or final peer-reviewed manuscript accepted for publication in a repository for scientific publications;

Moreover, the beneficiary must aim to deposit at the same time the research data needed to validate the results presented in the deposited scientific publications.

- (b) ensure open access to the deposited publication — via the repository — at the latest:
 - (i) on publication, if an electronic version is available for free via the publisher, or
 - (ii) within six months of publication (twelve months for publications in the social sciences and humanities) in any other case.
- (c) ensure open access — via the repository — to the bibliographic metadata that identify the deposited publication.

The bibliographic metadata must be in a standard format and must include all of the following:

- the terms “*SESAR Joint Undertaking*”, “*European Union (EU)*” and “*Horizon 2020*”;
- the name of the action, acronym and grant number;
- the publication date, and length of embargo period if applicable, and
- a persistent identifier.

29.3 Open access to research data

Not applicable

29.4 Information on funding — Obligation and right to use the JU logo and the EU emblem

Unless the JU requests or agrees otherwise or unless it is impossible, any dissemination of results (in any form, including electronic) must:

- (a) display the JU logo;
- (b) display the EU emblem and
- (c) include the following text:

“This project has received funding from the SESAR Joint Undertaking under grant agreement No 734143 under European Union’s Horizon 2020 research and innovation programme”.

When displayed together with another logo, the JU logo and the EU emblem must have appropriate prominence.

For the purposes of their obligations under this Article, the beneficiaries may use the JU logo and the EU emblem without first obtaining approval from the JU or the Commission.

This does not however give them the right to exclusive use.

Moreover, they may not appropriate the JU logo or the EU emblem or any similar trademark or logo, either by registration or by any other means.

29.5 Disclaimer excluding JU responsibility

Any dissemination of results must indicate that it reflects only the author's view and that the JU is not responsible for any use that may be made of the information it contains.

29.6 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the grant may be reduced (see Article 43).

Such a breach may also lead to any of the other measures described in Chapter 6.

ARTICLE 30 — TRANSFER AND LICENSING OF RESULTS

30.1 Transfer of ownership

Each beneficiary may transfer ownership of its results.

It must however ensure that its obligations under Articles 26.2, 26.4, 27, 28, 29, 30 and 31 also apply to the new owner and that this owner has the obligation to pass them on in any subsequent transfer.

This does not change the security obligations in Article 37, which still apply.

Unless agreed otherwise (in writing) for specifically-identified third parties or unless impossible under applicable EU and national laws on mergers and acquisitions, a beneficiary that intends to transfer ownership of results must give at least 45 days advance notice (or less if agreed in writing) to the other beneficiaries that still have (or still may request) access rights to the results. This notification must include sufficient information on the new owner to enable any beneficiary concerned to assess the effects on its access rights.

Unless agreed otherwise (in writing) for specifically-identified third parties, any other beneficiary may object within 30 days of receiving notification (or less if agreed in writing), if it can show that the transfer would adversely affect its access rights. In this case, the transfer may not take place until agreement has been reached between the beneficiaries concerned.

30.2 Granting licenses

Each beneficiary may grant licences to its results (or otherwise give the right to exploit them), if:

- (a) this does not impede the rights under Article 31 and
- (b) the beneficiary complies with its additional exploitation obligations (see Article 28.1 and Annex 1).

In addition to Points (a) and (b), exclusive licences for results may be granted only if all the other beneficiaries concerned have waived their access rights (see Article 31.1).

This does not change the dissemination obligations in Article 29 or security obligations in Article 37, which still apply.

30.3 JU right to object to transfers or exclusive licensing

The JU may — up to four years after the period set out in Article 3 — object to a transfer of ownership or the exclusive licensing of results, if:

- (a) it is to a third party established in a non-EU country not associated with Horizon 2020 and
- (b) the JU considers that the transfer or licence is not in line with EU interests regarding competitiveness or is inconsistent with ethical principles or security considerations.

A beneficiary that intends to transfer ownership or grant an exclusive licence must formally notify the JU before the intended transfer or licensing takes place and:

- identify the specific results concerned;

- describe in detail the new owner or licensee and the planned or potential exploitation of the results, and
- include a reasoned assessment of the likely impact of the transfer or licence on EU competitiveness and its consistency with ethical principles and security considerations.

The JU may request additional information.

If the JU decides to object to a transfer or exclusive licence, it must formally notify the beneficiary concerned within 60 days of receiving notification (or any additional information it has requested).

No transfer or licensing may take place in the following cases:

- pending the JU decision, within the period set out above;
- if the JU objects;
- until the conditions are complied with, if the JU objection comes with conditions.

30.4 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the grant may be reduced (see Article 43).

Such a breach may also lead to any of the other measures described in Chapter 6.

ARTICLE 31 — ACCESS RIGHTS TO RESULTS

31.1 Exercise of access rights — Waiving of access rights — No sub-licensing

The conditions set out in Article 25.1 apply.

The obligations set out in this Article do not change the security obligations in Article 37, which still apply.

31.2 Access rights for other beneficiaries, for implementing their own tasks under the action

The beneficiaries must give each other access — on a royalty-free basis — to results needed for implementing their own tasks under the action.

31.3 Access rights for other beneficiaries, for exploiting their own results

The beneficiaries must give each other — under fair and reasonable conditions (see Article 25.3) — access to results needed for exploiting their own results.

Requests for access may be made — unless agreed otherwise — up to one year after the period set out in Article 3.

31.4 Access rights of affiliated entities

Unless agreed otherwise in the consortium agreement, access to results must also be given — under fair and reasonable conditions (Article 25.3) — to affiliated entities established in an EU Member

State or associated country, if this is needed for those entities to exploit the results generated by the beneficiaries to which they are affiliated.

Unless agreed otherwise (see above; Article 31.1), the affiliated entity concerned must make any such request directly to the beneficiary that owns the results.

Requests for access may be made — unless agreed otherwise — up to one year after the period set out in Article 3.

31.5 Access rights for the JU, EU institutions, bodies, offices or agencies and EU Member States

The beneficiaries must give access to their results — on a royalty-free basis — to EU institutions, bodies, offices or agencies, for developing, implementing or monitoring EU policies or programmes.

Such access rights are limited to non-commercial and non-competitive use.

This does not change the right to use any material, document or information received from the beneficiaries for communication and publicising activities (see Article 38.2).

31.6 Access rights for third parties

The beneficiaries must give — under the conditions set out in Article 31.2 and 31.3 — access to their results to complementary beneficiaries²⁴, for the purposes of the complementary grant agreement(s) (see Article 2).

The beneficiaries must give third parties — up to four years after the period set out in Article 3 and under fair and reasonable conditions (see Article 25.3) — access to their results needed for interoperability.

The beneficiaries must give third parties — up to four years after the period set out in Article 3 and on a royalty-free basis — access to their results needed for interoperability, in particular for implementing the results in EU Member States or associated countries that are not participating in the action.

Beneficiaries must give access to software components under an EU public licence (or compatible licences) and must comply with any additional requirements set out in Annex 1.

31.7 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the grant may be reduced (see Article 43).

Such breaches may also lead to any of the other measures described in Chapter 6.

SECTION 4 OTHER RIGHTS AND OBLIGATIONS

²⁴ ‘Complementary beneficiary’ means a beneficiary of a complementary grant agreement.

ARTICLE 32 — RECRUITMENT AND WORKING CONDITIONS FOR RESEARCHERS

32.1 Obligation to take measures to implement the European Charter for Researchers and Code of Conduct for the Recruitment of Researchers

The beneficiaries must take all measures to implement the principles set out in the Commission Recommendation on the European Charter for Researchers and the Code of Conduct for the Recruitment of Researchers²⁵, in particular regarding:

- working conditions;
- transparent recruitment processes based on merit, and
- career development.

The beneficiaries must ensure that researchers and third parties involved in the action are aware of them.

32.2 Consequences of non-compliance

If a beneficiary breaches its obligations under this Article, the JU may apply any of the measures described in Chapter 6.

ARTICLE 33 — GENDER EQUALITY

33.1 Obligation to aim for gender equality

The beneficiaries must take all measures to promote equal opportunities between men and women in the implementation of the action. They must aim, to the extent possible, for a gender balance at all levels of personnel assigned to the action, including at supervisory and managerial level.

33.2 Consequences of non-compliance

If a beneficiary breaches its obligations under this Article, the JU may apply any of the measures described in Chapter 6.

ARTICLE 34 — ETHICS

34.1 Obligation to comply with ethical principles

The beneficiaries must carry out the action in compliance with:

- (a) ethical principles (including the highest standards of research integrity — as set out, for instance, in the European Code of Conduct for Research Integrity²⁶ — and including, in particular, avoiding fabrication, falsification, plagiarism or other research misconduct) and

²⁵ Commission Recommendation 2005/251/EC of 11 March 2005 on the European Charter for Researchers and on a Code of Conduct for the Recruitment of Researchers (OJ L 75, 22.3.2005, p. 67).

²⁶ The European Code of Conduct for Research Integrity of ALLEA (All European Academies) and ESF (European Science Foundation) of March 2011.

http://www.esf.org/fileadmin/Public_documents/Publications/Code_Conduct_ResearchIntegrity.pdf

(b) applicable international, EU and national law.

Funding will not be granted for activities carried out outside the EU if they are prohibited in all Member States.

The beneficiaries must ensure that the activities under the action have an exclusive focus on civil applications.

The beneficiaries must ensure that the activities under the action do not:

- (a) aim at human cloning for reproductive purposes;
- (b) intend to modify the genetic heritage of human beings which could make such changes heritable (with the exception of research relating to cancer treatment of the gonads, which may be financed), or
- (c) intend to create human embryos solely for the purpose of research or for the purpose of stem cell procurement, including by means of somatic cell nuclear transfer.

34.2 Activities raising ethical issues

Activities raising ethical issues must comply with the ‘**ethics requirements**’ set out in Annex 1.

Before the beginning of an activity raising an ethical issue, the coordinator must submit (see Article 52) to the JU copy of:

- (a) any ethics committee opinion required under national law and
- (b) any notification or authorisation for activities raising ethical issues required under national law.

If these documents are not in English, the coordinator must also submit an English summary of the submitted opinions, notifications and authorisations (containing, if available, the conclusions of the committee or authority concerned).

If these documents are specifically requested for the action, the request must contain an explicit reference to the action title. The coordinator must submit a declaration by each beneficiary concerned that all the submitted documents cover the action tasks.

34.3 Activities involving human embryos or human embryonic stem cells

Activities involving research on human embryos or human embryonic stem cells may be carried out only if:

- they are set out in Annex 1 or
- the coordinator has obtained explicit approval (in writing) from the JU (see Article 52).

34.4 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the grant may be reduced (see Article 43) and the Agreement or participation of the beneficiary may be terminated (see Article 50).

Such breaches may also lead to any of the other measures described in Chapter 6.

ARTICLE 35 — CONFLICT OF INTERESTS

35.1 Obligation to avoid a conflict of interests

The beneficiaries must take all measures to prevent any situation where the impartial and objective implementation of the action is compromised for reasons involving economic interest, political or national affinity, family or emotional ties or any other shared interest (**‘conflict of interests’**).

They must formally notify to the JU without delay any situation constituting or likely to lead to a conflict of interests and immediately take all the necessary steps to rectify this situation.

The JU may verify that the measures taken are appropriate and may require additional measures to be taken by a specified deadline.

35.2 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the grant may be reduced (see Article 43) and the Agreement or participation of the beneficiary may be terminated (see Article 50).

Such breaches may also lead to any of the other measures described in Chapter 6.

ARTICLE 36 — CONFIDENTIALITY

36.1 General obligation to maintain confidentiality

During implementation of the action and for four years after the period set out in Article 3, the parties must keep confidential any data, documents or other material (in any form) that is identified as confidential at the time it is disclosed (**‘confidential information’**).

If a beneficiary requests, the JU may agree to keep such information confidential for an additional period beyond the initial four years.

If information has been identified as confidential only orally, it will be considered to be confidential only if this is confirmed in writing within 15 days of the oral disclosure.

Unless otherwise agreed between the parties, they may use confidential information only to implement the Agreement.

The beneficiaries may disclose confidential information to their personnel or third parties involved in the action only if they:

- (a) need to know to implement the Agreement and
- (b) are bound by an obligation of confidentiality.

This does not change the security obligations in Article 37, which still apply.

The JU may disclose confidential information to its staff, other EU institutions and bodies or third parties, if:

- (a) this is necessary to implement the Agreement or safeguard the EU's or JU's financial interests and
- (b) the recipients of the information are bound by an obligation of confidentiality.

The confidentiality obligations no longer apply if:

- (a) the disclosing party agrees to release the other party;
- (b) the information was already known by the recipient or is given to him without obligation of confidentiality by a third party that was not bound by any obligation of confidentiality;
- (c) the recipient proves that the information was developed without the use of confidential information;
- (d) the information becomes generally and publicly available, without breaching any confidentiality obligation, or
- (e) the disclosure of the information is required by EU or national law.

36.2 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the grant may be reduced (see Article 43).

Such breaches may also lead to any of the other measures described in Chapter 6.

ARTICLE 37 — SECURITY-RELATED OBLIGATIONS

37.1 Results with a security recommendation

Not applicable

37.2 Classified results

Not applicable

37.3 Activities involving dual-use goods or dangerous materials and substances

Not applicable

37.4 Consequences of non-compliance

Not applicable

ARTICLE 38 — PROMOTING THE ACTION — VISIBILITY OF FUNDING

38.1 Communication activities by beneficiaries

38.1.1 Obligation to promote the action and its results

The beneficiaries must promote the action and its results, by providing targeted information to multiple audiences (including the media and the public) in a strategic and effective manner.

This does not change the dissemination obligations in Article 29, the confidentiality obligations in Article 36 or the security obligations in Article 37, all of which still apply.

Before engaging in a communication activity expected to have a major media impact, the beneficiaries must inform the JU (see Article 52).

38.1.2 Information on funding — Obligation and right to use the JU logo and the EU emblem

Unless the JU requests or agrees otherwise or unless it is impossible, any communication activity related to the action (including in electronic form, via social media, etc.) and any infrastructure, equipment and major results funded by the grant must:

- (a) display the JU logo;
- (b) display the EU emblem and
- (c) include the following text:

For communication activities: *“This project has received funding from the SESAR Joint Undertaking under grant agreement No 734143 under European Union’s Horizon 2020 research and innovation programme”*.

For infrastructure, equipment and major results: *“This [infrastructure][equipment][insert type of result] is part of a project that has received funding from the SESAR Joint Undertaking under grant agreement No 734143 under European Union’s Horizon 2020 research and innovation programme”*.

When displayed together with another logo, the JU logo and the EU emblem must have appropriate prominence.

For the purposes of their obligations under this Article, the beneficiaries may use the JU logo and the EU emblem without first obtaining approval from the JU or the Commission.

This does not, however, give them the right to exclusive use.

Moreover, they may not appropriate the JU logo or the EU emblem or any similar trademark or logo, either by registration or by any other means.

38.1.3 Disclaimer excluding JU responsibility

Any communication activity related to the action must indicate that it reflects only the author's view and that the JU is not responsible for any use that may be made of the information it contains.

38.2 Communication activities by the JU

38.2.1 Right to use beneficiaries’ materials, documents or information

The JU may use, for its communication and publicising activities, information relating to the action, documents notably summaries for publication and public deliverables as well as any other material, such as pictures or audio-visual material that it receives from any beneficiary (including in electronic form).

This does not change the confidentiality obligations in Article 36 and the security obligations in Article 37, all of which still apply.

However, if the JU's use of these materials, documents or information would risk compromising legitimate interests, the beneficiary concerned may request the JU not to use it (see Article 52).

The right to use a beneficiary's materials, documents and information includes:

- (a) **use for its own purposes** (in particular, making them available to persons working for the JU or any other EU institution, body, office or agency or body or institutions in EU Member States; and copying or reproducing them in whole or in part, in unlimited numbers);
- (b) **distribution to the public** (in particular, publication as hard copies and in electronic or digital format, publication on the internet, as a downloadable or non-downloadable file, broadcasting by any channel, public display or presentation, communicating through press information services, or inclusion in widely accessible databases or indexes);
- (c) **editing or redrafting** for communication and publicising activities (including shortening, summarising, inserting other elements (such as meta-data, legends, other graphic, visual, audio or text elements), extracting parts (e.g. audio or video files), dividing into parts, use in a compilation);
- (d) **translation**;
- (e) giving **access in response to individual requests** under Regulation No 1049/2001²⁷, without the right to reproduce or exploit;
- (f) **storage** in paper, electronic or other form;
- (g) **archiving**, in line with applicable document-management rules, and
- (h) the right to authorise **third parties** to act on its behalf or sub-license the modes of use set out in Points (b),(c),(d) and (f) to third parties if needed for the communication and publicising activities of the JU.

If the right of use is subject to rights of a third party (including personnel of the beneficiary), the beneficiary must ensure that it complies with its obligations under this Agreement (in particular, by obtaining the necessary approval from the third parties concerned).

Where applicable (and if provided by the beneficiaries), the JU will insert the following information:

“© – [year] – [name of the copyright owner]. All rights reserved. Licensed to the SESAR Joint Undertaking under conditions.”

38.3 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the grant may be reduced (see Article 43).

Such breaches may also lead to any of the other measures described in Chapter 6.

²⁷ Regulation (EC) No 1049/2001 of the European Parliament and of the Council of 30 May 2001 regarding public access to European Parliament, Council and Commission documents, OJ L 145, 31.5.2001, p. 43.

ARTICLE 39 — PROCESSING OF PERSONAL DATA

39.1 Processing of personal data by the JU and the Commission

Any personal data under the Agreement will be processed by the JU or the Commission under Regulation No 45/2001²⁸ and according to the ‘notifications of the processing operations’ to the Data Protection Officer (DPO) of the JU or the Commission (publicly accessible in the DPO register).

Such data will be processed by the ‘**data controller**’ of the JU or the Commission for the purposes of implementing, managing and monitoring the Agreement or protecting the financial interests of the JU, EU or Euratom (including checks, reviews, audits and investigations; see Article 22).

The persons whose personal data are processed have the right to access and correct their own personal data. For this purpose, they must send any queries about the processing of their personal data to the data controller, via the contact point indicated in the ‘privacy statement’ that are published on the JU and the Commission websites.

They also have the right to have recourse at any time to the European Data Protection Supervisor (EDPS).

39.2 Processing of personal data by the beneficiaries

The beneficiaries must process personal data under the Agreement in compliance with applicable EU and national law on data protection (including authorisations or notification requirements).

The beneficiaries may grant their personnel access only to data that is strictly necessary for implementing, managing and monitoring the Agreement.

The beneficiaries must inform the personnel whose personal data are collected and processed by the JU or the Commission. For this purpose, they must provide them with the privacy statement (see above), before transmitting their data to the JU or the Commission.

39.3 Consequences of non-compliance

If a beneficiary breaches any of its obligations under Article 39.2, the JU may apply any of the measures described in Chapter 6.

ARTICLE 40 — ASSIGNMENTS OF CLAIMS FOR PAYMENT AGAINST THE JU

The beneficiaries may not assign any of their claims for payment against the JU to any third party, except if approved by the JU on the basis of a reasoned, written request by the coordinator (on behalf of the beneficiary concerned).

If the JU has not accepted the assignment or the terms of it are not observed, the assignment will have no effect on it.

In no circumstances will an assignment release the beneficiaries from their obligations towards the JU.

²⁸ Regulation (EC) No 45/2001 of the European Parliament and of the Council of 18 December 2000 on the protection of individuals with regard to the processing of personal data by the Community institutions and bodies and on the free movement of such data (OJ L 8, 12.01.2001, p. 1).

CHAPTER 5 DIVISION OF BENEFICIARIES' ROLES AND RESPONSIBILITIES
— RELATIONSHIP WITH COMPLEMENTARY BENEFICIARIES —
RELATIONSHIP WITH PARTNERS OF A JOINT ACTION

ARTICLE 41 — DIVISION OF BENEFICIARIES' ROLES AND RESPONSIBILITIES
— RELATIONSHIP WITH COMPLEMENTARY BENEFICIARIES —
RELATIONSHIP WITH PARTNERS OF A JOINT ACTION

41.1 Roles and responsibilities towards the JU

The beneficiaries have full responsibility for implementing the action and complying with the Agreement.

The beneficiaries are jointly and severally liable for the **technical implementation** of the action as described in Annex 1. If a beneficiary fails to implement its part of the action, the other beneficiaries become responsible for implementing this part (without being entitled to any additional JU funding for doing so), unless the JU expressly relieves them of this obligation.

The **financial responsibility** of each beneficiary is governed by Articles 44, 45 and 46.

41.2 Internal division of roles and responsibilities

The internal roles and responsibilities of the beneficiaries are divided as follows:

(a) Each **beneficiary** must:

- (i) keep information stored in the 'Beneficiary Register' (via the electronic exchange system) up to date (see Article 17);
- (ii) inform the coordinator immediately of any events or circumstances likely to affect significantly or delay the implementation of the action (see Article 17);
- (iii) submit to the coordinator in good time:
 - individual financial statements for itself and its linked third parties and, if required, certificates on the financial statements (see Article 20);
 - the data needed to draw up the technical reports (see Article 20);
 - ethics committee opinions and notifications or authorisations for activities raising ethical issues (see Article 34);
 - any other documents or information required by the JU under the Agreement, unless the Agreement requires the beneficiary to submit this information directly to the JU.

(b) The **coordinator** must:

- (i) monitor that the action is implemented properly (see Article 7);
- (ii) act as the intermediary for all communications between the beneficiaries and the JU (in particular, providing the JU with the information described in Article 17), unless the Agreement specifies otherwise;

- (iii) request and review any documents or information required by the JU and verify their completeness and correctness before passing them on to the JU;
- (iv) submit the deliverables and reports to the JU (see Articles 19 and 20);
- (v) ensure that all payments are made to the other beneficiaries without unjustified delay (see Article 21);
- (vi) inform the JU of the amounts paid to each beneficiary, when required under the Agreement (see Articles 44 and 50) or requested by the JU.

The coordinator may not delegate the above-mentioned tasks to any other beneficiary or subcontract them to any third party.

41.3 Internal arrangements between beneficiaries — Consortium agreement

Not applicable

41.4 Relationship with complementary beneficiaries — Collaboration agreement

Not applicable

41.5 Relationship with partners of a joint action — Coordination agreement

Not applicable

CHAPTER 6 REJECTION OF COSTS — REDUCTION OF THE GRANT — RECOVERY — PENALTIES — DAMAGES — SUSPENSION — TERMINATION — FORCE MAJEURE

SECTION 1 REJECTION OF COSTS — REDUCTION OF THE GRANT — RECOVERY — PENALTIES

ARTICLE 42 — REJECTION OF INELIGIBLE COSTS

42.1 Conditions

42.1.1 The JU will — at the time of an **interim payment, at the payment of the balance or afterwards** — reject any costs which are ineligible (see Article 6), in particular following checks, reviews, audits or investigations (see Article 22).

42.1.2 The rejection may also be based on the **extension of findings from other grants to this grant**, under the conditions set out in Article 22.5.2.

42.2 Ineligible costs to be rejected — Calculation — Procedure

Ineligible costs will be rejected in full.

If the JU rejects costs **without reduction of the grant** (see Article 43) or **recovery of undue amounts** (see Article 44), it will formally notify the coordinator or beneficiary concerned the rejection of

costs, the amounts and the reasons why (if applicable, together with the notification of amounts due; see Article 21.5). The coordinator or beneficiary concerned may — within 30 days of receiving notification — formally notify the JU of its disagreement and the reasons why.

If the JU rejects costs **with reduction of the grant** or **recovery of undue amounts**, it will formally notify the rejection in the ‘**pre-information letter**’ on reduction or recovery set out in Articles 43 and 44.

42.3 Effects

If the JU rejects costs at the time of an **interim payment** or **the payment of the balance**, it will deduct them from the total eligible costs declared, for the action, in the periodic or final summary financial statement (see Articles 20.3 and 20.4). It will then calculate the interim payment or payment of the balance as set out in Articles 21.3 or 21.4.

If the JU — **after an interim payment but before the payment of the balance** — rejects costs declared in a periodic summary financial statement, it will deduct them from the total eligible costs declared, for the action, in the next periodic summary financial statement or in the final summary financial statement. It will then calculate the interim payment or payment of the balance as set out in Articles 21.3 or 21.4.

If the JU rejects costs **after the payment of the balance**, it will deduct the amount rejected from the total eligible costs declared, by the beneficiary, in the final summary financial statement. It will then calculate the revised final grant amount as set out in Article 5.4.

ARTICLE 43 — REDUCTION OF THE GRANT

43.1 Conditions

43.1.1 The JU may — **at the payment of the balance** or **afterwards** — reduce the maximum grant amount (see Article 5.1), if the action has not been implemented properly as described in Annex 1 or another obligation under the Agreement has been breached.

43.1.2 The JU may also reduce the maximum grant amount on the basis of the **extension of findings from other grants to this grant**, under the conditions set out in Article 22.5.2.

43.2 Amount to be reduced — Calculation — Procedure

The amount of the reduction will be proportionate to the improper implementation of the action or to the seriousness of the breach.

Before reduction of the grant, the JU will formally notify a ‘**pre-information letter**’ to the coordinator or beneficiary concerned:

- informing it of its intention to reduce the grant, the amount it intends to reduce and the reasons why and
- inviting it to submit observations within 30 days of receiving notification

If the JU does not receive any observations or decides to pursue reduction despite the observations it has received, it will formally notify **confirmation** of the reduction (if applicable, together with the notification of amounts due; see Article 21).

43.3 Effects

If the JU reduces the grant at the time of **the payment of the balance**, it will calculate the reduced grant amount for the action and then determine the amount due as payment of the balance (see Articles 5.3.4 and 21.4).

If the JU reduces the grant **after the payment of the balance**, it will calculate the revised final grant amount for the beneficiary concerned (see Article 5.4). If the revised final grant amount for the beneficiary concerned is lower than its share of the final grant amount, the JU will recover the difference (see Article 44).

ARTICLE 44 — RECOVERY OF UNDUE AMOUNTS

44.1 Amount to be recovered — Calculation — Procedure

The JU will — after **termination of the participation of a beneficiary, at the payment of the balance or afterwards** — claim back any amount that was paid but is not due under the Agreement.

Each beneficiary's financial responsibility in case of recovery is limited to its own debt (including undue amounts paid by the JU for costs declared by its linked third parties), except for the amount retained for the Guarantee Fund (see Article 21.4).

44.1.1 Recovery after termination of a beneficiary's participation

If recovery takes place after termination of a beneficiary's participation (including the coordinator), the JU will claim back the undue amount from the beneficiary concerned, by formally notifying it a debit note (see Article 50.2 and 50.3). This note will specify the amount to be recovered, the terms and the date for payment.

If payment is not made by the date specified in the debit note, the JU will **recover** the amount:

- (a) by '**offsetting**' it — without the beneficiary's consent — against any amounts owed to the beneficiary concerned by the JU.

In exceptional circumstances, to safeguard the EU's or JU's financial interests, the JU may offset before the payment date specified in the debit note;

- (b) if a linked third party has accepted joint and several liability (see Article 14), by **holding the third party liable** up to the maximum JU contribution indicated, for the linked third party, in the estimated budget (see Annex 2) and/or

- (c) by **taking legal action** (see Article 57).

If payment is not made by the date specified in the debit note, the amount to be recovered (see above) will be increased by **late-payment interest** at the rate set out in Article 21.11, from the day following the payment date in the debit note, up to and including the date the JU receives full payment of the amount.

Partial payments will be first credited against expenses, charges and late-payment interest and then against the principal.

Bank charges incurred in the recovery process will be borne by the beneficiary, unless Directive 2007/64/EC²⁹ applies.

44.1.2 Recovery at payment of the balance

If the payment of the balance takes the form of a recovery (see Article 21.4), the JU will formally notify a ‘**pre-information letter**’ to the coordinator:

- informing it of its intention to recover, the amount due as the balance and the reasons why;
- specifying that it intends to deduct the amount to be recovered from the amount retained for the Guarantee Fund;
- requesting the coordinator to submit a report on the distribution of payments to the beneficiaries within 30 days of receiving notification, and
- inviting the coordinator to submit observations within 30 days of receiving notification.

If no observations are submitted or the JU decides to pursue recovery despite the observations it has received, it will **confirm recovery** (together with the notification of amounts due; see Article 21.5) and:

- pay the difference between the amount to be recovered and the amount retained for the Guarantee Fund, **if the difference is positive** or
- formally notify to the coordinator a **debit note** for the difference between the amount to be recovered and the amount retained for the Guarantee Fund, **if the difference is negative**. This note will also specify the terms and the date for payment.

If the coordinator does not repay the JU by the date in the debit note and has not submitted the report on the distribution of payments: the JU will **recover** the amount set out in the debit note from the coordinator (see below).

If the coordinator does not repay the JU by the date in the debit note, but has submitted the report on the distribution of payments: the JU will:

- (a) identify the beneficiaries for which the amount calculated as follows is negative:

{ { {beneficiary’s costs declared in the final summary financial statement and approved by the JU multiplied by the reimbursement rate set out in Article 5.2 for the beneficiary concerned

plus

its linked third parties’ costs declared in the final summary financial statement and approved by the JU multiplied by the reimbursement rate set out in Article 5.2 for each linked third party concerned}

divided by

the JU contribution for the action calculated according to Article 5.3.1 }

²⁹ Directive 2007/64/EC of the European Parliament and of the Council of 13 November 2007 on payment services in the internal market amending Directives 97/7/EC, 2002/65/EC, 2005/60/EC and 2006/48/EC and repealing Directive 97/5/EC (OJ L 319, 05.12.2007, p. 1).

multiplied by

the final grant amount (see Article 5.3)},

minus

{pre-financing and interim payments received by the beneficiary} }.

- (b) formally notify to each beneficiary identified according to point (a) a **debit note** specifying the terms and date for payment. The amount of the debit note is calculated as follows:

{ {amount calculated according to point (a) for the beneficiary concerned

divided by

the sum of the amounts calculated according to point (a) for all the beneficiaries identified according to point (a)}

multiplied by

the amount set out in the debit note formally notified to the coordinator}.

If payment is not made by the date specified in the debit note, the JU will **recover** the amount:

- (a) by '**offsetting**' it — without the beneficiary's consent — against any amounts owed to the beneficiary concerned by the JU.

In exceptional circumstances, to safeguard the EU's or JU's financial interests, the JU may offset before the payment date specified in the debit note;

- (b) by **drawing on the Guarantee Fund**. The JU will formally notify the beneficiary concerned the debit note on behalf of the Guarantee Fund and recover the amount:

- (i) if a linked third party has accepted joint and several liability (see Article 14), by **holding the third party liable** up to the maximum JU contribution indicated, for the linked third party, in the estimated budget (see Annex 2) and/or

- (ii) by **taking legal action** (see Article 57).

If payment is not made by the date in the debit note, the amount to be recovered (see above) will be increased by **late-payment interest** at the rate set out in Article 21.11, from the day following the payment date in the debit note, up to and including the date the JU receives full payment of the amount.

Partial payments will be first credited against expenses, charges and late-payment interest and then against the principal.

Bank charges incurred in the recovery process will be borne by the beneficiary, unless Directive 2007/64/EC applies.

44.1.3 Recovery of amounts after payment of the balance

If, for a beneficiary, the revised final grant amount (see Article 5.4) is lower than its share of the final grant amount, it must repay the difference to the JU.

The beneficiary's share of the final grant amount is calculated as follows:

{ {beneficiary's costs declared in the final summary financial statement and approved by the JU multiplied by the reimbursement rate set out in Article 5.2 for the beneficiary concerned

plus

its linked third parties' costs declared in the final summary financial statement and approved by the JU multiplied by the reimbursement rate set out in Article 5.2 for each linked third party concerned}

divided by

the JU contribution for the action calculated according to Article 5.3.1 }

multiplied by

the final grant amount (see Article 5.3)}.

If the coordinator has not distributed amounts received (see Article 21.7), the JU will also recover these amounts.

The JU will formally notify a **pre-information letter** to the beneficiary concerned:

- informing it of its intention to recover, the due amount and the reasons why and
- inviting it to submit observations within 30 days of receiving notification.

If no observations are submitted or the JU decides to pursue recovery despite the observations it has received, it will **confirm** the amount to be recovered and formally notify to the beneficiary concerned a **debit note**. This note will also specify the terms and the date for payment.

If payment is not made by the date specified in the debit note, the JU will **recover** the amount:

- (a) by '**offsetting**' it — without the beneficiary's consent — against any amounts owed to the beneficiary concerned by the JU.

In exceptional circumstances, to safeguard the EU's or JU's financial interests, the JU may offset before the payment date specified in the debit note;

- (b) by **drawing on the Guarantee Fund**. The JU will formally notify the beneficiary concerned the debit note on behalf of the Guarantee Fund and recover the amount:

- (i) if a linked third party has accepted joint and several liability (see Article 14), by **holding the third party liable** up to the maximum JU contribution indicated, for the linked third party, in the estimated budget (see Annex 2) and/or

- (ii) by **taking legal action** (see Article 57).

If payment is not made by the date in the debit note, the amount to be recovered (see above) will be increased by **late-payment interest** at the rate set out in Article 21.11, from the day following the date for payment in the debit note, up to and including the date the JU receives full payment of the amount.

Partial payments will be first credited against expenses, charges and late-payment interest and then against the principal.

Bank charges incurred in the recovery process will be borne by the beneficiary, unless Directive 2007/64/EC applies.

ARTICLE 45 — ADMINISTRATIVE AND FINANCIAL PENALTIES

45.1 Conditions

Under Articles 84 and 89 of the Financial Rules of the JU (read in conjunction with Articles 109 and 131(5) of the Financial Regulation No 966/2012) the JU may impose **administrative** and **financial penalties** if a beneficiary:

- (a) has committed substantial errors, irregularities or fraud or is in serious breach of its obligations under the Agreement or
- (b) has made false declarations about information required under the Agreement or for the submission of the proposal (or has not supplied such information).

Each beneficiary is responsible for paying the financial penalties imposed on it.

Under Articles 84 and 89 of the Financial Rules of the JU (read in conjunction with Article 109(3) of the Financial Regulation No 966/2012), the JU may — under certain conditions and limits — publish decisions imposing administrative or financial penalties.

45.2 Duration — Amount of penalty — Calculation

Administrative penalties exclude the beneficiary from all JU contracts and grants for a maximum of five years from the date the infringement is established by the JU.

If the beneficiary commits another infringement within five years of the date the first infringement is established, the JU may extend the exclusion period up to 10 years.

Financial penalties will be between 2% and 10% of the maximum JU contribution indicated, for the beneficiary concerned, in the estimated budget (see Annex 2).

If the beneficiary commits another infringement within five years of the date the first infringement is established, the JU may increase the rate of financial penalties to between 4% and 20%.

45.3 Procedure

Before applying a penalty, the JU will formally notify the beneficiary concerned:

- informing it of its intention to impose a penalty, its duration or amount and the reasons why and
- inviting it to submit observations within 30 days.

If the JU does not receive any observations or decides to impose the penalty despite of observations it has received, it will formally notify **confirmation** of the penalty to the beneficiary concerned and — in case of financial penalties — deduct the penalty from the payment of the balance or formally notify a **debit note**, specifying the amount to be recovered, the terms and the date for payment.

If payment is not made by the date specified in the debit note, the JU may **recover** the amount:

- (a) by ‘**offsetting**’ it — without the beneficiary’s consent — against any amounts owed to the beneficiary concerned by the JU.

In exceptional circumstances, to safeguard the EU’s or JU’s financial interests, the JU may offset before the payment date specified in the debit note;

- (b) by **taking legal action** (see Article 57).

If payment is not made by the date in the debit note, the amount to be recovered (see above) will be increased by **late-payment interest** at the rate set out in Article 21.11, from the day following the payment date in the debit note, up to and including the date the JU receives full payment of the amount.

Partial payments will be first credited against expenses, charges and late-payment interest and then against the principal.

Bank charges incurred in the recovery process will be borne by the beneficiary, unless Directive 2007/64/EC applies.

SECTION 2 LIABILITY FOR DAMAGES

ARTICLE 46 — LIABILITY FOR DAMAGES

46.1 Liability of the JU

The JU cannot be held liable for any damage caused to the beneficiaries or to third parties as a consequence of implementing the Agreement, including for gross negligence.

The JU cannot be held liable for any damage caused by any of the beneficiaries or third parties involved in the action, as a consequence of implementing the Agreement.

46.2 Liability of the beneficiaries

46.2.1 Conditions

Except in case of force majeure (see Article 51), the beneficiaries must compensate the JU for any damage it sustains as a result of the implementation of the action or because the action was not implemented in full compliance with the Agreement.

Each beneficiary is responsible for paying the damages claimed from it.

46.2.2 Amount of damages - Calculation

The amount the JU can claim from a beneficiary will correspond to the damage caused by that beneficiary.

46.2.3 Procedure

Before claiming damages, the JU will formally notify the beneficiary concerned:

- informing it of its intention to claim damages, the amount and the reasons why and
- inviting it to submit observations within 30 days.

If the JU does not receive any observations or decides to claim damages despite the observations it has received, it will formally notify **confirmation** of the claim for damages and a **debit note**, specifying the amount to be recovered, the terms and the date for payment.

If payment is not made by the date specified in the debit note, the JU may **recover** the amount:

- (a) by ‘**offsetting**’ it — without the beneficiary’s consent — against any amounts owed to the beneficiary concerned by the JU.

In exceptional circumstances, to safeguard the EU’s or JU’s financial interests, the JU may offset before the payment date specified in the debit note;

- (b) by **taking legal action** (see Article 57).

If payment is not made by the date in the debit note, the amount to be recovered (see above) will be increased by **late-payment interest** at the rate set out in Article 21.11, from the day following the payment date in the debit note, up to and including the date the JU receives full payment of the amount.

Partial payments will be first credited against expenses, charges and late-payment interest and then against the principal.

Bank charges incurred in the recovery process will be borne by the beneficiary, unless Directive 2007/64/EC applies.

SECTION 3 SUSPENSION AND TERMINATION

ARTICLE 47 — SUSPENSION OF PAYMENT DEADLINE

47.1 Conditions

The JU may — at any moment — suspend the payment deadline (see Article 21.2 to 21.4) if a request for payment (see Article 20) cannot be approved because:

- (a) it does not comply with the provisions of the Agreement (see Article 20);
- (b) the technical reports or financial reports have not been submitted or are not complete or additional information is needed, or
- (c) there is doubt about the eligibility of the costs declared in the financial statements and additional checks, reviews, audits or investigations are necessary.

47.2 Procedure

The JU will formally notify the coordinator of the suspension and the reasons why.

The suspension will **take effect** the day notification is sent by the JU (see Article 52).

If the conditions for suspending the payment deadline are no longer met, the suspension will be **lifted** — and the remaining period will resume.

If the suspension exceeds two months, the coordinator may request the JU if the suspension will continue.

If the payment deadline has been suspended due to the non-compliance of the technical or financial reports (see Article 20) and the revised report or statement is not submitted or was submitted but is also rejected, the JU may also terminate the Agreement or the participation of the beneficiary (see Article 50.3.1(I)).

ARTICLE 48 — SUSPENSION OF PAYMENTS

48.1 Conditions

The JU may — at any moment — suspend, in whole or in part, the pre-financing payment and interim payments for one or more beneficiaries or the payment of the balance for all beneficiaries, if a beneficiary:

- (a) has committed or is suspected of having committed substantial errors, irregularities, fraud or serious breach of obligations in the award procedure or under this Agreement or
- (b) has committed — in other JU, EU or Euratom grants awarded to it under similar conditions — systemic or recurrent errors, irregularities, fraud or serious breach of obligations that have a material impact on this grant (**extension of findings from other grants to this grant**; see Article 22.5.2).

48.2 Procedure

Before suspending payments, the JU will formally notify the coordinator:

- informing it of its intention to suspend payments and the reasons why and
- inviting it to submit observations within 30 days of receiving notification.

If the JU does not receive observations or decides to pursue the procedure despite the observations it has received, it will formally notify **confirmation** of the suspension. Otherwise, it will formally notify that the suspension procedure is not continued.

The suspension will **take effect** the day the confirmation notification is sent by the JU.

If the conditions for resuming payments are met, the suspension will be **lifted**. The JU will formally notify the coordinator.

During the suspension, the periodic report(s) (see Article 20.3) must not contain any individual financial statements from the beneficiary concerned and its linked third parties. When the JU resumes payments, the coordinator may include them in the next periodic report.

The beneficiaries may suspend implementation of the action (see Article 49.1) or terminate the Agreement or the participation of the beneficiary concerned (see Article 50.1 and 50.2).

ARTICLE 49 — SUSPENSION OF THE ACTION IMPLEMENTATION

49.1 Suspension of the action implementation, by the beneficiaries

49.1.1 Conditions

The beneficiaries may suspend implementation of the action or any part of it, if exceptional circumstances — in particular *force majeure* (see Article 51) — make implementation impossible or excessively difficult.

49.1.2 Procedure

The coordinator must immediately formally notify to the JU the suspension (see Article 52), stating:

- the reasons why and
- the expected date of resumption.

The suspension will **take effect** the day this notification is received by the JU.

Once circumstances allow for implementation to resume, the coordinator must immediately formally notify the JU and request an **amendment** of the Agreement to set the date on which the action will be resumed, extend the duration of the action and make other changes necessary to adapt the action to the new situation (see Article 55) — unless the Agreement or the participation of a beneficiary has been terminated (see Article 50).

The suspension will be **lifted** with effect from the resumption date set out in the amendment. This date may be before the date on which the amendment enters into force.

Costs incurred during suspension of the action implementation are not eligible (see Article 6).

49.2 Suspension of the action implementation, by the JU

49.2.1 Conditions

The JU may suspend implementation of the action or any part of it:

- (a) if a beneficiary has committed or is suspected of having committed substantial errors, irregularities, fraud or serious breach of obligations in the award procedure or under this Agreement;
- (b) if a beneficiary has committed — in other JU, EU or Euratom grants awarded to it under similar conditions — systemic or recurrent errors, irregularities, fraud or serious breach of obligations that have a material impact on this grant (**extension of findings from other grants to this grant**; see Article 22.5.2), or
- (c) if the action is suspected of having lost its scientific or technological relevance.

49.2.2 Procedure

Before suspending implementation of the action, the JU will formally notify the coordinator:

- informing it of its intention to suspend the implementation and the reasons why and
- inviting it to submit observations within 30 days of receiving notification.

If the JU does not receive observations or decides to pursue the procedure despite the observations it has received, it will formally notify **confirmation** of the suspension. Otherwise, it will formally notify that the procedure is not continued.

The suspension will **take effect** five days after confirmation notification is received by the coordinator (or on a later date specified in the notification).

It will be **lifted** if the conditions for resuming implementation of the action are met.

The coordinator will be formally notified of the lifting and the Agreement will be **amended** to set the date on which the action will be resumed, extend the duration of the action and make other changes necessary to adapt the action to the new situation (see Article 55) — unless the Agreement has already been terminated (see Article 50).

The suspension will be lifted with effect from the resumption date set out in the amendment. This date may be before the date on which the amendment enters into force.

Costs incurred during suspension are not eligible (see Article 6).

The beneficiaries may not claim damages due to suspension by the JU (see Article 46).

Suspension of the action implementation does not affect the JU's right to terminate the Agreement or participation of a beneficiary (see Article 50), reduce the grant or recover amounts unduly paid (see Articles 43 and 44).

ARTICLE 50 — TERMINATION OF THE AGREEMENT OR OF THE PARTICIPATION OF ONE OR MORE BENEFICIARIES

50.1 Termination of the Agreement by the beneficiaries

50.1.1 Conditions and procedure

The beneficiaries may terminate the Agreement.

The coordinator must formally notify termination to the JU (see Article 52), stating:

- the reasons why and
- the date the termination will take effect. This date must be after the notification.

If no reasons are given or if the JU considers the reasons do not justify termination, the Agreement will be considered to have been '**terminated improperly**'.

The termination will **take effect** on the day specified in the notification.

50.1.2 Effects

The coordinator must — within 60 days from when termination takes effect — submit:

- (i) a periodic report (for the open reporting period until termination; see Article 20.3) and
- (ii) the final report (see Article 20.4).

If the JU does not receive the reports within the deadline (see above), only costs which are included in an approved periodic report will be taken into account.

The JU will **calculate** the final grant amount (see Article 5.3) and the balance (see Article 21.4) on the basis of the reports submitted. Only costs incurred until termination are eligible (see Article 6). Costs relating to contracts due for execution only after termination are not eligible.

Improper termination may lead to a reduction of the grant (see Article 43).

After termination, the beneficiaries' obligations (in particular Articles 20, 22, 23, Section 3 of Chapter 4, 36, 37, 38 and 40) continue to apply.

50.2 Termination of the participation of one or more beneficiaries, by the beneficiaries

50.2.1 Conditions and procedure

The participation of one or more beneficiaries may be terminated by the coordinator, on request of the beneficiary concerned or on behalf of the other beneficiaries.

The coordinator must formally notify termination to the JU (see Article 52) and inform the beneficiary concerned.

If the coordinator's participation is terminated without its agreement, the formal notification must be done by another beneficiary (acting on behalf of the other beneficiaries).

The notification must include:

- the reasons why;
- the opinion of the beneficiary concerned (or proof that this opinion has been requested in writing);
- the date the termination takes effect. This date must be after the notification, and
- a request for amendment (see Article 55), with a proposal for reallocation of the tasks and the estimated budget of the beneficiary concerned (see Annexes 1 and 2) and, if necessary, the addition of one or more new beneficiaries (see Article 56). If termination takes effect after the period set out in Article 3, no request for amendment must be included unless the beneficiary concerned is the coordinator. In this case, the request for amendment must propose a new coordinator.

If this information is not given or if the JU considers that the reasons do not justify termination, the participation will be considered to have been **terminated improperly**.

The termination will **take effect** on the day specified in the notification.

50.2.2 Effects

The coordinator must — within 30 days from when termination takes effect — submit:

- (i) a report on the distribution of payments to the beneficiary concerned and
- (ii) if termination takes effect during the period set out in Article 3, a ‘**termination report**’ from the beneficiary concerned, for the open reporting period until termination, containing an overview of the progress of the work, an overview of the use of resources, the individual financial statement and, if applicable, the certificate on the financial statement (see Articles 20.3 and 20.4).

The information in the termination report must also be included in the periodic report for the next reporting period (see Article 20.3).

If the request for amendment is rejected by the JU, (because it calls into question the decision awarding the grant or breaches the principle of equal treatment of applicants), the Agreement may be terminated according to Article 50.3.1(c).

If the request for amendment is accepted by the JU, the Agreement is **amended** to introduce the necessary changes (see Article 55).

The JU will **calculate** — on the basis of the periodic reports, the termination report and the report on the distribution of payments — if the (pre-financing and interim) payments received by the beneficiary concerned exceed the beneficiary’s JU contribution (calculated by applying the reimbursement rate(s) to the eligible costs declared by the beneficiary and its linked third parties and approved by the JU). Only costs incurred by the beneficiary concerned until termination takes effect are eligible (see Article 6). Costs relating to contracts due for execution only after termination are not eligible.

- If the payments received **exceed the amounts due**:
 - if termination takes effect during the period set out in Article 3 and the request for amendment is accepted, the beneficiary concerned must repay to the coordinator the amount unduly received. The JU will formally notify the amount unduly received and request the beneficiary concerned to repay it to the coordinator within 30 days of receiving notification. If it does not repay the coordinator, the JU will draw upon the Guarantee Fund to pay the coordinator and then notify a **debit note** on behalf of the Guarantee Fund to the beneficiary concerned (see Article 44);
 - in all other cases (in particular if termination takes effect after the period set out in Article 3), the JU will formally notify a **debit note** to the beneficiary concerned. If payment is not made by the date in the debit note, the Guarantee Fund will pay to the JU the amount due and the JU will notify a debit note on behalf of the Guarantee Fund to the beneficiary concerned (see Article 44);
 - if the beneficiary concerned is the former coordinator, it must repay the new coordinator according to the procedure above, unless:
 - termination is after an interim payment and
 - the former coordinator has not distributed amounts received as pre-financing or interim payments (see Article 21.7).

In this case, the JU will formally notify a **debit note** to the former coordinator. If payment is not made by the date in the debit note, the Guarantee Fund will pay to the JU the amount due.

The JU will then pay the new coordinator and notify a debit note on behalf of the Guarantee Fund to the former coordinator (see Article 44).

- If the payments received **do not exceed the amounts due**: amounts owed to the beneficiary concerned will be included in the next interim or final payment.

If the JU does not receive the termination report within the deadline (see above), only costs included in an approved periodic report will be taken into account.

If the JU does not receive the report on the distribution of payments within the deadline (see above), it will consider that:

- the coordinator did not distribute any payment to the beneficiary concerned and that
- the beneficiary concerned must not repay any amount to the coordinator.

Improper termination may lead to a reduction of the grant (see Article 43) or termination of the Agreement (see Article 50).

After termination, the concerned beneficiary's obligations (in particular Articles 20, 22, 23, Section 3 of Chapter 4, 36, 37, 38 and 40) continue to apply.

50.3 Termination of the Agreement or the participation of one or more beneficiaries, by the JU

50.3.1 Conditions

The JU may terminate the Agreement or the participation of one or more beneficiaries, if:

- (a) one or more beneficiaries do not accede to the Agreement (see Article 56);
- (b) a change to their legal, financial, technical, organisational or ownership situation (or those of its linked third parties) is likely to substantially affect or delay the implementation of the action or calls into question the decision to award the grant;
- (c) following termination of participation for one or more beneficiaries (see above), the necessary changes to the Agreement would call into question the decision awarding the grant or breach the principle of equal treatment of applicants (see Article 55);
- (d) implementation of the action is prevented by force majeure (see Article 51) or suspended by the coordinator (see Article 49.1) and either:
 - (i) resumption is impossible, or
 - (ii) the necessary changes to the Agreement would call into question the decision awarding the grant or breach the principle of equal treatment of applicants;
- (e) a beneficiary is declared bankrupt, being wound up, having its affairs administered by the courts, has entered into an arrangement with creditors, has suspended business activities, or is subject to any other similar proceedings or procedures under national law;
- (f) a beneficiary (or a natural person who has the power to represent or take decisions on its behalf) has been found guilty of professional misconduct, proven by any means;

- (g) a beneficiary does not comply with the applicable national law on taxes and social security;
- (h) the action has lost scientific or technological relevance;
- (i) not applicable;
- (j) not applicable;
- (k) a beneficiary (or a natural person who has the power to represent or take decisions on its behalf) has committed fraud, corruption, or is involved in a criminal organisation, money laundering or any other illegal activity affecting the EU's or JU's financial interests;
- (l) a beneficiary (or a natural person who has the power to represent or take decisions on its behalf) has — in the award procedure or under the Agreement — committed:
 - (i) substantial errors, irregularities, fraud or
 - (ii) serious breach of obligations, including improper implementation of the action, submission of false information, failure to provide required information, breach of ethical principles;
- (m) a beneficiary has committed — in other JU, EU or Euratom grants awarded to it under similar conditions — systemic or recurrent errors, irregularities, fraud or serious breach of obligations that have a material impact on this grant ('**extension of findings from other grants to this grant**').

50.3.2 Procedure

Before terminating the Agreement or participation of one or more beneficiaries, the JU will formally notify the coordinator:

- informing it of its intention to terminate and the reasons why and
- inviting it, within 30 days of receiving notification, to submit observations and — in case of Point (l.ii) above — to inform the JU of the measures to ensure compliance with the obligations under the Agreement.

If the JU does not receive observations or decides to pursue the procedure despite the observations it has received, it will formally notify to the coordinator **confirmation** of the termination and the date it will take effect. Otherwise, it will formally notify that the procedure is not continued.

The termination will **take effect**:

- for terminations under Points (b), (c), (e), (g), (h), (j), and (l.ii) above: on the day specified in the notification of the confirmation (see above);
- for terminations under Points (a), (d), (f), (i), (k), (l.i) and (m) above: on the day after the notification of the confirmation is received by the coordinator.

50.3.3 Effects

- (a) for **termination of the Agreement**:

The coordinator must — within 60 days from when termination takes effect — submit:

- (i) a periodic report (for the last open reporting period until termination; see Article 20.3) and
- (ii) a final report (see Article 20.4).

If the Agreement is terminated for breach of the obligation to submit the reports (see Articles 20.8 and 50.3.1(l)), the coordinator may not submit any reports after termination.

If the JU does not receive the reports within the deadline (see above), only costs which are included in an approved periodic report will be taken into account.

The JU will **calculate** the final grant amount (see Article 5.3) and the balance (see Article 21.4) on the basis of the reports submitted. Only costs incurred until termination takes effect are eligible (see Article 6). Costs relating to contracts due for execution only after termination are not eligible.

This does not affect the JU's right to reduce the grant (see Article 43) or to impose administrative and financial penalties (Article 45).

The beneficiaries may not claim damages due to termination by the JU (see Article 46).

After termination, the beneficiaries' obligations (in particular Articles 20, 22, 23, Section 3 of Chapter 4, 36, 37, 38 and 40) continue to apply.

(b) for **termination of the participation of one or more beneficiaries:**

The coordinator must — within 60 days from when termination takes effect — submit:

- (i) a report on the distribution of payments to the beneficiary concerned;
- (ii) a request for amendment (see Article 55), with a proposal for reallocation of the tasks and estimated budget of the beneficiary concerned (see Annexes 1 and 2) and, if necessary, the addition of one or more new beneficiaries (see Article 56). If termination is notified after the period set out in Article 3, no request for amendment must be submitted unless the beneficiary concerned is the coordinator. In this case the request for amendment must propose a new coordinator, and
- (iii) if termination takes effect during the period set out in Article 3, a **termination report** from the beneficiary concerned, for the open reporting period until termination, containing an overview of the progress of the work, an overview of the use of resources, the individual financial statement and, if applicable, the certificate on the financial statement (see Article 20).

The information in the termination report must also be included in the periodic report for the next reporting period (see Article 20.3).

If the request for amendment is rejected by the JU (because it calls into question the decision awarding the grant or breaches the principle of equal treatment of applicants), the Agreement may be terminated according to Article 50.3.1(c).

If the request for amendment is accepted by the JU, the Agreement is **amended** to introduce the necessary changes (see Article 55).

The JU will **calculate** — on the basis of the periodic reports, the termination report and the report on the distribution of payments — if the (pre-financing and interim) payments received by the beneficiary concerned exceed the beneficiary's JU contribution (calculated by applying the reimbursement rate(s) to the eligible costs declared by the beneficiary and its linked third parties and approved by the JU). Only costs incurred by the beneficiary concerned until termination takes effect are eligible (see Article 6). Costs relating to contracts due for execution only after termination are not eligible.

- If the payments received **exceed the amounts due**:
 - if termination takes effect during the period set out in Article 3 and the request for amendment is accepted, the beneficiary concerned must repay to the coordinator the amount unduly received. The JU will formally notify the amount unduly received and request the beneficiary concerned to repay it to the coordinator within 30 days of receiving notification. If it does not repay the coordinator, the JU will draw upon the Guarantee Fund to pay the coordinator and then notify a debit note on behalf of the Guarantee Fund to the beneficiary concerned (see Article 44);
 - in all other cases, in particular if termination takes effect after the period set out in Article 3, the JU will formally notify a **debit note** to the beneficiary concerned. If payment is not made by the date in the debit note, the Guarantee Fund will pay to the JU the amount due and the JU will notify a debit note on behalf of the Guarantee Fund to the beneficiary concerned (see Article 44);
 - if the beneficiary concerned is the former coordinator, it must repay the new coordinator the amount unduly received, unless:
 - termination takes effect after an interim payment and
 - the former coordinator has not distributed amounts received as pre-financing or interim payments (see Article 21.7)

In this case, the JU will formally notify a **debit note** to the former coordinator. If payment is not made by the date in the debit note, the Guarantee Fund will pay to the JU the amount due. The JU will then pay the new coordinator and notify a debit note on behalf of the Guarantee Fund to the former coordinator (see Article 44).

- If the payments received **do not exceed the amounts due**: amounts owed to the beneficiary concerned will be included in the next interim or final payment.

If the JU does not receive the termination report within the deadline (see above), only costs included in an approved periodic report will be taken into account.

If the JU does not receive the report on the distribution of payments within the deadline (see above), it will consider that:

- the coordinator did not distribute any payment to the beneficiary concerned, and that

- the beneficiary concerned must not repay any amount to the coordinator.

After termination, the concerned beneficiary's obligations (in particular Articles 20, 22, 23, Section 3 of Chapter 4, 36, 37, 38 and 40) continue to apply.

SECTION 4 FORCE MAJEURE

ARTICLE 51 — FORCE MAJEURE

'Force majeure' means any situation or event that:

- prevents either party from fulfilling their obligations under the Agreement,
- was unforeseeable, exceptional situation and beyond the parties' control,
- was not due to error or negligence on their part (or on the part of third parties involved in the action), and
- proves to be inevitable in spite of exercising all due diligence.

The following cannot be invoked as force majeure:

- any default of a service, defect in equipment or material or delays in making them available, unless they stem directly from a relevant case of force majeure,
- labour disputes or strikes, or
- financial difficulties.

Any situation constituting force majeure must be formally notified to the other party without delay, stating the nature, likely duration and foreseeable effects.

The parties must immediately take all the necessary steps to limit any damage due to force majeure and do their best to resume implementation of the action as soon as possible.

The party prevented by force majeure from fulfilling its obligations under the Agreement cannot be considered in breach of them.

CHAPTER 7 FINAL PROVISIONS

ARTICLE 52 — COMMUNICATION BETWEEN THE PARTIES

52.1 Form and means of communication

Communication under the Agreement (information, requests, submissions, 'formal notifications', etc.) must:

- be made in writing and
- bear the number of the Agreement.

Until the payment of the balance: all communication must be made through the electronic exchange system and using the forms and templates provided there.

After the payment of the balance: formal notifications must be made by registered post with proof of delivery ('formal notification on paper').

Communications in the electronic exchange system must be made by persons authorised according to the 'Terms and Conditions of Use of the electronic exchange system'. For naming the authorised persons, each beneficiary must have designated — before the signature of this Agreement — a 'Legal Entity Appointed Representative (LEAR)'. The role and tasks of the LEAR are stipulated in his/her appointment letter (see Terms and Conditions of Use of the electronic exchange system).

If the electronic exchange system is temporarily unavailable, instructions will be given on the JU and Commission websites.

52.2 Date of communication

Communications are considered to have been made when they are sent by the sending party (i.e. on the date and time they are sent through the electronic exchange system).

Formal notifications through the **electronic** exchange system are considered to have been made when they are received by the receiving party (i.e. on the date and time of acceptance by the receiving party, as indicated by the time stamp). A formal notification that has not been accepted within 10 days after sending is considered to have been accepted.

Formal notifications **on paper** sent by **registered post** with proof of delivery (only after the payment of the balance) are considered to have been made on either:

- the delivery date registered by the postal service or
- the deadline for collection at the post office.

If the electronic exchange system is temporarily unavailable, the sending party cannot be considered in breach of its obligation to send a communication within a specified deadline.

52.3 Addresses for communication

The **electronic** exchange system must be accessed via the following URL:

<https://ec.europa.eu/research/participants/portal/desktop/en/projects/>

The JU will formally notify the coordinator and beneficiaries in advance any changes to this URL.

Formal notifications on paper (only after the payment of the balance) addressed **to the JU** must be sent to the following address:

SESAR Joint Undertaking
B-1049 Brussels Belgium

Formal notifications on paper (only after the payment of the balance) addressed **to the beneficiaries** must be sent to their legal address as specified in the 'Beneficiary Register'.

ARTICLE 53 — INTERPRETATION OF THE AGREEMENT

53.1 Precedence of the Terms and Conditions over the Annexes

The provisions in the Terms and Conditions of the Agreement take precedence over its Annexes.

Annex 2 takes precedence over Annex 1.

53.2 Privileges and immunities

Nothing in the Agreement may be interpreted as a waiver of any privileges or immunities accorded to the EUROCONTROL - EUROPEAN ORGANISATION FOR THE SAFETY OF AIR NAVIGATION by its constituent documents or international law.

ARTICLE 54 — CALCULATION OF PERIODS, DATES AND DEADLINES

In accordance with Regulation No 1182/71³⁰, periods expressed in days, months or years are calculated from the moment the triggering event occurs.

The day during which that event occurs is not considered as falling within the period.

ARTICLE 55 — AMENDMENTS TO THE AGREEMENT

55.1 Conditions

The Agreement may be amended, unless the amendment entails changes to the Agreement which would call into question the decision awarding the grant or breach the principle of equal treatment of applicants.

Amendments may be requested by any of the parties.

55.2 Procedure

The party requesting an amendment must submit a request for amendment signed in the electronic exchange system (see Article 52).

The coordinator submits and receives requests for amendment on behalf of the beneficiaries (see Annex 3).

If a change of coordinator is requested without its agreement, the submission must be done by another beneficiary (acting on behalf of the other beneficiaries).

The request for amendment must include:

- the reasons why;
- the appropriate supporting documents;

³⁰ Regulation (EEC, Euratom) No 1182/71 of the Council of 3 June 1971 determining the rules applicable to periods, dates and time-limits (OJ L 124, 8.6.1971, p. 1).

- for a change of coordinator without its agreement: the opinion of the coordinator (or proof that this opinion has been requested in writing).

The JU may request additional information.

If the party receiving the request agrees, it must sign the amendment in the electronic exchange system within 45 days of receiving notification (or any additional information the JU has requested). If it does not agree, it must formally notify its disagreement within the same deadline. The deadline may be extended, if necessary for the assessment of the request. If no notification is received within the deadline, the request is considered to have been rejected

An amendment **enters into force** on the day of the signature of the receiving party.

An amendment **takes effect** on the date agreed by the parties or, in the absence of such an agreement, on the date on which the amendment enters into force.

ARTICLE 56 — ACCESSION TO THE AGREEMENT

56.1 Accession of the beneficiaries mentioned in the Preamble

The other beneficiaries must accede to the Agreement by signing the Accession Form (see Annex 3) in the electronic exchange system (see Article 52) within 30 days after its entry into force (see Article 58) and for beneficiaries for which the JU has requested joint and several liability of a linked third party, by also submitting — at accession — a declaration on joint and several liability (see Annex 3a) signed by the third party.

They will assume the rights and obligations under the Agreement with effect from the date of its entry into force (see Article 58).

If a beneficiary does not accede to the Agreement within the above deadline, the coordinator must — within 30 days — request an amendment to make any changes necessary to ensure proper implementation of the action. This does not affect the JU's right to terminate the Agreement (see Article 50).

56.2 Addition of new beneficiaries

In justified cases, the beneficiaries may request the addition of a new beneficiary.

For this purpose, the coordinator must submit a request for amendment in accordance with Article 55. It must include an Accession Form (see Annex 3) signed by the new beneficiary in the electronic exchange system (see Article 52).

New beneficiaries must assume the rights and obligations under the Agreement with effect from the date of their accession specified in the Accession Form (see Annex 3).

ARTICLE 57 — APPLICABLE LAW AND SETTLEMENT OF DISPUTES

57.1 Applicable law

The Agreement is governed by the applicable EU law, supplemented if necessary by the law of Belgium.

57.2 Dispute settlement

If a dispute concerning the interpretation, application or validity of the Agreement cannot be settled amicably, the General Court — or, on appeal, the Court of Justice of the European Union — has sole jurisdiction. Such actions must be brought under Article 272 of the Treaty on the Functioning of the EU (TFEU).

As an exception, if such a dispute is between the JU and SKYGUIDE, SA SUISSE POUR LES SERVICES DE LA NAVIGATION AERIENNE CIVILS ET MILITAIRES, STIFTELSEN SINTEF, the competent Belgian courts have sole jurisdiction.

As an exception, for the following beneficiaries:

- EUROCONTROL - EUROPEAN ORGANISATION FOR THE SAFETY OF AIR NAVIGATION

such disputes must — if they cannot be settled amicably — be referred to arbitration.

The Permanent Court of Arbitration Optional Rules for Arbitration Involving International Organisations and States in force at the date of entry into force of the Agreement will apply.

The appointing authority will be the Secretary-General of the Permanent Court of Arbitration following a written request submitted by either party.

The arbitration proceedings must take place in Brussels and the language used in the arbitral proceedings will be English.

The arbitral award will be binding on all parties and will not be subject to appeal.

If a dispute concerns administrative or financial penalties or offsetting the beneficiaries must bring action before the General Court — or, on appeal, the Court of Justice of the European Union — under Article 263 TFEU.

ARTICLE 58 — ENTRY INTO FORCE OF THE AGREEMENT

The Agreement will enter into force on the day of signature by the JU or the coordinator, depending on which is later.

SIGNATURES

For the coordinator

For the JU



ANNEX 1 (part A)

Research and Innovation action

NUMBER — 734143 — PJ10 PROSA

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1.1. The project summary

Project Number ¹	734143	Project Acronym ²	PJ10 PROSA
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One form per project

General information

Project title ³	Controller Tools and Team Organisation for the Provision of Separation in Air Traffic Management
Starting date ⁴	The first day of the month after the signature by the JU
Duration in months ⁵	38
Call (part) identifier ⁶	H2020-SESAR-2015-2
Topic	SESAR.IR-VLD.Wave1-14-2015 Separation Management En-Route and TMA
Fixed EC Keywords	AAS ATM Automated Support, DSS Decision Support Systems
Free keywords	Controller Support Tools, Team Organisation, Separation Management, RPAS, Automation in ATM, Controller License, Validation, Simulation, Multi Sector Planner, Flight Centric ATC, Collaborative Control

Abstract ⁷

Single European Sky – the vision is clearly described in the ATM Masterplan. Reaching the goals for the European Airspace is only possible with focused technical developments on European level.

The air traffic controller is the main player in the traffic management at tactical level. This project aims at providing the air traffic controller with more automated tools, thus freeing capacity for situations where human intervention is crucial. This provides even safer service for an increasing amount of traffic and with lower costs, as required by airspace users.

This project is a part of the SESAR programme and addresses separation management. It will not only improve current conflict detection tools, but also develop new tools aiding the air traffic controller with resolution advisory and monitoring of flight trajectory.

The project also addresses new ways of working together. Air traffic controllers traditionally work in pairs and in specific airspace. Could we change this to multi-planner setup, sector less airspace and seamless cross-border operations? Our project will ensure the research is developed to a stage where it can be used in operational air traffic management systems in Europe. This ensures that anyone can fly safer, cheaper and quicker in Europe in 10 years. Another really important issue is the integration of “Remotely Piloted Aircraft Systems” – drones. Drones are new to European Air Traffic Management, and it is urgent to address concepts and technological developments needed to handle this kind of traffic safely.

The companies involved in this project are the only ones that can deliver this kind of result. Not on their own – but as the unique cooperation between air navigation service providers and air and ground industry. The capabilities to provide sustainable results usable throughout Europe by fast-time, real-time simulations and live trials ensures that developed prototypes are working in the context of future traffic and ATM systems.

1.2. List of Beneficiaries

Project Number ¹	734143	Project Acronym ²	PJ10 PROSA
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List of Beneficiaries

No	Name	Short name	Country	Project entry month ⁸	Project exit month
1	DFS DEUTSCHE FLUGSICHERUNG GMBH	DFS	Germany	1	38
2	AIRBUS SAS	AIRBUS	France	1	38
3	NAVIAIR	Naviair/COOPANS	Denmark	1	38
4	DIRECTION DES SERVICES DE LA NAVIGATION AERIENNE	DSNA	France	1	38
5	ENTIDAD PUBLICA EMPRESARIAL ENAIRE	ENAIRE	Spain	1	38
6	ENAV SPA	ENAV	Italy	1	38
7	LEONARDO - FINMECCANICA SPA	FINMECCANICA	Italy	1	38
8	SKYGUIDE, SA SUISSE POUR LES SERVICES DE LA NAVIGATION AERIENNE CIVILS ET MILITAIRES	SKYGUIDE	Switzerland	1	38
9	SAAB AKTIEBOLAG	SAAB (NATMIG)	Sweden	1	38
10	NATS (EN ROUTE) PUBLIC LIMITED COMPANY	NATS	United Kingdom	1	38
11	DASSAULT AVIATION	DASSAULT	France	1	38
12	THALES AIR SYSTEMS SAS	THALES AIR SYS	France	1	38
13	INDRA SISTEMAS SA	INDRA	Spain	1	38
14	EUROCONTROL - EUROPEAN ORGANISATION FOR THE SAFETY OF AIR NAVIGATION	EUROCONTROL	Belgium	1	38
15	RIZENI LETOVEHO PROVOZU CESKE REPUBLIKY STATNI PODNIK	ANS CR (B4)	Czech Republic	1	38
16	FREQUENTIS AG	FRQ (FSP)	Austria	1	38
17	DEUTSCHES ZENTRUM FUER LUFT - UND RAUMFAHRT EV	DLR (AT-One)	Germany	1	38
18	AUSTRO CONTROL OSTERREICHISCHE GESELLSCHAFT FUR ZIVILLUFTFAHRT MBH	ACG/COOPANS	Austria	1	38
19	CROATIA CONTROL, CROATIAN AIR NAVIGATION SERVICES LTD	CCL/COOPANS	Croatia	1	38
20	UDARAS EITLIOCHTA NA HEIREANN THE IRISH AVIATION AUTHORITY	IAA/COOPANS	Ireland	1	38
21	LUFTFARTSVERKET	LFV/COOPANS	Sweden	1	38
22	AIRTEL ATN LIMITED	AIRTEL (NATMIG)	Ireland	1	38
23	STIFTELSEN SINTEF	SINTEF (NATMIG)	Norway	1	38

1.2. List of Beneficiaries

No	Name	Short name	Country	Project entry month ⁸	Project exit month
24	LETOVE PREVADZKOVE SLUZBY SLOVENSKEJ REPUBLIKY, STATNY PODNIK	LPS SR (B4)	Slovakia	1	38
25	VALSTYBES IMONE ORO NAVIGACIJA	ON (B4)	Lithuania	1	38
26	POLSKA AGENCJA ZEGLUGI POWIETRZNEJ	PANSA (B4)	Poland	1	38
27	HUNGAROCONTROL MAGYAR LEGIFORGALMI SZOLGALAT ZARTKORUEN MUKODO RESZVENYTARSASAG	HC (FSP)	Hungary	1	38
28	ATOS BELGIUM	ATOS (FSP)	Belgium	1	38
29	STICHTING NATIONAAL LUCHT- EN RUIMTEVAARTLABORATORIUM	NLR (AT-One)	Netherlands	1	38

1.3. Workplan Tables - Detailed implementation

1.3.1. WT1 List of work packages

WP Number ⁹	WP Title	Lead beneficiary ¹⁰	Person-months ¹¹	Start month ¹²	End month ¹³
WP1	Solution PJ.10-01a: High Productivity Controller Team Organisation	8 - SKYGUIDE	312.02	1	36
WP2	Solution PJ.10-01b: Flight Centric ATC	17 - DLR (AT-One)	543.37	1	36
WP3	Solution PJ.10-01c: Collaborative Control	10 - NATS	328.90	1	36
WP4	Solution PJ.10-02a: Improved performance in the provision of separation	4 - DSNNA	1,370.26	1	36
WP5	Solution PJ.10-02b: Advanced Separation Management	10 - NATS	994.86	7	36
WP6	Solution PJ.10-05: IFR RPAS Integration	6 - ENAV	383.29	1	36
WP7	Solution PJ.10-06: Generic' (non-geographical) Controller Validations	10 - NATS	35.00	1	36
WP8	Management	1 - DFS	38.00	1	38
WP9	Ethics requirements	1 - DFS	N/A	1	38
Total			4,005.70		

1.3.2. WT2 list of deliverables

Deliverable Number ¹⁴	Deliverable Title	WP number ⁹	Lead beneficiary	Type ¹⁵	Dissemination level ¹⁶	Due Date (in months) ¹⁷
D1.1	10-01a V2 Data Pack	WP1	8 - SKYGUIDE	Report	Public	24
D2.1	10-01b V1 Data Pack	WP2	17 - DLR (AT-One)	Report	Public	24
D2.2	10-01b V2 Data Pack	WP2	17 - DLR (AT-One)	Report	Public	33
D3.1	10-01c V2 Data Pack	WP3	10 - NATS	Report	Public	24
D4.1	10-02a V2 Data Pack	WP4	4 - DSNA	Report	Public	12
D4.2	10-02a V3 Data Pack	WP4	4 - DSNA	Report	Public	27
D5.1	10-02b V1 Data Pack	WP5	10 - NATS	Report	Public	24
D6.1	10-05 V1 Data Pack	WP6	6 - ENAV	Report	Public	12
D6.2	10-05 V2 Data Pack	WP6	6 - ENAV	Report	Public	33
D7.1	10-06 V1 Data Pack	WP7	10 - NATS	Report	Public	24
D8.1	Project Management Plan	WP8	1 - DFS	Report	Confidential, only for members of the consortium (including the Commission Services)	5
D8.2	Final Project Report	WP8	1 - DFS	Report	Public	34
D8.3	Quarterly Progress Report 01	WP8	1 - DFS	Report	Confidential, only for members of the consortium (including the Commission Services)	3
D8.4	Quarterly Progress Report 02	WP8	1 - DFS	Report	Confidential, only for members of the consortium (including the Commission Services)	6
D8.5	Quarterly Progress Report 03	WP8	1 - DFS	Report	Confidential, only for members of the consortium (including the Commission Services)	9
D8.6	Quarterly Progress Report 04	WP8	1 - DFS	Report	Confidential, only for members of the consortium (including the Commission Services)	12
D8.7	Quarterly Progress Report 05	WP8	1 - DFS	Report	Confidential, only for members	15

Deliverable Number¹⁴	Deliverable Title	WP number⁹	Lead beneficiary	Type¹⁵	Dissemination level¹⁶	Due Date (in months)¹⁷
					of the consortium (including the Commission Services)	
D8.8	Quarterly Progress Report 06	WP8	1 - DFS	Report	Confidential, only for members of the consortium (including the Commission Services)	18
D8.9	Quarterly Progress Report 07	WP8	1 - DFS	Report	Confidential, only for members of the consortium (including the Commission Services)	21
D8.10	Quarterly Progress Report 08	WP8	1 - DFS	Report	Confidential, only for members of the consortium (including the Commission Services)	24
D8.11	Quarterly Progress Report 09	WP8	1 - DFS	Report	Confidential, only for members of the consortium (including the Commission Services)	27
D8.12	Quarterly Progress Report 10	WP8	1 - DFS	Report	Confidential, only for members of the consortium (including the Commission Services)	30
D8.13	Quarterly Progress Report 11	WP8	1 - DFS	Report	Confidential, only for members of the consortium (including the Commission Services)	33
D8.14	Quarterly Progress Report 12	WP8	1 - DFS	Report	Confidential, only for members of the consortium (including the Commission Services)	36
D9.1	H - Requirement No. 1	WP9	1 - DFS	Ethics	Confidential, only for members of the consortium (including the	5

Deliverable Number¹⁴	Deliverable Title	WP number⁹	Lead beneficiary	Type¹⁵	Dissemination level¹⁶	Due Date (in months)¹⁷
					Commission Services)	
D9.2	POPD - Requirement No. 2	WP9	1 - DFS	Ethics	Confidential, only for members of the consortium (including the Commission Services)	5
D9.3	NEC - Requirement No. 3	WP9	1 - DFS	Ethics	Confidential, only for members of the consortium (including the Commission Services)	5
D9.4	M - Requirement No. 4	WP9	1 - DFS	Ethics	Confidential, only for members of the consortium (including the Commission Services)	5

1.3.3. WT3 Work package descriptions

Work package number ⁹	WP1	Lead beneficiary ¹⁰	8 - SKYGUIDE
Work package title	Solution PJ.10-01a: High Productivity Controller Team Organisation		
Start month	1	End month	36

Objectives

The objectives of PJ.10-01a Solution are to further investigate the concept of operation and the associated system support required for operating in new team structures such as the combined role of Single Person Operations and the Multi-Sector Planner.

Objectives of these new roles are to have a Planner Controller responsible for the airspace under executive control of two or more independent Executive Controllers (1P-nE) with the purpose to balance the workload among them. The Solution focuses on the typical “one Planning Controller to several Executive Controllers” Multi Sector Planning organisations and concentrates on the efficient and safe distribution of responsibility for traffic and separation management across the team.

The PJ.10-01a Solution will also concentrate on the environment where the MSP could act efficiently by addressing following topics:

- Does sectorisation fit to MSP activities?
- Does MSP Interact with ATFCM?
- Which tools will be necessary to achieve MSP role?
- Effect of route structure on MSP role; current route structure versus Free Route airspace
- Controller Training as key factor

Also, the SPO will be studied in combination with the MSP and specific topics on this role will be addressed in parallel. This will be assessed through two sets of V2 and V3 validations dealing with different environments (i.e. low/medium/high complexity En-Route and TMA, fixed route network and free route environment).

Two OI steps are studied :

- CM-0303 "Sector Team Operations Adapted to New Responsibilities in En-Route, 1 Planning to several Tactical Controllers team structure “
- CM-0304 "Sector Team Operations Adapted to New Responsibilities in the TMA, 1 Planning to several Tactical Controllers team structure"

Validations

The validations will be performed in close co-operation with PJ.10-02a and PJ.10-02b. Skyguide will perform validation of CM-0303 as specified above on the platform as validations performed for PJ.10-02a and PJ.10-02b (prototype development will take place within 10-02a & 10-02b). CCL/COOPANS and LFV/COOPANS will perform validation of CM-0304 as specified above together with Thales Air Systems (industry partner). ENAV in coordination with FINMECCANICA (industry partner) intends to validate some SPO/MSP aspects related to CM-0303 in the context of PJ.10-02a (validation activity and platform development will take place in the frame of Solution 10-02a).

The scope will be to validate new sector team organisations and responsibilities distribution together with associated assistance tools. The validation activities aim at providing a more strategic environment to optimise flight profiles, minimise delays, increase ANSP cost efficiencies while taking into account intrinsic uncertainty in the trajectory: different team organisation for MSP with different assignments of responsibilities including improved handover procedures.

This solution will also validate the integration of new ATC separation management functionalities where applicable roles and responsibilities between Local ATFCM (Extended ATC Planner) and ATC will be also considered.

The integration of PJ.10-01a validation objectives in the PJ.10-02a/b planning is a prerequisite to be able to validate the Solution. Validation parameters will comprise but are not limited to human performance aspects like situational awareness, workload, need for training, usage of new tools, identification of requirements for the specification or adjustments of new tools / functions. Implications for airspace design will be explored.

Description of work and role of partners

WP1 - Solution PJ.10-01a: High Productivity Controller Team Organisation [Months: 1-36]
SKYGUIDE, ENAV, FINMECCANICA, THALES AIR SYS, INDRA, CCL/COOPANS, LFV/COOPANS

For both the V2 and V3 maturity cycle concept descriptions will be produced that will focus on procedures description and airspace design for the team organisation of multi-sector planning. The V2 phase is expected to be completed within Wave 1, while the V3 phase will be started, however not completed within Wave 1. Validation activities will be conducted in both V2 and V3 phase by means of real-time simulation. Within the simulations the KPA impact of the new team organisation in comparison to today's reference EC-PC sector team will be assessed. Validation parameters will comprise but are not limited to human performance aspects like situational awareness, workload, need for training, usage of new tools, identification of requirements for the specification or adjustments of new tools / functions.

Two complementary platforms will be used in order to reflect different sets European system functionalities as well as different ATM system philosophies. Therefore, the validation results can be expected to be valid for a wider variety of European operational environments. For the simulation the following two complementary platforms will be used:

- The Skyguide IBP (SkySim) is developed based on the operational system in duty. The advanced R&D platform is equipped with state-of the art 4D trajectory based functionality. Its 16 positions can be easily set-up with any European airspace configuration allowing multi ACCs validations. Skysoft-ATM will set-up the validation platform and will adapt the controller support tools and associated HMI according to the requirements issued from the concepts to be validated. Skysoft-ATM will also provide expertise in support to requirements elaboration.

- The COOPANS Narsim & IBP (platform of COOPANS partners) is a research and development platform capable of advanced simulations of TMA and En-Route as well as tower environments. Narsim is a very flexible platform where industry developed components can be integrated and validated on up to 26 working positions where as the IBP is a validation platform built on COOPANS operational software (Thales Air Systems TopSky ATC platform) usable for full scale V3 validations and enhanced with dedicated prototypes such as Conflict Detection & Resolution tool, Tactical Controller Tool associated with HMI capabilities. Thales Air Systems will contribute with its technical expertise to the definition of the technical solution, provide and support an Industry Based Platform (Thales Air Systems TopSky ATC platform) in close coordination with PJ.10-02a. This platform will be used for COOPANS validation in this solution.

Thales Australia Limited will contribute with its technical expertise to the definition of the technical solution, develop and support simulation and ATC tools prototypes which will be integrated in the Thales Air Systems TopSky ATC platform for COOPANS validation.

ENAV in coordination with FINMECCANICA (industry partner) intends to validate some SPO/MSP aspects related to CM-0303 in the context of PJ.10-02a (validation activity and platform development will take place in the frame of Solution 10-02a). ENAVs LTP DEEP BLUE supports to assess the operators' impact of the New Sector Team Operations, investigating role and responsibilities distribution among operators, operating methods, effective allocation of tasks between operator and machine together with potential changes in operator competences. As Research Branch of ENAV, SICTA is intended to contribute in all activities where ENAV is involved, with special emphasis on the operational validation of the concept developed within the solution. Specifically, transversal contribution is expected for the concept, procedures and requirements definition; for structuring and organizing all validation activities; for executing and reporting related to all validation exercises envisaged to be performed as well as for the related analysis of the ATM performances. As already reported in the relevant section of the proposal submitted last April, SICTA participation is quite significant from an ENAV perspective considering it brings an important piece of transversal technical, operational and management expertise. SICTA, as part of the ENAV Group and bound to ENAV through shared ownership, is to all effects same as an ENAV department and their in kind contribution is to be considered as a single block. DEEP BLUE significant contribution will be provided for human performance assessments, applying dedicated methodologies and expertise.

Participation per Partner

Partner number and short name	WP1 effort
6 - ENAV	2.85
SICTA	5.63
DEEP BLUE	18.52
7 - FINMECCANICA	21.60
8 - SKYGUIDE	20.09
SKYSOFTATM	4.91
12 - THALES AIR SYS	168.00

Partner number and short name	WP1 effort
THALES-AUS	10.00
13 - INDRA	51.00
19 - CCL/COOPANS	2.20
21 - LFV/COOPANS	7.22
Total	312.02

List of deliverables

Deliverable Number ¹⁴	Deliverable Title	Lead beneficiary	Type ¹⁵	Dissemination level ¹⁶	Due Date (in months) ¹⁷
D1.1	10-01a V2 Data Pack	8 - SKYGUIDE	Report	Public	24

Description of deliverables

<p>V2 Datapack Contractual Deliverables:</p> <ul style="list-style-type: none"> - OSED/SPR/INTEROP Concept Description - TS/IRS Technical Specification - CBA <p>Internal Deliverables:</p> <ul style="list-style-type: none"> - V2 VALP and VALR - V3 Intermediate VALP and VALR - V3 Intermediate OSED/SPR/INTEROP Concept Description - V3 Intermediate TS/IRS Technical Specification - V3 Intermediate CBA <p>D1.1 : 10-01a V2 Data Pack [24]</p> <p>Consists of a) OSED/SPR/INTEROP b) TS/IRS c) CBA</p>
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Schedule of relevant Milestones

Milestone number ¹⁸	Milestone title	Lead beneficiary	Due Date (in months)	Means of verification
MS1	V2 Gate for Solution PJ.10-01a	8 - SKYGUIDE	26	All documents for V data pack delivered and Gate review with SJU has been passed.

Work package number ⁹	WP2	Lead beneficiary ¹⁰	17 - DLR (AT-One)
Work package title	Solution PJ.10-01b: Flight Centric ATC		
Start month	1	End month	36

Objectives

Coordination and monitoring of project’s progress to accomplish the main objectives regarding time and resources. This Solution encompasses the investigation of Flight Centric ATC for two different environments: low complexity environment; and medium and high complexity environment. The respective OI steps that addressed comprise CM-0200B and CM-0200C. The different validations will address the following topics:

- investigation of a baseline which compares (actual) controller numbers, number of voice communications with the demand in sectorless ATM and quantification of the expected benefits in terms of performances (including workload), productivity and capacity;
- operational procedures to deal with the coordination needs among controllers;
- communication: possible technological scenarios toward data link and geographically independent voice communication (air-ground, ground-ground), analysis and suggestions for communication Solutions both based on current and future technologies
- an assessment of the workload distribution between controllers and different criteria for the assignment of aircraft to controller including a quantification of the expected benefits in terms of performances;
- analysis of integration needs with local ATFCM processes: dynamic Demand Capacity Balancing (DCB);
- an investigation of required CD&R performance and assessment of advanced separation tools;
- priority and deconfliction rules;
- investigation of safety aspects including non-standard situations (severe weather, closure, system degradation, emergency)
- transition strategies from current to flight-centred ATC, including a roadmap how to progress step-by-step from the current situation to a future desired communications environment.

Validations:
 The validation activities will comprise the following topics:

- Communication in Flight Centric ATC environment in standard and non-standard situations: Communication between controller and pilot has to be specifically addressed within Flight Centric ATC due to the nature of very large sectorless environments that stretch out into different frequency protection areas. This topic addresses the demand concerning voice communications within the sectorless ATM. In the second exercise, the thread will investigate the communication by exploring the technological transition for voice communication and comparing numbers of transmissions. It will also investigate non-standard situations in order to assess procedures for emergency, weather, closure situations.
- Benefits with regards workload & controller tools for Flight Centric ATC environment:
 The workload reduction and distribution between controllers within Flight Centric ATC environment has to be assessed with this topic. Furthermore different intelligent strategies for the assignment of aircraft and are expected to significantly contribute to the benefits of the Flight Centric ATC concept. This topic will also address the co-ordination needs among controllers as well as possibilities to integrate the Flight Centric ATC concept within the dynamic airspace configuration and flow management processes (dynamic DCB).

Description of work and role of partners

WP2 - Solution PJ.10-01b: Flight Centric ATC [Months: 1-36]
DLR (AT-One), DFS, DSNA, ENAIRE, THALES AIR SYS, INDRA, EUROCONTROL, ANS CR (B4), FRQ (FSP), HC (FSP)

For both the V1 and V2 maturity cycle concept descriptions will be produced that will focus on procedures description and airspace design for the team organisation of flight centric ATC. The V1 and V2 phase are expected to be completed within Wave 1. Validation activities will be conducted in the V1 phase by means of paper study and fast-time simulation. The V2 phase will comprise of several real-time simulations within both the communication and the workload & controller tools thread.

Three complementary platforms will be used in order to reflect different sets of European system functionalities as well as different ATM system philosophies. Furthermore, the different platforms do focus on special aspects of the Flight Centric ATC concept (e.g. communication, controller tools, dynamic DCB). Therefore the validation results can be

expected to be complimentary and valid for a wider variety of European operational environments. For the real-time simulations the following complementary platforms will be used:

DLR (AT-One) TrafficSim: TrafficSim is a DLR-developed air traffic simulator that is suitable as a proof-of-concept simulation for new ATM-concepts and trajectory based operations. It can also be connected to a fully functional controller working position for Flight Centric ATC and provides state of the art controller tools.

ENAIRES iTEC IBP: ENAIRES iTEC IBP is based on the iTEC ATC system developed by INDRA. iTEC provides an advanced Flight Data Processing system and a controller working position that meets the SESAR requirements and facilitates interoperability with other European air traffic management system. The platform can be highly configured according to the specific procedures and roles needs. ENAIRES will be involved in all the activities related to the concept description and the associated technical specification as well as in the validation activities tasks. Moreover, ISDEFE will contribute to the concept development. INECO and CRIDA will participate in the tasks related to the concept development and validation activities.

ANS CR will provide ATC expertise in the sectorless airspace FTS. AFT contribution will cover development of fast-time simulation using AgentFly tool focusing on workload reduction, and evaluation of scenarios. CTU will design and develop architecture for sectorless environment simulation, intelligent assignment strategies and dynamic airspace configuration and required performance of CD&R tools to support sectorless operations. Integra will support ANS CR in the tasks addressing the safety aspects of the activities, in particular pre validation safety assessments, refinement of safety requirements post validation and their integration into the SPR.

ANS CR contribution is coupled with AFT simulation tool (Agent Fly) to be used for the fast-time simulations and subsequently as an input data source for the real-time simulation. The tool has to be adapted by AFT and will require significant SW adjustment to be used in sectorless Environment. The main precondition for AgentFly readiness is CTU support including research, design and development of architecture and algorithms, data analysis, and evaluation. The role of LTP Integra is to support given solution with safety expertise. As sectorless environment is a new approach we expect higher requirements for safety aspect analysis and results processing. ANS CR will support this solution with ATC expertise.

Participation per Partner

Partner number and short name	WP2 effort
1 - DFS	44.00
4 - DSNA	7.20
5 - ENAIRES	35.40
CRIDA	26.70
ISDEFE	2.80
INECO	6.40
12 - THALES AIR SYS	6.00
13 - INDRA	153.00
14 - EUROCONTROL	46.00
15 - ANS CR (B4)	11.49
Integra	6.48
CTU	17.25
AFT	58.65
16 - FRQ (FSP)	18.00
17 - DLR (AT-One)	84.00
27 - HC (FSP)	20.00
Total	543.37

List of deliverables

Deliverable Number¹⁴	Deliverable Title	Lead beneficiary	Type¹⁵	Dissemination level¹⁶	Due Date (in months)¹⁷
D2.1	10-01b V1 Data Pack	17 - DLR (AT-One)	Report	Public	24
D2.2	10-01b V2 Data Pack	17 - DLR (AT-One)	Report	Public	33

Description of deliverables

V1 Data Pack Contractual Deliverables:
 OSED/SPR/INTEROP
 V2 Data Pack Contractual Deliverables:
 OSED/SPR/INTEROP
 TS/IRS
 CBA
 Internal Deliverables:
 V1 VALP and VALR
 V2 VALP and VALR
 D2.1 : 10-01b V1 Data Pack [24]
 Consists of: a) OSED/SPR/INTEROP
 D2.2 : 10-01b V2 Data Pack [33]
 Consists of a) OSED/SPR/INTEROP b) TS/IRS c) CBA

Schedule of relevant Milestones

Milestone number¹⁸	Milestone title	Lead beneficiary	Due Date (in months)	Means of verification
MS2	V1 Gate for Solution PJ.10-01b	17 - DLR (AT-One)	26	All documents for V data pack delivered and Gate review with SJU has been passed.
MS3	V2 Gate for Solution PJ.10-01b	17 - DLR (AT-One)	35	All documents for V data pack delivered and Gate review with SJU has been passed.

Work package number ⁹	WP3	Lead beneficiary ¹⁰	10 - NATS
Work package title	Solution PJ.10-01c: Collaborative Control		
Start month	1	End month	36

Objectives

The concept of collaborative control (co-ordination by exception rather than co-ordination by procedure) will be assessed for En-Route and TMA at V2 maturity, at different levels of density and complexity. The concept of collaborative control researched here will improve and enhance the work already performed in SESAR 1 to create additional benefits and to further investigate its potential alongside advanced controller tools.

To investigate the impact of collaborative control when procedures are put in place to manage the reduction of coordination agreements between En-Route and TMA.

To research the collaborative control concept when it is paired with advances in controller tools support.

To develop and validate performance requirements for tools support for different grades of collaborative control practice.

OI steps addressed at V2 : CM-0305, CM-0306

In reference to the MAWP, CM-0305 has a stated maturity level of V2. Maturity report update [13] from the SJU confirms the achieved maturity level is V1, as such partners (NATS and ENAV) may start with V2 validations for this OI.

Validations:

The partners, using a number of approaches, are investigating sector team organisations adapted to new responsibilities and operational procedures involving reduced coordinations in En-Route and TMA. NATS will enhance their ACE software platform to enable iFACTS like tools to operate in a collaborative control environment in a high-complexity/high density TMA; the operational environment will also involve aspects of systemised TMA design. NATS will share a joint validation with PJ.10-02b where it will assess the advanced separation concept at a V1 maturity. ENAV in coordination with FINMECCANICA (industry partner) will conduct a joint validation with PJ.10-02b to validate some objectives of En-Route Collaborative Control (related to CM-0306) with the support of advanced controller tools and platform developed in the frame of solution 10-02b.

Description of work and role of partners

WP3 - Solution PJ.10-01c: Collaborative Control [Months: 1-36]
NATS, DSNA, ENAIRE, ENAV, FINMECCANICA, THALES AIR SYS, INDRA

For the V2 maturity cycle concept descriptions will be produced that will focus on procedures description and airspace design for the team organisation of collaborative control. The V2 phase is expected to be completed within Wave 1. Validation activities will be conducted in the V2 phase by means of real-time simulations. The V2 phase will comprise several real-time simulations. The different aspects of the concept collaborative control will be assessed including task sharing within the controller team, feasibility of tools. Validation parameters will comprise but are not limited to human performance aspects like situational awareness, workload, and usage of tools.

Two complementary platforms will be used in order to reflect different sets of European system functionalities as well as different ATM system philosophies. Furthermore, the different platforms do focus on special aspects of the collaborative control concept (e.g. sector team responsibility, controller tools, En-Route vs. TMA operational environment). Therefore, the validation results can be expected to be complimentary and valid for a wider variety of European operational environments. For the real-time simulations the following complementary platforms will be used:

NATS ACE Simulator Platform: ACE is a Simulator asset used for development, demonstration and real time simulation purposes within NATS. It provides run time application software providing prototyping and realtime simulation capabilities. This environment is particularly well suited to evaluating new or improved concepts for ATCO decision support tools.

ENAIRE iTEC IBP: for description please refer to Solution PJ.10-01b. ENAIRE will develop a prototype in collaboration with Indra to investigate the operational procedures to deal with the reduction of coordination agreements in the transition phase between En-Route and TMA, the impact on MSP teams will be considered as well; coordination with PJ.10-02b is also planned. ENAIRE will be involved in all the activities related to the concept description and the associated technical specification as well as in the validation activities tasks. Moreover, INECO and CRIDA will contribute to the concept development and participate in the tasks related to the validation activities.

ENAV in coordination with FINMECCANICA (industry partner) will conduct a joint validation with PJ.10-02b to validate some objectives of En-Route Collaborative Control (related to CM-0306) with the support of advanced controller tools and platform developed in the frame of solution 10-02b. As Research Branch of ENAV, SICTA is intended to contribute in all activities where ENAV is involved, with special emphasis on the operational validation of

the concept developed within the solution. Specifically, transversal contribution is expected for the concept, procedures and requirements definition; for structuring and organizing all validation activities; for executing and reporting related to all validation exercises envisaged to be performed as well as for the related analysis of the ATM performances. As already reported in the relevant section of the proposal submitted last April, SICTA participation is quite significant from an ENAV perspective considering it brings an important piece of transversal technical, operational and management expertise. SICTA, as part of the ENAV Group and bound to ENAV through shared ownership, is to all effects same as an ENAV department and their in kind contribution is to be considered as a single block.

Participation per Partner

Partner number and short name	WP3 effort
4 - DSNA	2.00
5 - ENAIRE	39.10
CRIDA	26.70
INECO	6.50
6 - ENAV	6.07
SICTA	6.93
7 - FINMECCANICA	21.60
10 - NATS	61.00
12 - THALES AIR SYS	6.00
13 - INDRA	153.00
Total	328.90

List of deliverables

Deliverable Number ¹⁴	Deliverable Title	Lead beneficiary	Type ¹⁵	Dissemination level ¹⁶	Due Date (in months) ¹⁷
D3.1	10-01c V2 Data Pack	10 - NATS	Report	Public	24

Description of deliverables

V2 Data Pack Contractual Deliverables:
 OSED/SPR/INTEROP
 TS/IRS
 CBA
 Internal Deliverables:
 V2 VALP and VALR
 D3.1 : 10-01c V2 Data Pack [24]
 Consists of a) OSED/SPR/INTEROP b) TS/IRS c) CBA

Schedule of relevant Milestones

Milestone number¹⁸	Milestone title	Lead beneficiary	Due Date (in months)	Means of verification
MS4	V2 Gate for Solution PJ.10-01c	10 - NATS	26	All documents for V data pack delivered and Gate review with SJU has been passed.

Work package number ⁹	WP4	Lead beneficiary ¹⁰	4 - DSNA
Work package title	Solution PJ.10-02a: Improved performance in the provision of separation		
Start month	1	End month	36

Objectives

General objectives of PJ.10-02a are to improve and enhance work already performed in SESAR 1 with regards to controller tools for improved performance within separation management. As described in the MAWP, validation work will be addressed in En-Route, TMA, in Fixed and Free Route environments, at different levels of density and complexity. More detailed objectives aimed by the partners are the following ones:

For En-Route :

Enhance Conflict Detection and Resolution tools and concepts coming from SESAR 1 activities, including the use of improved trajectory data. The procedures and requirements for the Free Route environment will be taken into account (PJ.06). Evaluate interaction between MTCD and Tactical Controller Tools (TCT). Implement an optimised conflict resolution system considering flight efficiency and providing best service for flights contributing the most to predictability and conformance monitoring considering the improved ground trajectory prediction taking into account performance of EPP from PJ.18. In addition, the EPP Emulator elaborated within PJ.18 will be used as an input to improve trajectory prediction. Assist controllers in their separation tasks by enhanced tools with improved technical functionalities and innovative HMI features, in coordination with PJ.10-01a work on SPO/MSP aspects. Develop and validate performance requirements for separation tools, including the underlying trajectory prediction.

For TMA :

Develop conflict detection and resolution assistance solutions reaching TRL4/V2 in 2017 and TRL6/V3 in 2019. Improve TCT with special emphasis on TMA operational environment, in coordination with PJ.10-01a work. Develop Subtle Navigational Awareness Tool (decision support tool addressing unusual situations or influenced by subtle navigation factors).

For both environments :

Improve de-complexification and early de-confliction through time-based strategies, in coordination with PJ.09-02 work.

The following OI Steps will be addressed at V2 and V3 level: CM-0206, CM-0208-A, CM-0209, CM-0210 and CM-0403-A. Although listed in the MAWP, CM-0605 and CM-0606 will not be addressed by any of the partners. The partners had to prioritize Wave 1 work regarding available resources. However, 2D RNP aspects are planned to be addressed in Wave 2 in project PJ.10-02b (OIs CM-0607 for En-Route and CM-0608 for the TMA).

Validations:

The validation activities within this Solution will focus on controller tools for conflict detection, conflict resolution advisory and flight path monitoring. Controller tools are seen as the key enabler towards the reduction of workload and the increase of capacity and productivity for the separation management task. Given the significance of the tools this Solution will involve the majority of partners within PJ.10. Within the V2 and V3 phase various research and industrial prototypes will be developed and validated within different operational environments and ATM systems. Given the size of this Solution and in order to reflect the difference in procedures and airspace structure WP 4 is divided into three sub-work packages (SWP). The sub-work packages concentrate on En-Route environment, TMA environment and the early de-confliction through time based strategies (applicable for all environments). The division into sub work packages will be used to structure both validation threads and prototype development. For the elaboration for both the contractual and internal deliverables, only one task per Solution and maturity cycle will be foreseen.

Description of work and role of partners

WP4 - Solution PJ.10-02a: Improved performance in the provision of separation [Months: 1-36]
DSNA, DFS, AIRBUS, Naviair/COOPANS, ENAV, FINMECCANICA , SKYGUIDE, THALES AIR SYS, INDRA, EUROCONTROL, ANS CR (B4), ACG/COOPANS, CCL/COOPANS, IAA/COOPANS, LFV/COOPANS, PANS (B4)

For both the V2 and V3 maturity cycle concept descriptions will be produced that will focus on working procedures, configuration of tools and roles & responsibilities. The V2 and V3 phase are expected to be completed within Wave 1. Validation activities will be conducted in the V2 and V3 phase by means of fast-time and real-time simulations. Furthermore, two shadow mode trials are foreseen. For the validation activities different complementary toolsets will be developed. For example, conflict detection tools will be developed to assist a specific time horizon (e.g. MTCD vs. TCT). In total seven platforms will be used in order to reflect different sets of European system functionalities as

well as different ATM system philosophies. Within the existing human-centric work organisation of ATC new system functionalities can only be implemented following a stepwise approach. Therefore, it is necessary to grant the specific operational environments of European ANSPs in order to reach convergence on a European level. This factor together with the significance of controller tools for separation management justifies the effort and the variety of validation activities. Furthermore, the different platforms and prototypes do focus on special aspects of the controller tools (e.g. time horizon, roles & responsibility, different operational procedures & environments). Therefore, the validation results can be expected to be complementary and valid for a wider variety of European operational environments. For the real-time simulations the following platforms will be used:

Skyguide IBP: for description please refer to Solution PJ.10-01a

DSNA Coflight IBP: The DSNA Coflight IBP platform is built as close as possible to the future expected French system. It provides a set of operational tools (TCT, safety nets ...), and new tools which will be validated in SESAR 2020, such as conflict detection and resolution tools, de-complexification tools, trajectory tracking monitoring tools and new HMI features.

COOPANS Narsim & IBP: For description, please refer to Solution PJ.10-01a.

Thales Air Systems will contribute with its technical expertise to the definition of the technical solution, and will develop prototypes for separation enhancements. The prototypes will be integrated in an Industry Based Platform (Thales Air Systems TopSky ATC platform) in close coordination with PJ.10-01a. This platform will be used for COOPANS and ANS-CR validations in this solution.

SMATSA will contribute to the development of concept description (OSD/SPR/INTEROP) and validation tasks (VALP and VALR), and will also participate to the maturation of the OIs validated within this solution with air traffic controllers supporting the COOPANS validations. Thales Australia Limited will contribute with its technical expertise to the definition of the technical solution, develop and support simulation and ATC tools prototypes which will be integrated in the Thales Air Systems TopSky ATC platform for COOPANS validation.

ENAV En-Route / TMA IBP: The ENAV En-Route/TMA IBP provides the full set of capabilities allowing operating in realtime simulations as well as in shadow mode. It provides state of the art 4D trajectory based functionalities.

ENAV intends to focus on the validation of enhanced tools with improved technical functionalities and with innovative HMI features to assist controllers in their separation tasks. DEEP BLUE supports to the validation of the assistance tools for conflict detection and resolution allowing more strategic optimization of controllers' performance. Particularly, workload, situation awareness, need for training, usage and requirements identification of new tools will be the areas of investigation. As Research Branch of ENAV, SICTA is intended to contribute in all activities where ENAV is involved, with special emphasis on the operational validation of the concept developed within the solution. Specifically, transversal contribution is expected for the concept, procedures and requirements definition; for structuring and organizing all validation activities; for executing and reporting related to all validation exercises envisaged to be performed within this solution as well as for the related analysis of the ATM performances. As already reported in the relevant section of the proposal submitted last April, SICTA participation is quite significant from an ENAV perspective considering it brings an important piece of transversal technical, operational and management expertise. SICTA, as part of the ENAV Group and bound to ENAV through shared ownership, is to all effects same as an ENAV department and their in kind contribution is to be considered as a single block. For this reason, their overall contribution is to be considered joint and as main part of the contribution, consequently more significant than the other involved LTPs. DEEP BLUE significant contribution will be provided for human performance assessments, applying dedicated methodologies and expertise. BULATSA (as ENAV LTP) significant contribution will be provided for the validation activities in TMA environment by using their own facilities/platforms and ATCO personnel.

PANSA IBP: The PANSA IBP will have full iTEC based system capabilities (based on currently available operational version) and will be integrated with the PANSA ATM environment. Additionally the platform will be equipped with a simulator sub-system allowing to test integrated prototype modules.

ANS CR IBP: SESAR 2020 validation platform consisting of four controller working positions is planned in the ANS CR Prague premises. The ANS CR IBP will be based on the Thales Air Systems TopSky system and will be enhanced with 4D trajectory based functionalities.

ENAV BULATSA IBP: BULATSA deploys an open-end verification and validation platform capable to host different types of ATM systems and tools. The validation platform will be fed with live and simulated surveillance and flight plan data. The IBP will host a prototype demonstrator developed by Airbus Defence and Space SAS.

PANSA with its LTP UNIWARSAW (ICM) wants to build a Decision Support System to improve situational awareness and separation accurateness and management. PANSA will provide specific ATM knowledge and expertise in to the project, also all validation will take place in PANSA premises and engage PANSA ATCO's and experts. The biggest part of work is to devise whole system, build a mathematical model and write a software, which is out of PANSA scope, as an air navigation services provider. This part of work, which takes most of efforts will be provided by UNIWARSAW (ICM). PANSA will contribute with ATM knowledge and expertise, the validation platform, the validation exercise coordination and project coordination. UNIWARSAW will create data archive, write software, build a mathematical

modell addressing subtle navigational factors, build forecasting model, devise and develop a decision support tool (DST).

Skysoft-ATM will set-up the Skyguide validation platform and will adapt the conflict detection and resolution tools, the monitoring aids, the trajectory management tools and associated HMI according to the requirements issued from the concepts to be validated. Skysoft-ATM will also provide expertise in support to requirements elaboration.

ANS CR will be validation side for the RTS validation aiming at definition of required minimum performance specifications for CD&R. ANC SR will provide representative traffic scenarios, environment description and operational expertise in the formulation of resolution scenarios for the FTS purpose. AFT contribution will cover configuration and adaptation the Agent Fly system as necessary for the traffic scenario and resolution strategies. CTU will design algorithms for resolution strategies to achieve maximum flight efficiency and ATC workload reduction. Integra will support ANS CR in the tasks addressing the safety aspects of the activities, in particular pre validation safety assessments, refinement of safety requirements post validation and their integration into the SPR.

ANS CR contribution is coupled with AFT simulation tool (Agent Fly) to be used for the fast-time simulations and subsequently as an input data source for the real-time simulation. The tool has to be adapted by AFT and will require significant SW adjustment to support given CD&R tools for validation purpose. The main precondition for AgentFly readiness is CTU support including research, design and development of architecture and algorithms, data analysis, and evaluation.

DWD will provide meteorological expertise towards the preparation of realistic wind condition data for the validation of improved trajectories that incorporate wind via Mode S.

The effort of the Beneficiary Airbus SAS is below the effort of its Linked Third Party Airbus Operations SAS. This results from the structure of the company and the split in various legal entities, where the management of Commercial Aircraft Division is handled by Airbus SAS while Airbus Operations SAS hosts the Centre of Competence dealing with ATM systems design. Airbus SAS will contribute mainly to Content Integration Team. Airbus Operations SAS will contribute in front line to Work-packages WP4 and WP5.

Airbus Operations SAS will participate to concept refinement by making sure of the compatibility with aircraft initial-4D capability (no airborne evolution envisaged compared to PJ31) and will provide support about aircraft performance behaviour.

As a side-effect of the split between Airbus SAS and Airbus Operations SAS, the resulting contribution of the Beneficiary is also significantly below the effort of the LTP Airbus Defence and Space SAS.

The LTP Airbus Defence and Space SAS will participate to the development of the ENAV BULATSA IBP.

Participation per Partner

Partner number and short name	WP4 effort
1 - DFS	16.00
DWD	6.00
2 - AIRBUS	6.00
AI DS Space	17.00
AI OPS	45.00
3 - Naviair/COOPANS	32.10
4 - DSNA	55.30
6 - ENAV	12.16
SICTA	13.00
DEEP BLUE	12.22
BULATSA	17.62
7 - FINMECCANICA	334.60
8 - SKYGUIDE	21.00
SKYSOFTATM	9.00

Partner number and short name	WP4 effort
12 - THALES AIR SYS	258.00
THALES-AUS	18.00
SMATSA	42.00
13 - INDRA	205.00
14 - EUROCONTROL	50.00
15 - ANS CR (B4)	16.10
Integra	3.43
CTU	8.97
AFT	54.51
18 - ACG/COOPANS	7.01
19 - CCL/COOPANS	7.55
20 - IAA/COOPANS	12.14
21 - LFV/COOPANS	3.30
26 - PANSА (B4)	10.33
UNIWARSAW	76.92
Total	1,370.26

List of deliverables

Deliverable Number ¹⁴	Deliverable Title	Lead beneficiary	Type ¹⁵	Dissemination level ¹⁶	Due Date (in months) ¹⁷
D4.1	10-02a V2 Data Pack	4 - DSNA	Report	Public	12
D4.2	10-02a V3 Data Pack	4 - DSNA	Report	Public	27

Description of deliverables

V2 Data Pack Contractual Deliverables:
 OSED/SPR/INTEROP; TS/IRS; CBA
 V3 Data Pack Contractual Deliverables:
 OSED/SPR/INTEROP; TS/IRS; CBA
 Internal Deliverables:
 V2 VALP and VALR
 V3 VALP and VALR
 D4.1 : 10-02a V2 Data Pack [12]
 Consists of a) OSED/SPR/INTEROP b) TS/IRS c) CBA
 D4.2 : 10-02a V3 Data Pack [27]
 Consists of a) OSED/SPR/INTEROP b) TS/IRS c) CBA

Schedule of relevant Milestones

Milestone number¹⁸	Milestone title	Lead beneficiary	Due Date (in months)	Means of verification
MS5	V2 Gate for Solution PJ.10-02a	4 - DSNA	14	All documents for V data pack delivered and Gate review with SJU has been passed.
MS6	V3 Gate for Solution PJ.10-02a	4 - DSNA	29	All documents for V data pack delivered and Gate review with SJU has been passed.

Work package number ⁹	WP5	Lead beneficiary ¹⁰	10 - NATS
Work package title	Solution PJ.10-02b: Advanced Separation Management		
Start month	7	End month	36

Objectives

This SESAR Solution aims at increasing the quality of service of separation management in the En-Route and TMA operational environments (for example by reducing control workload, reducing separation buffers or facilitating new controller team organisations). For this purpose, automation mechanisms will be introduced (for example vertical and longitudinal separation are ensured by interventions recommended by the automated system that have to be confirmed by controllers and in exceptional cases by controller intervention). Controllers are assisted in their separation tasks by tools that make use of advanced data (for example EPP and Area of Responsibility (AOR) information) that increase the quality of provided services. These services comprise further improved ground trajectory prediction, resolution support increasing flight efficiency to allow for prioritisation, automated aspects of conflict resolution / dilution applied to mixed equipped fleet as well as an improved conformance monitoring that takes into account the calculated ground system trajectories. The platforms used within Solution PJ.10-02b will also be taken into account within the team organisation Solution (PJ.10-01a), because the workload reduction induced by the controller tools (with support of PJ.16-04) is the enabler for a more flexible and dynamic team organisation.

The advanced separation management functionalities will be developed and validated with special emphasis on both the En-Route and TMA operational environment. The OI steps addressed within this Solution comprise CM-0407, CM-0207B, CM-0403B for En-Route and CM0408, CM-0208B. Although listed in the MAWP, CM-0607 and CM-0608 will not be addressed by any of the partners in Wave 1. However, 2D RNP aspects are planned to be addressed in wave 2 in project PJ-10-02B (OIs CM-0607 for En-Route and CM-0608 for the TMA).

Validations:

The validation activities within this Solution will focus on the controller tools for conflict detection, conflict resolution advisory and flight path monitoring. This Solution is not focusing on improved performance of already existing controller tool functionality. Instead, further steps of automation (including recommendation of Solutions that are beneficial with regards to safety, flight efficiency and productivity) will be developed and prototyped. Given the significance of the tools for the performance of separation management, this Solution will involve the majority of partners within PJ.10. Within the V1 and V2 phase, various research and industrial prototypes, from PJ.10-01a and PJ.16-04, will be developed and validated within different operational environments and ATM systems. Given the size of this Solution and in order to reflect the difference in procedures and airspace structure WP 5 is divided into three sub-work packages (SWP). The division into sub work packages will be used to structure both validation threads and prototype development. For the elaboration for both the contractual and internal deliverables, only one task per Solution and maturity cycle will be foreseen.

Description of work and role of partners

WP5 - Solution PJ.10-02b: Advanced Separation Management [Months: 7-36]
 NATS, DFS, AIRBUS, Naviair/COOPANS, ENAIRE, ENAV, FINMECCANICA , SKYGUIDE, THALES AIR SYS, INDRA, EUROCONTROL, ANS CR (B4), ACG/COOPANS, CCL/COOPANS, IAA/COOPANS, LFV/COOPANS

For both the V1 and V2 maturity cycle concept descriptions will be produced that will focus on working procedures, configuration of tools and roles & responsibilities. The V1 phase is expected to be completed in Wave 1, while the V2 phase will be started but not completed within Wave 1. Validation activities will be conducted in the V1 and V2 phase by means of fast-time and real-time simulations. For the validation activities different complementary toolsets will be developed. For example, resolution advisory will provide automated recommendation for different time horizons (e.g. strategic resolution vs. tactical recommended intervention).

In total five platforms will be used in order to reflect different sets of European system functionalities as well as different ATM system philosophies. Within the existing human-centric work organisation of ATC new system functionalities can only be implemented following a stepwise approach. Therefore, it is necessary to grant the specific operational environments of European ANSPs in order to reach convergence on a European level. This factor together with the significance of controller tools for separation management justifies the effort and the variety of validation activities. Furthermore, the different platforms and prototypes focus on special aspects of the controller tools (e.g. time horizon, roles & responsibility, different operational procedures & environments) Therefore, the validation results can be

expected to be complementary and valid for a wider variety of European operational environments. For the real-time simulations the following platforms will be used:

DFS ATCAS IBP: The platform is based on the ATM system ATCAS that is currently operational in Germany's Lower airspace. The ATM system can be integrated with different research prototype modules and can be run with data derived from a traffic generator.

COOPANS Narsim: for description please refer to Solution PJ.10-01a

Thales Air Systems will contribute with its technical expertise to the definition of the intermediate technical solution, and will start developing prototypes for separation enhancements that will be used in a Thales Air Systems TopSky ATC platform for wave 2 validation.

SMATSA will contribute to the development of concept description (OSD/SPR/INTEROP) and validation tasks (VALP and VALR), and will also participate to the maturation of the OIs validated within this solution with air traffic controllers supporting the COOPANS validations. Thales Australia Limited will contribute with its technical expertise to the definition of the technical solution, develop and support simulation and ATC tools prototypes which will be integrated in the Thales Air Systems TopSky ATC platform for COOPANS validation.

ENAV En-Route / TMA IBP: for description please refer to Solution PJ.10-02a.

ENAV intends to focus on the validation of enhanced conflict detection and resolution and enhanced monitoring aids with innovative HMI features. CIRA provides specialized support in the development of automatic controller support tools for advanced separation management, with reference to Conflict Detection, Conflict Resolution and Enhanced Situational Awareness functionalities. As Research Branch of ENAV, SICTA is intended to contribute in all activities where ENAV is involved, with special emphasis on the operational validation of the concept developed within the solution. Specifically, transversal contribution is expected for the concept, procedures and requirements definition; for structuring and organizing all validation activities; for executing and reporting related to all validation exercises envisaged to be performed within this solution as well as for the related analysis of the ATM performances.

As already reported in the relevant section of the proposal submitted last April, SICTA participation is quite significant from an ENAV perspective considering it brings an important piece of transversal technical, operational and management expertise. SICTA, as part of the ENAV Group and bound to ENAV through shared ownership, is to all effects same as an ENAV department and their in kind contribution is to be considered as a single block. CIRA significant contribution will be provided for the development of automatic controller support tools for advanced separation management. The contribution will come from the Air Transport Sustainability Dept., which gained relevant expertise in the framework of Situational Awareness, Traffic Avoidance and Collision Avoidance systems through participation in several international projects. BULATSA (as ENAV LTP) contribution will be mainly provided for the validation activities in TMA environment by using their own facilities/platforms and ATCO personnel.

NATS ACE Simulator Platform: for description please refer to Solution PJ.10-01c

ENAV / BULATSA IBP: for description please refer to Solution PJ.10-02a

ENAV in coordination with FINMECCANICA (industry partner) intends to validate some aspects/objectives related to CM-0306 (PJ.10-01c) in the context of PJ.10-02b.

Skysoft-ATM provide expertise support in the view of the preparation of the Wave 2 activities.

INECO and ISDEFE will be involved in the concept development activities. INECO and ISDEFE will undertake more than 50% of ENAIRE's contribution. Ineco gathers the most accurate expertise, and as a company owned by ENAIRE, its optimal collaboration with ENAIRE has been proved along SESAR 1. ISDEFE is a State-owned company that offers consulting and engineering services for Spanish public administration and public international agencies, addressing the definition, implementation, operation, evolution and regulation of CNS/ATM aspects and has been working together with ENAIRE in several activities. All the above duly justify the huge involvement of them on behalf of ENAIRE.

ANS CR will be validation side aiming at RTS validation of CD&R tools to support traffic stability using closed clearances. AFT contribution will cover configuration and adaptation the Agent Fly system as necessary for the traffic scenario and resolution strategies. CTU will design algorithms for resolution strategies to achieve maximum flight efficiency and ATC workload reduction. Integra will support ANS CR in the tasks addressing the safety aspects of the activities, in particular pre validation safety assessments, refinement of safety requirements post validation and their integration into the SPR.

ANS CR contribution is coupled with AFT simulation tool (Agent Fly) to be used for the fast-time simulations and subsequently as an input data source for the real-time simulation. The tool has to be adapted by AFT and will require significant SW adjustment to support given CD&R tools for validation purpose. The main precondition for AgentFly readiness is CTU support including research, design and development of architecture and algorithms, data analysis, and evaluation.

The effort of the Beneficiary Airbus SAS is below the effort of its Linked Third Party Airbus Operations SAS. This results from the structure of the company and the split in various legal entities, where the management of Commercial Aircraft Division is handled by Airbus SAS while Airbus Operations SAS hosts the Centre of Competence dealing with

ATM systems design. Airbus SAS will contribute mainly to Content Integration Team. Airbus Operations SAS will contribute in front line to Work-packages WP4 and WP5.
 Airbus Operations SAS will participate to concept refinement by making sure of the compatibility with aircraft initial-4D capability (no airborne evolution envisaged compared to PJ31) and will provide support about aircraft performance behaviour, in relation with model developed in PJ18-solution 6.
 As a side-effect of the split between Airbus SAS and Airbus Operations SAS, the resulting contribution of the Beneficiary is also significantly below the effort of the LTP Airbus Defence and Space SAS.
 The LTP Airbus Defence and Space SAS will participate to the development of the ENAV BULATSA IBP.

Participation per Partner

Partner number and short name	WP5 effort
1 - DFS	39.00
2 - AIRBUS	6.00
AI DS Space	17.00
AI OPS	49.00
3 - Naviair/COOPANS	14.39
5 - ENAIRE	0.20
ISDEFE	5.60
INECO	7.10
6 - ENAV	4.30
CIRA	14.35
SICTA	8.67
BULATSA	8.68
7 - FINMECCANICA	118.70
8 - SKYGUIDE	4.95
SKYSOFTATM	2.05
10 - NATS	104.00
12 - THALES AIR SYS	50.00
THALES-AUS	6.00
SMATSA	42.00
13 - INDRA	409.00
14 - EUROCONTROL	18.00
15 - ANS CR (B4)	7.36
Integra	1.25
CTU	8.97
AFT	35.35
18 - ACG/COOPANS	2.55
19 - CCL/COOPANS	3.08
20 - IAA/COOPANS	5.66
21 - LFV/COOPANS	1.65

Partner number and short name	WP5 effort
Total	994.86

List of deliverables

Deliverable Number ¹⁴	Deliverable Title	Lead beneficiary	Type ¹⁵	Dissemination level ¹⁶	Due Date (in months) ¹⁷
D5.1	10-02b V1 Data Pack	10 - NATS	Report	Public	24

Description of deliverables

V1 Data Pack Contractual Deliverables:
 OSED/SPR/INTEROP
 Internal Deliverables:
 V1 VALP and VALR
 Intermediate V2 VALP and VALR
 Intermediate OSED/SPR/INTEROP; TS/IRS; CBA
 D5.1 : 10-02b V1 Data Pack [24]
 Consists of a) OSED/SPR/INTEROP

Schedule of relevant Milestones

Milestone number ¹⁸	Milestone title	Lead beneficiary	Due Date (in months)	Means of verification
MS7	V1 Gate for Solution PJ.10-02b	10 - NATS	26	All documents for V data pack delivered and Gate review with SJU has been passed.

Work package number ⁹	WP6	Lead beneficiary ¹⁰	6 - ENAV
Work package title	Solution PJ.10-05: IFR RPAS Integration		
Start month	1	End month	36

Objectives

Airspaces where IFR services are provided can be extremely complex, and there are many challenges surrounding the integration of RPAS into these environments. The scope of PJ.10-05 solution is to investigate ways in which RPAS may be able to use a technical capability or procedural means to be safely integrated in ATM including complying with ATC instructions in order to be integrated in non-segregated airspace. According to this scope the main arguments treated by the solution can be summarised as :

- understanding and determining whether RPAS fit into the current manned aircraft classification criteria, or whether there is a need to establish a specific RPAS operation classification;
- addressing flight preparation, requiring information management for flight planning, where all intended flight-trajectories are planned in a manner compatible with the ATM Network;
- assessing of whether RPAS might, in the early phases of ATM integration, not behave exactly the same as other aircraft, because of the latency and a different flight awareness of the crew, and the consequent impact of these factors on separation provision;
- understanding of RPAS-specific trajectories that are not easy to describe in the existing B/MT format
 - RPAS might also stay on station in a given area that can be across several airspaces boundaries for a very long time, compared to manned aviation, when loitering on a mission for example; understanding the sensitivity of RPAS to severe weather conditions and their ability to anticipate them; this might require specific coordination between ATC and the remote pilot especially for reactive manoeuvres, level changes and rerouting;
- addressing ATC that will need awareness of RPAS activities in their AOR. Activities must be preannounced and the flight plan will need to indicate the fact that the flight is an RPAS. During flight, the air traffic controller and the other airspace users shall have some indication that the aircraft in question is unmanned. ATC shall have knowledge of the contingency procedures;
- addressing whether RPAS to be able to fly IFR in managed IFR airspace where VFR flight is permitted, the RPAS will need to be able to meet the obligations of IFR flight, including ‘traffic avoidance’, maintaining VMC conditions and terrain avoidance; and
- analysing the effects of loss-of-C2 link procedures, which will be developed for RPAS contingencies conditions.

The main objectives addressed by the solution derived from the arguments above are:

- Analysis and development of methods and models of trajectory description.
- Analysis of existing and proposed ATM procedures, new technologies, approaches and trends dealt with RPAS.
- Operational mission and scenario analysis for RPAS.
- Initial validation of minimum performance requirements for RPAS IFR/VFR flights and separation criteria.
- Operational validation of minimum performance requirements for RPAS IFR/VFR flights and separation criteria.
- Assessment of contingency situations, assessment related to cyber security aspects.

Description of work and role of partners

WP6 - Solution PJ.10-05: IFR RPAS Integration [Months: 1-36]
 ENAV, DFS, DSNA, ENAIRE, FINMECCANICA , SAAB (NATMIG), NATS, DASSAULT, THALES AIR SYS, INDRA, EUROCONTROL, CCL/COOPANS, LFV/COOPANS, PANSAs (B4)

According to the deliverables and validations that will be developed by the Project in Wave 1, for both V1 and V2 will be produced OSEDs that will collect in particular the Operational Environment and procedures description, the use cases and system/operation requirements that are critical for developing a plan for the integration of RPAS in current non segregate airspace. These activities are linked to the work of PJ.13-01-01 that includes in its scope the development of collision avoidance and traffic separation capabilities onboard an RPAS. In fact the PJ.13-10-01 is focused on Detect and Avoid, this function, according to the actual European (EASA) and ICAO rules is a fundamental requirement for a possible integration of Unmanned Aircraft in ATM. In this Solution, 3 V1 and 4 V2 validation exercises will be performed, one V1 VALP and one V1 VALR is expected for V1 cycle and the same for V2 cycle. The validation exercises will address different aspects of the validation objectives in order to serve a complete picture of the Solution.

Is important to underline that for some V2 validation activities, the human in the loop has been considered. ATCOs and RPAS pilots will participate during the Real Time Simulation sessions in order to assess the impact of the concept

analysed on their working method. In order to corroborate the analysis, this solution develops a dedicated Performance assessment that address

the main KPAs (SAF-SEC-HP) and CBA. Validations will make use of assets developed in other projects when relevant and possible, e.g. PJ.13-01 Real Time simulator capabilities in general and specific models such as for Detect & Avoid and C2. FINMECCANICA, TELESPIAZIO (third linked parties for FINMECCANICA), DASSAULT, SAAB (NATMIG) and other partners will contribute to the definition of the Air Traffic Insertion Requirements for IFR RPAS Integration. FINMECCANICA-TELESPIAZIO will also support the integration of the ATC simulator with the RPAS Full Mission Simulator and the SatCom/SatNav Simulator, all upgraded within the PJ.13-01-01 in compliance with the PJ.10-05 OSED/SPR/INTEROP requirements. ENAV, FINMECCANICA and TELESPIAZIO will use the integrated validation platform to validate the RPAS insertion capabilities in relation with separation management. The exercises will include the evaluation of the effects of introducing SatCom connectivity for C2 and ATC Communications (e.g. latency, link loss) and SatNav underperformances on RPAS operations and procedures, including the definition of contingency conditions. ENAV is leader of the solution. The main contribution is expected for the development of the concept, the definition of operational and performance requirements related to the integration of RPAS traffic into IFR operations. ENAV will also lead the V2 validation activity related to thread#2, will provide the RTS platform (enroute/TMA/ground), the operational personnel and will develop scenarios and procedures related to the validation exercise. CIRA contribution to the solution will come from different departments, all belonging to the On Board Systems and ATM division, and under the coordination of its Air Transport Management Department. Thanks to background acquired in coordinating one of the nine RPAS Demonstration projects in SESAR1, CIRA will support the analysis for the RPAS integration in IFR managed airspace, cooperating in identifying requirements for concept assessment, technical and procedural solutions validation. DEEP BLUE supports to the validation of the integration of the RPAS into the current ATM environment. Particularly, aspects related to procedural means to safely integrate RPAS into ATM, human performance – especially in contingency situations – and training needs may be investigated applying dedicated methodologies and expertise. IDS contribution is expected mainly for validation activities, analysis and development of methods/models for trajectory description, operational validation of minimum performance requirements for RPAS IFR/VFR flights and separation criteria, sensitivity of RPAS to severe conditions (e.g. weather) and assessment of contingency situations (e.g. data-link loss) and provision of RPAS Operational staff (remote pilots). MATS contribution to the project is envisaged mainly to the provision of ATCO personnel to be involved in the validation activities.

As Research Branch of ENAV, SICTA is intended to contribute in all activities where ENAV is involved, with special emphasis on the operational validation of the concept developed within the solution. Specifically, transversal contribution is expected for the concept, procedures and requirements definition; for structuring and organizing all validation activities; for executing and reporting related to all validation exercises envisaged to be performed within this solution as well as for the related analysis of the ATM performances. As already reported in the relevant section of the Proposal submitted last April, SICTA participation is quite significant from an ENAV perspective considering it brings an important piece of transversal technical, operational and management expertise. SICTA, as part of the ENAV Group and bound to ENAV through shared ownership, is to all effects same as an ENAV department and their in kind contribution is to be considered as a single block. For this reason, their overall contribution is to be considered joint and as main part of the contribution, consequently more significant than the most of the other involved LTPs. CIRA significant contribution will be provided for identifying requirements for concept assessment, technical and procedural solutions validation. IDS significant contribution will be provided for the validation platform evolution duties.

EUROCONTROL, in close collaboration with ENAV and the Maltese MATS (third linked party for ENAV) which will in particular provide the required air traffic controllers, will conduct a series of V1 and V2 RPAS integration validation activities based on Real Time Simulations techniques on relevant Mediterranean airspace (based on current Italian and Maltese daily operational experience). DSNA will contribute in the course of V2 validation activities in order to study RPAS integration with cooperative traffic. They will make use of the EASY platform. EASY is an easily reconfigurable set of ATM simulation tools, designed to facilitate the validation of new concepts. Easy relies on a simple distributed network protocol (IVY) which enables a fast integration of specific components and a simple monitoring and information retrieval from various external applications. Aircraft models manned or unmanned included basic flight performances. A tight cooperation with SAFRAN and DASSAULT will help to provide different RPAS models and to connect Remote Pilot Station to the Real Time Simulations. Dassault Aviation plans to participate to the refinement of the RPAS integration CONOPS. It will also provide the platform data necessary to evaluate the integration concepts using the solutions as coming out of PJ.03, PJ.11 and PJ.13. ENAC, as a DSNA third party, will contribute by providing models, algorithms, and software contribution to DSNA EASY platform for the RTS simulations with the help of operations experts, by designing operational procedures plans and providing safety analysis.

While the global effort of the Beneficiary DSNA for the whole project PJ-10 is higher than the sum of efforts of Linked Third Parties (ENAC and SAFRAN), the expertise of SAFRAN and ENAC in the very specific area of RPAS requires a significant amount of efforts which, inside PJ-10.05, is higher than DSNA's specific efforts. DSNA will supervise PJ-10.05 activity with highly specialized and extensive support provided by SAFRAN and ENAC.

LFV/COOPANS and CCL/COOPANS will perform a V2 Real Time Simulation, which will be joint with PJ.13-01-01 to address IFR integration including Detect & Avoid, also with RPAS pilots in the loop (in addition to ATCOs). Furthermore, RPAS integration will be studied in contingency, resilience and emergency situations. SAAB (NATMIG) will focus on coordination with PJ.13-01 including requirements work, simulation model integration, standardisation, validation planning and interoperability aspects.

PANSA intends to develop and validate methods and models of RPAS trajectory description, ATM procedures, operational missions and Scenarios, minimum performance requirements and separation criteria including flights contingency situations. POLITECHNIKA RZESZOWSKA IM IGNACEGO LUKASIEWICZA PRZ (PRZ) focus on analysis and development of methods and models of trajectory description, new technologies, approaches and trends, operational mission and scenario analysis for RPAS, initial validation of minimum performance requirements for RPAS IFR/VFR flights and separation criteria. PANSA will input to the project ATM knowledge and expertise and University of Rzeszow, as an expert in RPAS development will do validation exercise with use of its own RPAS fleet and validation platform.

INECO and ISDEFE will contribute to the concept development tasks and participate in the related validation activities. CRIDA will be involved in the tasks related to the validation activities. Crida, Ineco and Isdefe will undertake more than 50% of ENAIRE's contribution. Crida is the branch from ENAIRE in charge of the R&D activities and it plays a relevant role in all the ENAIRE's activities developed in the SESAR programme. Its main focus is the performance improvement of the ATM system, developing, validating and implementing ATM solutions. Ineco gather the most accurate expertise, and as a company owned by ENAIRE, its optimal collaboration with ENAIRE has been proved along SESAR 1. Isdefe is a State-owned company that offers consulting and engineering services for Spanish public administration and public international agencies, addressing the definition, implementation, operation, evolution and regulation of CNS/ATM aspects and has been working together with ENAIRE in several activities. All the above duly justify the huge involvement of them in this project on behalf of ENAIRE.

Participation per Partner

Partner number and short name	WP6 effort
1 - DFS	7.00
4 - DSNA	4.80
SAFRAN	5.80
ENAC	12.30
5 - ENAIRE	0.20
CRIDA	8.00
ISDEFE	9.10
INECO	8.80
6 - ENAV	4.79
I.D.S.	11.85
CIRA	14.35
MATS	0.62
SICTA	9.10
DEEP BLUE	6.29
7 - FINMECCANICA	55.00
TELESPAZIO	38.00
9 - SAAB (NATMIG)	9.00
10 - NATS	10.00
11 - DASSAULT	10.00

Partner number and short name	WP6 effort
12 - THALES AIR SYS	6.00
13 - INDRA	31.00
14 - EUROCONTROL	101.00
19 - CCL/COOPANS	1.08
21 - LFV/COOPANS	8.02
26 - PANSA (B4)	1.00
PRZ	10.19
Total	383.29

List of deliverables

Deliverable Number ¹⁴	Deliverable Title	Lead beneficiary	Type ¹⁵	Dissemination level ¹⁶	Due Date (in months) ¹⁷
D6.1	10-05 V1 Data Pack	6 - ENAV	Report	Public	12
D6.2	10-05 V2 Data Pack	6 - ENAV	Report	Public	33

Description of deliverables

V1 Data Pack Contractual Deliverables:
 OSED/SPR/INTEROP
 V2 Data Pack Contractual Deliverables:
 OSED/SPR/INTEROP; TS/IRS; CBA
 Internal Deliverables:
 V1 VALP and VALR
 V2 VALP and VALR
 D6.1 : 10-05 V1 Data Pack [12]
 Consists of a) OSED/SPR/INTEROP
 D6.2 : 10-05 V2 Data Pack [33]
 Consists of a) OSED/SPR/INTEROP b) TS/IRS c) CBA

Schedule of relevant Milestones

Milestone number ¹⁸	Milestone title	Lead beneficiary	Due Date (in months)	Means of verification
MS8	V1 Gate for Solution PJ.10-05	6 - ENAV	14	All documents for V data pack delivered and Gate review with SJU has been passed.
MS9	V2 Gate for Solution PJ.10-05	6 - ENAV	35	All documents for V data pack delivered and Gate review with SJU has been passed.

Work package number ⁹	WP7	Lead beneficiary ¹⁰	10 - NATS
Work package title	Solution PJ.10-06: Generic' (non-geographical) Controller Validations		
Start month	1	End month	36

Objectives

The objective is to identify the human, system and procedural needs that might allow a more flexible ATCO validation regime, for example “sector-type validations” that would allow a controller to operate in any airspace classified as a particular type. OI steps addressed at V1 : SDM-0203 No enablers are specified for this OI. The MAWP anticipates a V2 maturity for this OI to be reached by Release R8 (2018). Starting this Solution in January 2017 will push the achievement of this maturity level to Wave 2. Tools being designed and tested in Advanced Separation Management (PJ.10-02b) will assist in the enhancement of collaborative control for En-Route and TMA, the maturity of these tools is closely coupled with the success of this Solution and waiting for maturity in PJ.10-02b benefit the research conducted here.

For efficiency reasons, NATS (Solution lead) plan close co-operation between PJ.10-06 and PJ.10-01c and PJ.10-02b, including at solution management level, and anticipate the potential for joint validations between these Solutions that would cover all concepts.

Validations:

The validations planned herein will be performed in close co-operation with PJ.10-01c and PJ.10-02b. Skyguide will perform validation of SDM-0203 as specified above to V1 maturity in a classroom environment with ATM and validation experts. This study will provide insights into the requirements of human, system and procedural needs that will permit this OI to be achieved and controllers being able to operate in airspace classified as a particular type. NATS will perform a similar study addressing SDM-0203 in close co-operation with Skyguide to V1 maturity (as described above) alongside the development of collaborative control (PJ.10-01c) and enhanced separation management (PJ.10-02b). The applicability of generic validations will be addressed within the context of these other early maturity designs and to explore potential adaptations to enhance productivity and capacity in highdensity high complexity airspace. The V1 maturity level according to the MAWP is expected to be reached in Release R7. However, due to the need of close co-operation with PJ.10-01c and PJ.10-02b, V1 will be reached one year later than planned.

Description of work and role of partners

WP7 - Solution PJ.10-06: Generic' (non-geographical) Controller Validations [Months: 1-36]
NATS, SKYGUIDE, INDRA

For the V1 maturity cycle a concept description will be produced that will focus on opportunities and educational needs to allow more generic controller certification. The V1 phase is expected to be completed within Wave 1. Validation activities will be conducted in the V1 phase by means of paper studies based on closely linked realtime simulation exercises within the team organisation Solution PJ.10-01c and the controller tool Solution PJ.10-02b.

Participation per Partner

Partner number and short name	WP7 effort
8 - SKYGUIDE	4.00
10 - NATS	11.00
13 - INDRA	20.00
Total	35.00

List of deliverables

Deliverable Number¹⁴	Deliverable Title	Lead beneficiary	Type¹⁵	Dissemination level¹⁶	Due Date (in months)¹⁷
D7.1	10-06 V1 Data Pack	10 - NATS	Report	Public	24

Description of deliverables

V1 Data Pack Contractual Deliverables:
 OSED/SPR/INTEROP
 Internal Deliverables:
 V1 VALP and VALR
 D7.1 : 10-06 V1 Data Pack [24]
 Consists of a) OSED/SPR/INTEROP

Schedule of relevant Milestones

Milestone number¹⁸	Milestone title	Lead beneficiary	Due Date (in months)	Means of verification
MS10	V1 gate for Solution PJ.10-06	10 - NATS	26	All documents for V data pack delivered and Gate review with SJU has been passed.

Work package number ⁹	WP8	Lead beneficiary ¹⁰	1 - DFS
Work package title	Management		
Start month	1	End month	38

Objectives

Coordination and monitoring of project’s progress to accomplish the main objectives regarding time and resources. Coordinate with SESAR 2020 programme and fulfil the administrative requirements of the grant agreement.

Description of work and role of partners

WP8 - Management [Months: 1-38]
DFS
 Project Management and Coordination (M1.1-M7.1).
 Day-to-day monitoring and control of Project progress with respect to project objectives, timetable and acceptance of deliverables. Responsible to carry out the main management activities at project level and the reporting process, and assure timed delivery. Meetings to be organised: Review meeting with SJU (annual), PMB (monthly TelCo, on demand), EPMB (annual and on demand). The Project Manager (PM), together with the PMB and EPMB, will act as project steering committee. Change requests will be handled by the committee to allow flexibility. A management report will be produced every six months to document project progress. Project Quality Management and Standardisation (M1.1-M7.1). The coordinator is ISO – 9001 Standard certified and will ensure the quality of the project. A project management handbook will be produced to establish a project quality plan.
 Reporting and Communication with the SJU (M1.1-M7.1).
 In cooperation with all involved partners, the POC for communication activities is responsible to provide the required periodic and final reports to the SJU / European Commission.
 Technical and Scientific Coordination (M1.1-M7.1).
 The Project Content Integration Leader will organise the technical and scientific conceptualisation of the project, the coordination of technical activities in the project, and the development of a common project understanding and vision across the timeline. He/she coordinates the PCIT.
 Contribution to the SESAR 2020 Programme Management (M1.1-M7.1)
 i.e. Programme Committee and its sub-committees. Administration of the project according to the grant agreement.

Participation per Partner

Partner number and short name	WP8 effort
1 - DFS	38.00
Total	38.00

List of deliverables

Deliverable Number ¹⁴	Deliverable Title	Lead beneficiary	Type ¹⁵	Dissemination level ¹⁶	Due Date (in months) ¹⁷
D8.1	Project Management Plan	1 - DFS	Report	Confidential, only for members of the consortium (including the Commission Services)	5
D8.2	Final Project Report	1 - DFS	Report	Public	34

List of deliverables

Deliverable Number ¹⁴	Deliverable Title	Lead beneficiary	Type ¹⁵	Dissemination level ¹⁶	Due Date (in months) ¹⁷
D8.3	Quarterly Progress Report 01	1 - DFS	Report	Confidential, only for members of the consortium (including the Commission Services)	3
D8.4	Quarterly Progress Report 02	1 - DFS	Report	Confidential, only for members of the consortium (including the Commission Services)	6
D8.5	Quarterly Progress Report 03	1 - DFS	Report	Confidential, only for members of the consortium (including the Commission Services)	9
D8.6	Quarterly Progress Report 04	1 - DFS	Report	Confidential, only for members of the consortium (including the Commission Services)	12
D8.7	Quarterly Progress Report 05	1 - DFS	Report	Confidential, only for members of the consortium (including the Commission Services)	15
D8.8	Quarterly Progress Report 06	1 - DFS	Report	Confidential, only for members of the consortium (including the Commission Services)	18
D8.9	Quarterly Progress Report 07	1 - DFS	Report	Confidential, only for members of the consortium (including the Commission Services)	21
D8.10	Quarterly Progress Report 08	1 - DFS	Report	Confidential, only for members of the consortium (including the Commission Services)	24
D8.11	Quarterly Progress Report 09	1 - DFS	Report	Confidential, only for members of the consortium (including the Commission Services)	27
D8.12	Quarterly Progress Report 10	1 - DFS	Report	Confidential, only for members of the	30

List of deliverables

Deliverable Number ¹⁴	Deliverable Title	Lead beneficiary	Type ¹⁵	Dissemination level ¹⁶	Due Date (in months) ¹⁷
				consortium (including the Commission Services)	
D8.13	Quarterly Progress Report 11	1 - DFS	Report	Confidential, only for members of the consortium (including the Commission Services)	33
D8.14	Quarterly Progress Report 12	1 - DFS	Report	Confidential, only for members of the consortium (including the Commission Services)	36

Description of deliverables

Project Management Plan PMP : Defines how the project is executed, monitored and controlled, and closed
 Final Project Report – Project Achievements
 Quarterly Project Reports - Status information

D8.1 : Project Management Plan [5]
 Defines how the project is executed, monitored, controlled and closed.

D8.2 : Final Project Report [34]
 Project achievements

D8.3 : Quarterly Progress Report 01 [3]
 Quarterly Progress Report

D8.4 : Quarterly Progress Report 02 [6]
 Quarterly Progress Report

D8.5 : Quarterly Progress Report 03 [9]
 Quarterly Progress Report

D8.6 : Quarterly Progress Report 04 [12]
 Quarterly Progress Report

D8.7 : Quarterly Progress Report 05 [15]
 Quarterly Progress Report

D8.8 : Quarterly Progress Report 06 [18]
 Quarterly Progress Report

D8.9 : Quarterly Progress Report 07 [21]
 Quarterly Progress Report

D8.10 : Quarterly Progress Report 08 [24]
 Quarterly Progress Report

D8.11 : Quarterly Progress Report 09 [27]
 Quarterly Progress Report

D8.12 : Quarterly Progress Report 10 [30]
 Quarterly Progress Report

D8.13 : Quarterly Progress Report 11 [33]
Quarterly Progress Report
D8.14 : Quarterly Progress Report 12 [36]
Quarterly Progress Report

Schedule of relevant Milestones

Milestone number¹⁸	Milestone title	Lead beneficiary	Due Date (in months)	Means of verification
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Work package number ⁹	WP9	Lead beneficiary ¹⁰	1 - DFS
Work package title	Ethics requirements		
Start month	1	End month	38

Objectives

The objective is to ensure compliance with the 'ethics requirements' set out in this work package.

Description of work and role of partners

WP9 - Ethics requirements [Months: 1-38]
DFS
 This work package sets out the 'ethics requirements' that the project must comply with.

List of deliverables

Deliverable Number ¹⁴	Deliverable Title	Lead beneficiary	Type ¹⁵	Dissemination level ¹⁶	Due Date (in months) ¹⁷
D9.1	H - Requirement No. 1	1 - DFS	Ethics	Confidential, only for members of the consortium (including the Commission Services)	5
D9.2	POPD - Requirement No. 2	1 - DFS	Ethics	Confidential, only for members of the consortium (including the Commission Services)	5
D9.3	NEC - Requirement No. 3	1 - DFS	Ethics	Confidential, only for members of the consortium (including the Commission Services)	5
D9.4	M - Requirement No. 4	1 - DFS	Ethics	Confidential, only for members of the consortium (including the Commission Services)	5

Description of deliverables

The 'ethics requirements' that the project must comply with are included as deliverables in this work package.

D9.1 : H - Requirement No. 1 [5]
 2.1. Details on the procedures and criteria that will be used to identify/recruit research participants must be provided.
 2.2. Detailed information must be provided on the informed consent procedures that will be implemented for the participation of humans. 2.3. Templates of the informed consent forms and information sheet must be submitted on request. 2.9. Copies of ethics approvals for the research with humans must be submitted.

D9.2 : POPD - Requirement No. 2 [5]
 4.1. Copies of opinion or confirmation by the competent Institutional Data Protection Officer and/or authorization or notification by the National Data Protection Authority must be submitted (which ever applies according to the Data

Protection Directive (EC Directive 95/46, currently under revision, and the national law). 4.4. Detailed information must be provided on the procedures that will be implemented for data collection, storage, protection, retention and destruction and confirmation that they comply with national and EU legislation.

D9.3 : NEC - Requirement No. 3 [5]

6.1. The applicant must confirm that the ethical standards and guidelines of Horizon2020 will be rigorously applied, regardless of the country in which the research is carried out. 6.3. The applicant must clarify whether personal data will be imported to/exported from EU and provide the adequate authorisations.

D9.4 : M - Requirement No. 4 [5]

9.1. Details on measures to prevent malevolent/criminal/terrorist abuse of research findings must be provided.

Schedule of relevant Milestones

Milestone number ¹⁸	Milestone title	Lead beneficiary	Due Date (in months)	Means of verification
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1.3.4. WT4 List of milestones

Milestone number ¹⁸	Milestone title	WP number ⁹	Lead beneficiary	Due Date (in months) ¹⁷	Means of verification
MS1	V2 Gate for Solution PJ.10-01a	WP1	8 - SKYGUIDE	26	All documents for V data pack delivered and Gate review with SJU has been passed.
MS2	V1 Gate for Solution PJ.10-01b	WP2	17 - DLR (AT-One)	26	All documents for V data pack delivered and Gate review with SJU has been passed.
MS3	V2 Gate for Solution PJ.10-01b	WP2	17 - DLR (AT-One)	35	All documents for V data pack delivered and Gate review with SJU has been passed.
MS4	V2 Gate for Solution PJ.10-01c	WP3	10 - NATS	26	All documents for V data pack delivered and Gate review with SJU has been passed.
MS5	V2 Gate for Solution PJ.10-02a	WP4	4 - DSNA	14	All documents for V data pack delivered and Gate review with SJU has been passed.
MS6	V3 Gate for Solution PJ.10-02a	WP4	4 - DSNA	29	All documents for V data pack delivered and Gate review with SJU has been passed.
MS7	V1 Gate for Solution PJ.10-02b	WP5	10 - NATS	26	All documents for V data pack delivered and Gate review with SJU has been passed.
MS8	V1 Gate for Solution PJ.10-05	WP6	6 - ENAV	14	All documents for V data pack delivered and Gate review with SJU has been passed.
MS9	V2 Gate for Solution PJ.10-05	WP6	6 - ENAV	35	All documents for V data pack delivered and Gate review with SJU has been passed.
MS10	V1 gate for Solution PJ.10-06	WP7	10 - NATS	26	All documents for V data pack delivered and Gate review with SJU has been passed.

1.3.5. WT5 Critical Implementation risks and mitigation actions

Risk number	Description of risk	WP Number	Proposed risk-mitigation measures
1	Availability of validation platform provided by otherPJ or Solutions (i.e. PJ.18-02, PJ.10-02a, PJ.10-02b) Severity: Medium Likelihood: Low	WP1	Adapt scope of validation to platform available
2	Performance metrics for CD&R tool accuracy and controller workload and their measurement definition is not delivered (on time). Severity: Low Likelihood: Low	WP2	None
3	Lack of benefit demonstration activities with regard to the number of objectives Severity: High Likelihood: Medium	WP4	Increase the number of FTS exercises
4	Lack of representativeness of the behavior of generated traffic (specially 4D aircraft) for CBA assumptions. Severity: High Likelihood: Low	WP4	Monitor coordination with PJ.18-06
5	Lack of representativeness of the behaviour of generated traffic for validation scenarios preparation Severity: High Likelihood: Low	WP4	Monitor coordination with PJ.18-06
6	Development on international level very fast. Solutions for the ATM integration of RPAS are discussed in different working groups (e.g. EASA, ICAO, JARUS, EUROCAE) and national level (e.g. FAA). Results from these activities can influence the validation planned in this Solution. Severity: Medium Likelihood: Medium	WP6	Member participation in these groups. Observe the results from the different working groups. Discussion with the relevant bodies about the results of the validation activities. Communicate the results of the SESAR activities to the working groups.
7	PJ.13-01-01 could not provide an RPAS platform suitable for a full V2 validation of the PJ.10-05 OSED due to the fact that the PJ.13-01-01 Solution has planned to validate the Traffic Avoidance function	WP6	SJU should promote the PJ.13-01-01 to develop the Traffic Avoidance function up to TRL 4 so as to support the V2 validation activities of the PJ.10-05. Possible fallback: focus on airspace class A-C with cooperative traffic.

Risk number	Description of risk	WP Number	Proposed risk-mitigation measures
	only at V1 level in wave 1 (in line with MAWP/DoW). Severity: High Likelihood: High		
8	Lack of information on RPAS platforms mean that behaviours cannot be credibly standardised or impacts assessed Severity: Medium Likelihood: High	WP6	Close monitoring of current developments in coordination with PJ.13.

1.3.6. WT6 Summary of project effort in person-months

	WP1	WP2	WP3	WP4	WP5	WP6	WP7	WP8	WP9	Total Person/Months per Participant
1 - DFS	0	44	0	16	39	7	0	38		144
· DWD	0	0	0	6	0	0	0	0	0	6
2 - AIRBUS	0	0	0	6	6	0	0	0		12
· AI DS Space	0	0	0	17	17	0	0	0	0	34
· AI OPS	0	0	0	45	49	0	0	0	0	94
3 - Navair/COOPANS	0	0	0	32.10	14.39	0	0	0		46.49
4 - DSNA	0	7.20	2	55.30	0	4.80	0	0		69.30
· SAFRAN	0	0	0	0	0	5.80	0	0	0	5.80
· ENAC	0	0	0	0	0	12.30	0	0	0	12.30
5 - ENAIRE	0	35.40	39.10	0	0.20	0.20	0	0		74.90
· CRIDA	0	26.70	26.70	0	0	8	0	0	0	61.40
· ISDEFE	0	2.80	0	0	5.60	9.10	0	0	0	17.50
· INECO	0	6.40	6.50	0	7.10	8.80	0	0	0	28.80
6 - ENAV	2.85	0	6.07	12.16	4.30	4.79	0	0		30.17
· I.D.S.	0	0	0	0	0	11.85	0	0	0	11.85
· CIRA	0	0	0	0	14.35	14.35	0	0	0	28.70
· MATS	0	0	0	0	0	0.62	0	0	0	0.62
· SICTA	5.63	0	6.93	13	8.67	9.10	0	0	0	43.33
· DEEP BLUE	18.52	0	0	12.22	0	6.29	0	0	0	37.03
· BULATSA	0	0	0	17.62	8.68	0	0	0	0	26.30
7 - FINMECCANICA	21.60	0	21.60	334.60	118.70	55	0	0		551.50
· TELESPAZIO	0	0	0	0	0	38	0	0	0	38
8 - SKYGUIDE	20.09	0	0	21	4.95	0	4	0		50.04

	WP1	WP2	WP3	WP4	WP5	WP6	WP7	WP8	WP9	Total Person/Months per Participant
· SKYSOFTATM	4.91	0	0	9	2.05	0	0	0	0	15.96
9 - SAAB (NATMIG)	0	0	0	0	0	9	0	0		9
10 - NATS	0	0	61	0	104	10	11	0		186
11 - DASSAULT	0	0	0	0	0	10	0	0		10
12 - THALES AIR SYS	168	6	6	258	50	6	0	0		494
· THALES-AUS	10	0	0	18	6	0	0	0	0	34
· SMATSA	0	0	0	42	42	0	0	0	0	84
13 - INDRA	51	153	153	205	409	31	20	0		1022
14 - EUROCONTROL	0	46	0	50	18	101	0	0		215
15 - ANS CR (B4)	0	11.49	0	16.10	7.36	0	0	0		34.95
· Integra	0	6.48	0	3.43	1.25	0	0	0	0	11.16
· CTU	0	17.25	0	8.97	8.97	0	0	0	0	35.19
· AFT	0	58.65	0	54.51	35.35	0	0	0	0	148.51
16 - FRQ (FSP)	0	18	0	0	0	0	0	0		18
17 - DLR (AT-One)	0	84	0	0	0	0	0	0		84
18 - ACG/COOPANS	0	0	0	7.01	2.55	0	0	0		9.56
19 - CCL/COOPANS	2.20	0	0	7.55	3.08	1.08	0	0		13.91
20 - IAA/COOPANS	0	0	0	12.14	5.66	0	0	0		17.80
21 - LFV/COOPANS	7.22	0	0	3.30	1.65	8.02	0	0		20.19
22 - AIRTEL (NATMIG)	0	0	0	0	0	0	0	0		0
23 - SINTEF (NATMIG)	0	0	0	0	0	0	0	0		0
24 - LPS SR (B4)	0	0	0	0	0	0	0	0		0
25 - ON (B4)	0	0	0	0	0	0	0	0		0
26 - PANSA (B4)	0	0	0	10.33	0	1	0	0		11.33
· UNIWARSAW	0	0	0	76.92	0	0	0	0	0	76.92
· PRZ	0	0	0	0	0	10.19	0	0	0	10.19

	WP1	WP2	WP3	WP4	WP5	WP6	WP7	WP8	WP9	Total Person/Months per Participant
27 - HC (FSP)	0	20	0	0	0	0	0	0		20
28 - ATOS (FSP)	0	0	0	0	0	0	0	0		0
29 - NLR (AT-One)	0	0	0	0	0	0	0	0		0
Total Person/Months	312.02	543.37	328.90	1370.26	994.86	383.29	35	38		4005.70

1.3.7. WT7 Tentative schedule of project reviews

Review number ¹⁹	Tentative timing	Planned venue of review	Comments, if any
RV1	14	TBD	First project control gate
RV2	26	TBD	Second project control gate
RV3	37	SJU, Brussels	Project close out gate

1. Project number

The project number has been assigned by the Commission as the unique identifier for your project. It cannot be changed. The project number **should appear on each page of the grant agreement preparation documents (part A and part B)** to prevent errors during its handling.

2. Project acronym

Use the project acronym as given in the submitted proposal. It can generally not be changed. The same acronym **should appear on each page of the grant agreement preparation documents (part A and part B)** to prevent errors during its handling.

3. Project title

Use the title (preferably no longer than 200 characters) as indicated in the submitted proposal. Minor corrections are possible if agreed during the preparation of the grant agreement.

4. Starting date

Unless a specific (fixed) starting date is duly justified and agreed upon during the preparation of the Grant Agreement, the project will start on the first day of the month following the entry into force of the Grant Agreement (NB : entry into force = signature by the Commission). Please note that if a fixed starting date is used, you will be required to provide a written justification.

5. Duration

Insert the duration of the project in full months.

6. Call (part) identifier

The Call (part) identifier is the reference number given in the call or part of the call you were addressing, as indicated in the publication of the call in the Official Journal of the European Union. You have to use the identifier given by the Commission in the letter inviting to prepare the grant agreement.

7. Abstract

8. Project Entry Month

The month at which the participant joined the consortium, month 1 marking the start date of the project, and all other start dates being relative to this start date.

9. Work Package number

Work package number: WP1, WP2, WP3, ..., WPn

10. Lead beneficiary

This must be one of the beneficiaries in the grant (not a third party) - Number of the beneficiary leading the work in this work package

11. Person-months per work package

The total number of person-months allocated to each work package.

12. Start month

Relative start date for the work in the specific work packages, month 1 marking the start date of the project, and all other start dates being relative to this start date.

13. End month

Relative end date, month 1 marking the start date of the project, and all end dates being relative to this start date.

14. Deliverable number

Deliverable numbers: D1 - Dn

15. Type

Please indicate the type of the deliverable using one of the following codes:

- R Document, report
- DEM Demonstrator, pilot, prototype
- DEC Websites, patent filings, videos, etc.
- OTHER
- ETHICS Ethics requirement

16. Dissemination level

Please indicate the dissemination level using one of the following codes:

PU Public
CO Confidential, only for members of the consortium (including the Commission Services)
EU-RES Classified Information: RESTREINT UE (Commission Decision 2005/444/EC)
EU-CON Classified Information: CONFIDENTIEL UE (Commission Decision 2005/444/EC)
EU-SEC Classified Information: SECRET UE (Commission Decision 2005/444/EC)

17. Delivery date for Deliverable

Month in which the deliverables will be available, month 1 marking the start date of the project, and all delivery dates being relative to this start date.

18. Milestone number

Milestone number: MS1, MS2, ..., MSn

19. Review number

Review number: RV1, RV2, ..., RVn

20. Installation Number

Number progressively the installations of a same infrastructure. An installation is a part of an infrastructure that could be used independently from the rest.

21. Installation country

Code of the country where the installation is located or IO if the access provider (the beneficiary or linked third party) is an international organization, an ERIC or a similar legal entity.

22. Type of access

VA if virtual access,
TA-uc if trans-national access with access costs declared on the basis of unit cost,
TA-ac if trans-national access with access costs declared as actual costs, and
TA-cb if trans-national access with access costs declared as a combination of actual costs and costs on the basis of unit cost.

23. Access costs

Cost of the access provided under the project. For virtual access fill only the second column. For trans-national access fill one of the two columns or both according to the way access costs are declared. Trans-national access costs on the basis of unit cost will result from the unit cost by the quantity of access to be provided.



History of Changes

Part A

Date	Page	Section	Extent of Change(s) and Justification
21/07/2016	N/A	N/A	In Table 3.2a “List of Milestones”, the Due date (in month) for the milestone “V2 Gate for Solution PJ.10-02a” was changed from 26 to 14. This editorial error was corrected to bring the table in line with the rest of the proposal. The V2 data pack will be subject to the R7 gate review that will take place in spring 2018.
31/08/2016	N/A	N/A	The description of solution related work packages were extended to differentiate between the contributions of beneficiaries and linked third parties. Justifications were added in case the contribution of the linked third parties are more significant than that of the beneficiary.
31/08/2016	N/A	N/A	Short names of beneficiaries of COOPANS consortium were adjusted to address the 15-character restriction of the H2020 portal.
13/10/2016	N/A	N/A	Dissemination Level of Final Project Report has been corrected.
18/10/2016	N/A	N/A	Airbus direct personnel costs declared as unit costs instead of actual costs
28/10/2016	N/A	N/A	Justification and contribution description of PANSA (B4) and LTP UNIWARSAW has been refined in WP description of solution 2a.
28/10/2016	N/A	N/A	Descriptions of contribution from beneficiary ENAV and its LTPs were moved from the “Objectives” section to the “Work Package description” section in solutions 1a and solutions 1c
28/10/2016	N/A	N/A	Descriptions of contribution from beneficiary ENAIRE and its LTPs were moved from the “Objectives” section to the “Work Package description” section in solution 1c.
28/10/2016	N/A	N/A	Description of contribution from beneficiary Thales Air Systems has been refined in solutions 1a, 2a and 2b.
28/10/2016	N/A	N/A	Refined description of ENAV contribution in solutions 2a and 2b
28/10/2016	N/A	N/A	Added description contribution from DSNA’s LTP ENAC
28/10/2016	N/A	N/A	Estimated costs of in-kind-contributions not used on premises from LFV/COOPANS’ LTP Linköping University were added in Annex 2
28/10/2016	N/A	N/A	Adjusted financial data for DSNA’s LTP SAFRAN to keep “Other direct costs” below the 15% threshold.
31/10/2016	N/A	N/A	Estimated costs of in-kind-contributions not used on premises from LFV/COOPANS’ LTP Linköping University were removed Annex 2 but stated in Annex 1 Part B after consultation with SJU.

Part B

Date	Page	Section	Extent of Change(s)and Justification
21/07/2016	All	All	The cover pages were removed. Tables with the history of changes for part A & B of Annex 1 were added. A table of contents was added. Tables 3.1a, 3.1b and 3.1c were removed from section 3.1 Tables 3.2a and 3.2b were removed from section 3.2 Table 3.4a was removed from section 3.4. A footer was added.
21/07/2016	25	3.1.1	In Figure 2, “Project 10 Gantt Chart” the V1 maturity milestone for solution PJ.10-06 was moved from Q2/18 to Q2/19. This editorial error was corrected to bring the figure in line with the rest of the proposal. The V1 data pack will be subject to the R8 gate review that will take place in spring 2019
26/07/2016	24	3.1.1	Reference to work package description in section 3.4 removed from section 3.1.1 because Annex 1 Part B does not contain anymore the work package descriptions.
26/07/2016	31	3.2.7	Reference to task in section 3.4 for ATM Focal Points removed because Annex 1 Part B does not contain anymore the task structure.
26/07/2016	N/A	4.1.2	Section 4.1.2 Main profiles/CV removed because these profiles are identical with the ones contained in section 3.3.
29/07/2016	102	4.2.21	Linköping University status changed from “Linked Third Party” to “Third Party” in section 4.2.21. When drafting the proposal it was expected to involve Linköping University as Linked Third Party. It has later been clarified, that involvement will be limited in size and that the legal demands for being a linked third party might be difficult to fulfill as this would require contractual agreements. Therefore there is a need to change the type to Third Party.
31/08/2016	24	3.1.1	Figure 1: “PJ.10 Work Break Down Structure” was modified to include the Ethics work package and to reflect the numbering scheme of the H2020 portal
31/08/2016	34	3.3	Rationale for participation of non-EU organization Thales Australia Limited was added.
31/08/2016	All	All	Short names for beneficiaries of COOPANS consortium were adjusted to address the character-length restriction of the H2020 portal.
31/08/2016	All	All	Use of short names for Frequentis consortium and Airbus was harmonized.
08/09/2016	97	4.2.12	The rational for subcontracting tasks of Thales Air Systems was elaborated to be consistent among all the different projects where Thales Air systems is involved.

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12/10/2016	All	All	Short name "PROSA" added to footer
12/10/2016	36	3.4	Due to budget modifications, section 3.4 amended with explanation
13/10/2016	91	4.2.5	Additional explanation of in-kind contribution by third party.
19/10/2016	71, 74, 85, 86	4.1.16, 4.1.1.27, 4.1.1.28	Use of Frequentis consortium legal and shortnames were corrected
19/10/2016	91	4.2.5	Additional explanation of in-kind contribution by third party.
28/10/2016	106	4.2.26	English names of PANSALTPs changed to Polish legal names to align with Annex 1 part A
28/10/2016	105	4.2.21	Added statement that change of Linköping University status from "Linked Third Party" to "Third Party" does not impact budget, tasks or general terms of the proposal.
28/10/2016	39	3.4	Added justification for having other costs exceeding the 15% of their personnel cost for PANSALTP (B4) and UNIWARSALTP, separately.
28/10/2016	40	3.4	Added justification for having other costs exceeding the 15% of their personnel cost for beneficiary ANS CR (B4).
28/10/2016	38	3.4	Added justification for having other costs exceeding the 15% of their personnel cost for beneficiary AIRBUS and AI OPS, separately.
28/10/2016	99	4.2.8	Added justification for participation of Skyguide's non-EU LTP Skysoft.
28/10/2016	90	4.2.2	Added statement underling Airbus' general approach on subcontracting in S2020 projects.
31/10/2016	102	4.2.12	Added justification for removal of Thales Air Systems' LTP Thales UK. Removed description of LTP Thales UK contribution to PJ10
31/10/2016	106	4.2.21	Added statement on the estimated costs of LiU in-kind-contribution.

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1 Excellence

This project is part of the SESAR 2020 Multi Annual Program for the period 2016-2019. It is part of the Industrial Research & Validation phase, developed under the SJU Private Public Partnership.

The Separation Management En-Route and Terminal Manoeuvring Area (TMA) project addresses the separation provision layer according to the International Civil Aviation Organisation (ICAO) definition of conflict management [5]. It defines the tactical process of keeping aircraft away from hazards by at least the appropriate separation minima and limits, to an acceptable level, the risk of collision between aircraft and hazards.

Under the umbrella of the SESAR 2020 Work Programme, Separation Management is part of the Advanced Air Traffic Services. Main benefits in this area are expected from increased automation, aiming at reducing the controller task load substantially while the human operator remains at the core of the system. The automated decision support tools comprise a complimentary set of conflict detection, conflict resolution, conformance and situation monitoring functionalities addressing the important areas of ICAO separation provision aspects. Furthermore, additional benefits are expected from using the best available data (e.g. airborne data). These data will be received either directly from the aircraft or will be made available via specific System Wide Information Management (SWIM) services.

In addition to the enhancements of decision support tools, the organisation of the controller team associated with new sharing of responsibilities offers high potential with respect to cost efficiency and capacity improvements while maintaining the required level of safety. The project will validate new innovative approaches like Flight Centric Air Traffic Control (ATC), where a controller is responsible for a limited set of flights, regardless of any sectors, thus enabling trajectory-based operations. Moreover, the Multi Sector Planner (MSP) offers benefits in terms of service provider cost reduction and more efficient team organisations. This comprises team organisations with one Planning Controller (PC) supporting two or more Executive Controllers (EC), as well as Single Person Operations (SPO). In addition, the role and tasks of the PC will change by allowing coordination where it is needed rather than restricting procedures at sector boundaries. This leads to more efficient flight profiles.

Another challenge is the successful integration of Remotely Piloted Aircraft Systems (RPAS) with the existing airspace users. This is a key issue for the SES. A failure in obtaining this aim could result in restrictions to the accessibility for those classes of vehicles, or lead to issues that adversely affect safety (such as airspace infringements). The agreed European RPAS Roadmap forms the foundation for the approach to progressively insert RPAS into non-segregated airspace, fully aligned with ICAO Aviation Systems Block Upgrades [8] (ASBU) and its three RPAS steps (blocks). SESAR 2020 has been tasked by the European Commission to address the remaining gaps in the Roadmap Strategic Research Plan (Annex 2) and Project 10 is one of four projects addressing the RPAS topic.

The advanced support tools and concepts developed in this project support to remove some of the requirements for the controller to be valid only on a defined volume of airspace. Generic controller validations should allow a more flexible validation regime. This would be a big step towards a more standardised European licence scheme.

1.1 Objectives

The main objective of PJ.10 is to propose strategies and solutions for future TMA and En-Route environments in European airspace, including Free Route airspace, for separation management. These strategies allow the air traffic controllers to continue managing separation in a safe, orderly and expeditious way without imposing certain tactical traffic restrictions to existing and new airspace users. Free Route airspace will also be extended below Flight Level (FL) 310. The objectives encompass in detail:

- a) Enhancement of SESAR1 delivered decision support and assistance tools through an improvement of their performances:
 - enhanced ground Trajectory Prediction (TP) in close cooperation with PJ.18;
 - shared information between ground and air;

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- use of aircraft derived data such as Extended Projected Profile (EPP) and Mode S Enhanced Data for synchronization of airborne and ground calculated trajectories;
 - use of meteorological data (e.g. improved wind prediction and convective weather zone prediction) for traffic separation;
 - integration of Airspace Management and mission trajectory data.
- b) Addition of new functionalities:
- automatic detection of conflicts, proposals for conflict resolutions tailored to the traffic situation and substantial reduction of missed conflicts and false alerts by using the above listed enhancements;
 - civil/military coordination with requirements addressing the specific performance of military aircraft and military operations in non-reserved airspace together with Instrument Flight Rules (IFR) traffic;
 - removal of boundary co-ordinations and associated boundary restrictions as laid down today e.g. in Letters of Agreement (LoA) between sectors or different ATC units;
 - Automatic assessment of solutions (What-if/What-else Probing for Conflict Detection (CD)) by selected Quality of Service parameter;
 - On-board Airborne Separation Assurance Systems (ASAS) supporting ATC tasks (addressed in the context of solution PJ.10-05: IFR RPAS integration)
- c) Validation of advanced separation aids by providing new ATC assistance and more automated support tools (automation taxonomy according to SESAR Human Performance Automation Issues [6]):
- Conflict Detection & Resolution (CD/R) tools, advancing from Information Analysis to Decision and Action Selection;
 - conflict Resolution Advisory (RA) tools with assessment of solutions;
 - conformance and aircraft intent monitoring (Monitoring Aids – MONA): conformance of aircraft track to controller clearance and aircraft intention to reference business trajectory.
- d) Validation of new sector team organisations and responsibilities distribution together with associated assistance tools in order to provide a more strategic environment to optimise flight profiles, minimise delays and reduce ANSP cost:
- different team organisations for multi sector planning with different assignments of responsibilities including improved handover procedures;
 - integration of new ATC separation management functionalities (decision support tools);
 - impact of the value provided by Required Navigation Performance (RNP) specifications (as defined in the ICAO Performance Based Navigation (PBN) Manual) to radar separation minima; and
 - consideration of roles and responsibilities between local flow management and ATC: provide the Extended ATC Planer (EAP) with additional solution set compared to SESAR1 (only Flight level changes).
- e) Validation of Flight Centric ATC in En-Route environment where a number of flights are assigned to a controller, unconstrained by geographical location, sector or national boundaries:
- validation of procedures for conflict detection and resolution including procedures for non-standard situations (emergency, weather...);
 - validation of workload and increase of controller productivity quantifying expected benefits;
 - consideration of procedures for flight optimisation and harmonization with local flow management;
 - validation of different aircraft-to-controller assignment strategies.
- f) Integration of different airspace users in TMA and En-Route airspace ensuring separation provision

- General Aviation and Rotorcraft by investigating and developing specific requirements; specifically the controller decision support tools need to cope with the requirements of these users. On-board system requirements will be coordinated with PJ.13.
- RPAS will be integrated into non-segregated airspace together with other manned traffic in a safe and transparent mode. Applicable separation methods and separation minima will be validated, guaranteeing the interoperability with the Air Traffic Management (ATM) system. Operational considerations specific to RPAS will be identified and technological needs coordinated with PJ.13.

g) Identification of cyber threats and elaboration of mitigation:

- The advanced automation aspects and further system integration by the use of Commercial off-the-shelf (COTS) components and standard protocols make it mandatory to identify and assess the risks imposed by cyber treats. In collaboration with industrial partners, a security assessment will be performed on the ATC tools/prototypes in order to identify system vulnerabilities, data security risks and make sure that security compliancy will be in line with the required standards for on line critical systems when concepts will be fully mature for deployment in operational environments. This assessment will be undertaken as part of the OSED/SPR/Interop production task.

1.2 Relation to the SESAR 2020 Work programme

This proposal addresses and offers solutions to the new identified key feature Advanced Air Traffic Services in terms of Separation Management in European En-Route and TMA environments. Therefore, it contributes essentially to the SESAR performance expectations, which are expressed in the Key Performance Areas (KPA). Main focus areas are safety, capacity, cost effectiveness, flight efficiency and human performance. The importance of the safety aspect is also underlined by the Performance Review Report 2014 [7] because “separation minima infringements remained the single largest category for serious [Air Navigation Service] ANS-related incidents”. As separation provision is one of the key functionalities in Air Traffic Management, the scope of the offered solutions comprises the entire European airspace, independent from any specific sector organisation or specific procedures like Free Route. It addresses the TMA and En-Route airspace, ranging from FLO to unlimited. Therefore, the potential benefits of the solutions in terms of KPA improvements is very high and can be applied anywhere in European managed airspace.

This proposal responds to the problems and limitations in current operations, which are mostly tactical with the use of multiple radar vectors and stepped climbs and descents to maintain separation between aircraft in high traffic situations. This leads to less efficient flight profiles and high levels of workload for both ATC and flight crews. Additionally, these less efficient profiles increase the amount of fuel required to be carried on board. Occasionally, where no further splitting of sectors is possible, the sector demand may exceed the available controller capacity. That could result in flow restrictions, flight level-capping and other measures that ensure safety at the expense of flight efficiency and timeliness.

This proposal suits Free Route operational environment and Mixed Mode operations. In addition, new system functionalities and further steps of automation provide the chance to achieve significant operational benefits concerning safety, capacity/productivity and cost-efficiency. New ATC tools and the development of new concepts are also included, to allow for different controller team and sector structures to suit various airspace structures like Free Route, various traffic levels and complexities. The need for higher controller productivity is addressed with new team organisations in order to decrease ATC related costs.

The separation management concepts developed in SESAR 1 have, in some cases, required development of an underlying trajectory prediction capability to generate the trajectories required to support conflict detection, conflict resolution, conformance monitoring and sector team roles. These Trajectory Prediction (TP) requirements are independent of the Reference Business Trajectory (RBT) and the trajectories are built locally (i.e. are not shared) to support the specific use in the required ATC tool. TP requirements produced in SESAR1 include building of separate trajectories to support the various planning and tactical tasks and tentative trajectories to support What-if functions. Additional improvements in PJ.18, like the incorporation of Flight Operation Centre (FOC) data together with Extended Projected Profile (EPP) data into ground-calculated trajectories, will be considered in PJ.10 to improve separation management concept.

These separation management concepts need to integrate new users such as RPAS. The systems that are to operate under Visual Flight Rules (VFR) or IFR will have to integrate safely and efficiently into an environment, which is dominated by manned aviation. This “Airspace Access and Airport operations” activity addresses the consequential airspace and airport integration aspects, such as, minimum performance requirements for IFR/VFR flights, separation criteria (e.g. wake turbulence, the impact of latency) and other ATM requirements that may be specific to RPAS.

In response to the outlined problems and shortcomings of current operations, the seven solutions introduced in the Multi-Annual Work Program [2] in PJ.10 address the SESAR2020 work programme:

- PJ.10-01a High Productivity Controller Team Organisation which focuses on validation of new sector team organisations and responsibilities distribution together with associated assistance tools, addressing mainly objectives of new sector team organisations;
- PJ.10-01b Flight Centric ATC where an air traffic controller is responsible for a certain number of aircraft throughout their entire flight segment within a given airspace whereas other controllers are responsible for different aircraft within the same airspace;
- PJ.10-01c Collaborative Control, i.e. co-ordination by exception rather than co-ordination, enabled by procedures resulting in reduced need for co-ordination agreements (so reduced workload) and fewer boundary constraints, thus enhancing current CD&R tools;
- PJ.10-02a Improved Performance in the Provision of Separation, continuing the work performed in SESAR1, improving CD/R tools with more accurate trajectory prediction and aircraft derived data, with focus on enhancements in decision support tools;
- PJ.10-02b Advanced Separation Management, introducing automation mechanisms (e.g. vertical and longitudinal separation) providing interventions recommended by the automated system) that have to be confirmed by controllers;
- PJ.10-05 IFR RPAS Integration, to investigate ways in which RPAS may be able to use a technical capability or procedural means to be safely integrated in ATM including complying with ATC instructions; to determine the impact of integration of RPAS flying IFR under ATM;
- PJ.10-06 Generic (non-geographical) Controller Validations, to identify and validate needs that might allow a more flexible ATCO validation regime that would allow a Controller to operate in any airspace classified as a particular type.

This proposal will not address Solution PJ.10-04 Ad Hoc Delegation of Separation to Flight Deck. This Solution assumes a (limited) transfer of separation responsibility between the controllers and aircrews, which imply significant modifications and certification of avionics, e.g. the Flight Management System (refer to ATM Master Plan, enablers A/C-16a, A/C-31c, A/C-48b, A/C-68). On the other hand, this Solution offers only benefits in oceanic areas and to a limited extent compared to the other Solutions with a much broader scope. This means that the relatively high development, implementations and certification costs cannot be justified at this stage. Moreover, ICAO decided at the 12th Air Navigation Conference “to modify the strategic direction for airborne surveillance aiming at not pursuing self-separation (B3-85) at this stage” [8]. This means that the development effort for Solution PJ.10-04 may have no future applications in terms of self-separation, which may justify the huge investment.

1.3 Concept and methodology

(a) Concept

This industrial research and validation proposal broadly continues the work carried out in SESAR 1, mainly in Work Packages four, five and ten. Therefore, it aims at maturing the Solutions PJ.10-01a High Productivity Controller Team Organisation, PJ.10-01c Collaborative Control and PJ.10-02a Improved Performance in the Provision of Separation from V2 maturity level to V3 maturity according to the European Operational Concept

Validation Methodology (E-OVCM) [9]¹. This correlates to Technology Readiness Levels (TRL) three to six. In addition, four Solutions will be validated from maturity level V1 to V3, or from TRL 1 to TRL 6. The reasons why these Solutions start from V1, are manifold:

- PJ.10-01b Flight Centric ATC is a new innovative concept which started outside SESAR1 in low density airspace by the project partners DFS and DLR (AT-ONE),
- PJ.10-02b Advanced Separation Management will address higher automation levels for separation provision, and exploratory research results that need to be applied in the target operational environment,
- PJ.10-05 IFR RPAS integration is a new subject for Advanced Air Traffic services, especially in high density European airspace (some work has already been done outside SESAR),
- PJ.10-06 Generic Controller Validations takes advantage of the aforementioned separation enablers in order to allow for a broader controller-licensing scheme.

In general, the Solutions are applicable to the operational environment of En-Route and TMA airspace. It comprises Upper and Lower high and medium complexity En-Route airspace and Approach airspace of medium and high complexity airports.

The airspace structure considered here will consist of Fixed Route and Free Route environment. Free Routing corresponds to the ability of the airspace user to plan and re-plan a route according to the user-defined segments within significant blocks of Free Route airspace.

The concept, enablers, the initial and target maturity levels and the outstanding Research and Development (R&D) needs of the Solutions, covered by this proposal, are listed below:

1) PJ.10-01a High Productivity Controller Team Organisation

This Solution develops concepts of operation and identifies the system support required for operating in team structures that are not the usual Planner-Executive two-person ATC sector team. In particular, the combined role for Single Person Operations (SPO) and the Multi Sector Planner (MSP) is where a Planner has responsibility for the airspace under the executive control of two or more independent Executive Controllers. The main objective aims at the tactical provision of separation between aircraft. The MSP is able to adjust flight profiles and/or the internal (executive) sector boundaries so that workload is balanced between the Executives. In the Upper airspace, the MSP team supports an operation tending towards Free Route concepts while in the Lower airspace and particularly TMA operations, a more systemized operation is developed to improve predictability and capacity through reduced tactical intervention.

Initial maturity at the end of SESAR1 is V1. V2 maturity will be reached in Wave 1 while V3 maturity² is planned for Wave 2. Outstanding R&D needs comprise the use of advanced separation management tools for the MSP configuration, impact of RNP capabilities, interface to local flow management and human performance aspects.

2) PJ.10-01b Flight Centric ATC

This new innovative approach³ encompasses the investigation of Flight Centric ATC for both low complexity and medium / high complexity environments. The idea is to dissolve sector boundaries and to have one controller in charge for a single flight to guide it through a large airspace. As a basic principle of Flight Centric ATC, a controller is no longer in charge of managing the entire traffic within a given sector. Instead, he/she is now responsible for a certain number of aircraft throughout their flight segment within a given airspace whereas other controllers are responsible for a certain number

¹ V1 maturity: scope solution; V2 maturity: determine feasibility; V3 maturity: integration to target environment

² Assuming about one year delay compared to MAWP (no maturity level will be achieved in Release 6). The latest OI-Step per solution determines the final maturity date. These maturity dates are taken from the latest SESAR Maturity Assessment Report [13].

³ Actually, military aircraft under control of Operational Air Traffic (OAT) already uses this type of control organisation. There is a potential link to solution PJ.10-05 (RPAS). When drones are staying a long time in the same area flight centric principles could be applied for control.

of different aircraft within the same airspace. This way of traffic control does not change the basic responsibilities given to the controller: to ensure a conflict-free flight. This SESAR Solution addresses in particular transition strategies from current operations to Flight Centric ATC and the assignment strategies of aircraft to controllers.

Important enablers are geographically independent voice communications and air-ground data link, accurate weather forecast and the SWIM blue profile services.

Initial maturity at the end of SESAR1 is V0. V1 and V2 maturity will be reached in Wave 1 while V3 maturity is planned for Wave 2. Outstanding R&D needs comprise among other topics assignment strategies of aircraft to controllers, use of advanced Decision Support Tools, integration of local Air Traffic Flow and Capacity Management (ATFCM) and transition aspects from current to Flight Centric ATC environment.

3) PJ.10-01c Collaborative Control

The Solution results in a concept of operation for collaborative control (i.e. co-ordination by exception rather than co-ordination by procedure).

New concepts such as release-on-contact, “porous” sector boundaries, sharing of airspace, flight intent and controller intent are all investigated. These concepts support:

- reduced need for co-ordination agreements (so reduced workload),
- fewer boundary constraints (so improved aircraft profiles),
- the application of constraints to aircraft trajectories at the point where the particular separation resolution is needed (which may be mid-sector rather than on the boundary) and
- the ability to combine sectors into MSP teams (enhancing the concepts developed in Solution PJ.10-01a).

Relevant SWIM services are Interoperability (IOP) and enhanced co-ordination messages across unit boundaries.

Initial maturity at the end of SESAR1 is V1. V2 maturity will be reached in Wave 1 while V3 maturity is planned for Wave 2. Outstanding R&D needs will focus on the best-suited operational environment, validation of the operational procedures and responsibilities among the controller team, the use of advanced controller support tools and transition factors such as training or staffing.

4) PJ.10-02a Improved Performance in the Provision of Separation

This Solution aims at improving the provision of separation (tactical layer). Vertical and longitudinal separation are ensured by tactical ATC intervention; however these instructions are limited as much as possible through the use of enhanced tools and aircraft data which allows predicting with high probability the future aircraft positions. Conformance monitoring assists the controller in maintaining situational awareness by assisting in specific routine tasks. For the detection of potential conflicts and the resolution support, both surveillance separation and wake vortex separation are considered. CD/R support will be based on improved ground trajectory prediction and potential controller actions. Further functions will be e.g. automatic conflict dilution and conformance monitoring.

Related Communication-Navigation-Surveillance (CNS) needs exist for air-ground data link for the provision of Automatic Dependent Surveillance-Contract (ADS-C) EPP service and Controlled Time of Arrival (CTA) / Controlled Time Over (CTO) exchange as well as availability of RNP/RNAV capabilities. Improved meteorological services are required for enhanced trajectory predictions and the yellow profile services for SWIM.

Initial maturity at the end of SESAR 1 is V1. V2 and V3 maturity will be reached in Wave 1. Outstanding R&D needs comprise the use of improved trajectory predictors reducing the number of nuisance alerts, in particular use of aircraft EPP data, calculation of wind data and further enhancing the accuracy of conflict detections by using the Mode S enhanced data set. Moreover, the use of these advanced support tools in other team organisations than the traditional one Executive – one Planner environment and the application of these tools in Free Route and Flight Centric airspace configurations needs to be investigated.

5) PJ.10-02b Advanced Separation Management

This SESAR Solution aims at increasing the quality of services of separation management by introducing automation mechanisms. This will result in reduced control workload, reduced separation buffers and facilitates new controller team organisation. Vertical and longitudinal separations are ensured by interventions recommended by the automated system and to be confirmed by controllers. In exceptional cases, controller intervention is still required. Controllers are assisted in their separation tasks by technical functionalities using advanced data that increase the quality of provided services. These comprise e.g. further improved ground trajectory prediction, resolution support providing effects on flight efficiency to allow for prioritisation; nearly automatic conflict dilution applied to mixed equipped fleet as well as improved conformance monitoring that takes into account the calculated ground system trajectories.

Related CNS needs exist for air-ground data link for the provision of ADS-C EPP service and CTA/CTO exchange as well as availability of RNP/RNAV capabilities. A meteorological Nowcast for wind based Mode S reporting and identification of “No Fly” zones is also needed.

Initial maturity at the end of SESAR1 is V0. V1 maturity will be reached in Wave 1 while V2 and V3 maturity is planned for Wave 2. Outstanding R&D needs comprise further improvements and synchronisation of the airborne and ground trajectory by integrating the ATC intent and airborne intent, consideration of ground trajectory (ATC) constraints, more automated resolution support allowing a better flight efficiency and prioritization of better-equipped aircraft. Moreover, human performance aspects and operational procedures need to be adapted to ensure resilience in a more automated environment.

6) PJ.10-05 IFR RPAS Integration

Airspace where IFR services are provided can be extremely complex, and there are many challenges surrounding the integration of RPAS into these environments. Research needs to be conducted to investigate ways in which RPAS may be able to use a technical capability or procedural means to be safely integrated in ATM including complying with ATC instructions. Investigations include key enablers such as detect and avoid systems, Command & Control (C2) and Contingency measures, to be addressed in close cooperation with PJ.13. Specific research needs to determine the impact of integration of RPAS on ATM in some areas presuming RPAS may not be able to comply with all existing manned operations rules, especially in case of control and command data-link loss between RPAS and the remote pilot, or some emergency cases. The activities include e.g. flight planning compatible with the ATM Network, assessment of possible different behaviour of RPAS that might affect separation provision, the specifics of an RPAS trajectory, their sensitivity to severe weather, definition of proper means to inform ATC on RPAS activities, enable operation in controlled airspace.

CNS, MET and SWIM needs are still to be identified and described as soon as the missing Operational Improvement OI Step is available. It is expected in the frame of the ATM Master Plan in Data Set 15.

Initial maturity at the end of SESAR1 is V0, since SESAR1 did not address RPAS except for nine demonstration projects, however some work has already been done outside SESAR. V1 and V2 maturity will be reached in Wave 1 in a step-by-step approach while V3 maturity is planned for Wave 2. Outstanding R&D needs comprise analysis how RPAS fits into current manned aircraft classification criteria, understanding the special characteristics and integrating the RPAS trajectories in ATM including weather sensitivity, developing procedures that allow RPAS to be able to fly IFR in managed IFR airspace and also developing contingency procedures e.g. in case of loss of data link.

7) PJ.10-06 Generic (non-geographical) Controller Validations

The current operation generally expects that controllers hold both a licence for a particular “discipline” (e.g. Area Control, Aerodrome Control etc.) and then a number of sector “validations” which permit that person to exercise their license in defined volumes of airspace. This Solution investigates possibilities to increase staff flexibility by granting licences to controllers for more sectors..

There are no specific CNS, MET or SWIM needs because this Solution depends on the enablers as defined in Solution PJ.10-02b.

Initial maturity at the end of SESAR1 is V0. V1 maturity will be reached in Wave 1 while V2 and V3 maturity are planned for Wave 2. Outstanding R&D needs comprise identification of the human,

system and procedural needs that might allow a more flexible controller validation regime. Examples are “sector-type validations” (e.g. High-level, TMA) that would allow a controller to operate in any airspace classified as a particular type. Moreover, the Solution will define what additional aids (information, support in emergencies, fallback modes of operation, etc.) are needed.

b) Methodology

The validation methodology to achieve the target maturity in Wave 1 consists of a number of different methods, techniques and tools, which are all in line with the E-OVCM and the current maturity level. Because of the high number of proposed validation exercises, this section is structured per solution and maturity level. It describes among the validation scenario also the validation platforms, organisation and dependencies to other solutions or projects.

The validation activities will be aligned with the SESAR 2020 Transition Validation Strategy, which is supposed to be provided by PJ.19. This will ensure that the validation objectives, validation scenarios and all processes are in line with the overarching SESAR WP methodology and concept.

Legend:

Vx	Addressed Maturity Level V1, V2 or V3
OI	OI step based on ATM Master Plan - Data Set 14
Type	RTS Real Time Simulation FTS Fast Time Simulation
Prototype	Research Prototype: output of R&D development activities Industrial Prototype: output of pre-implementation activities

Validation Approach Solution PJ.10-01a: High Productivity Controller Team Organisation

Within Solution PJ.10-01a activities with regards to the maturity cycles V2 and V3 are foreseen. V2 maturity level will be reached in R8. V3 activities will take place within Wave 1, although the overall V3 maturity is expected to be reached within Wave 2.

Validation Platforms: Skyguide, platform of COOPANS partners

Vx	OI	Type	Validation scenario/objectives	Remarks (e.g. dependencies, links outside SESAR)
V2	CM-0303 CM-0304	RTS	New Sector Team Operations validation: - Multi-Sector Planner - New Sector Team Operations validation & Advanced Separation Management	The Skyguide validation platform developed for PJ.18-02, PJ.10-02a and PJ.10-02b and the COOPANS validation platform developed for PJ.10-02a and PJ.10-02b is expected input for the PJ.10-01a validations.
V3	CM-0303	RTS	New Sector Team Operations validation, Improved Performance in the Provision of Separation & Advanced Separation Management → Overall V3 maturity to be expected for Wave 2.	ENAV in coordination with Finmeccanica (industry partner) will conduct a joint validation of some aspects related to CM-0303 in the frame of the solution 2a.

Validation Approach Solution PJ.10-01b: Flight Centric ATC

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Within Solution PJ.10-01b activities with regards to the maturity cycles V1 and V2 are foreseen. V1 maturity level is expected to be reached in R8. V2 maturity level is expected to be reached in 2019 in Wave 1.

Validation platforms: DLR (AT-ONE), ENAIRE

Vx	OI	Type	Validation scenario/objectives	Remarks (e.g. dependencies, links outside SESAR)
V1	CM-0200-C	Concept	<p>Communication study:</p> <ul style="list-style-type: none"> - Analysis of communication solutions based on current and future communication technologies - Roadmap development for future communication environment 	
V2	CM-0200-B CM-0200-C	FTS/RTS	<p>Communication assessment:</p> <ul style="list-style-type: none"> - Validate technological transition for voice communication in flight centric environment <p>Operational and performance assessment:</p> <ul style="list-style-type: none"> - Assess the operational procedures to deal with the coordination needs among controllers, together with the advanced separation tools which are needed to support the concept. - Assessment of the workload distribution between controllers in a flight-centric environment and the different criteria for the assignment of aircraft to each controller. - Quantify the expected benefits in terms of performances (including workload). 	The performance metrics for CD&R tool accuracy and controller workload are an expected input for PJ.10-01b validation activities. Prototypes developed in the scope of PJ.10-02b will be considered inputs to PJ.10-01b

Validation Approach Solution PJ.10-01c: Collaborative Control

Within Solution PJ.10-01c activities with regards to the maturity cycle V2 are foreseen. V2 maturity level is expected to be reached in R8.

Validation Platforms: NATS, ENAIRE

Vx	OI	Type	Validation scenario/objectives	Remarks (e.g. dependencies, links outside SESAR)
V2	CM-0305 CM-0306	RTS	<p>Assess the operational procedures to deal with the reduction of coordination agreements in the transition phase between En-Route and TMA. Multi-sector Planner teams will also be taken into consideration.</p> <p>Assess the advanced separation tools which are needed to support the concept.</p> <p>Quantify the expected benefits in terms of performances (including workload).</p>	<p>EPP data from PJ.18-06 and MET data from PJ.18-04 are an expected input for the PJ.10-01c validations. A Traffic Generator output from the PJ-18-06 – including emulated aircraft behavior for simulated 4D capable flights- is to be used for PJ.10-01c validations.</p> <p>Prototypes developed in the scope of PJ.10-02b will be considered inputs to PJ.10-01c.</p>

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Vx	OI	Type	Validation scenario/objectives	Remarks (e.g. dependencies, links outside SESAR)
				ENAV in coordination with Finmeccanica (industry partner) will conduct a joint validation of some aspects related to CM-0306 in the frame of the solution 2b.

Validation Approach Solution PJ.10-02a: Improved Performance in the provision of separation management

Within Solution PJ.10-02a activities with regards to the maturity cycles V2 and V3 are foreseen. V2 maturity level is expected to be reached in R7. V3 maturity level is expected to be reached in R8. Due to the size of the Solution, the validation exercises will be grouped to the En-route and TMA operational environments respectively.

Validation platforms: platform of COOPANS partners, ENAV (including LTPs), ANS CR (B4), PANSAs (B4), DSNAs, Skyguide

Vx	OI	Type	Validation scenario/objectives	Remarks (e.g. dependencies, links outside SESAR)
V2	CM-0209 CM-0210	FTS/RTS	Validation of research prototypes within the En-Route operational environment: <ul style="list-style-type: none"> - CD&R Tools En-Route (MTCd, TCT) - Time based operations Tools - Monitoring Aids - Subtle Navigational Awareness Tool - Integration of EPP data into ATM systems 	The prototypes developed for the Skyguide platform are an expected output for PJ.10-01a validations (En-Route). A Traffic Generator output from the PJ.18-06 -including emulated aircraft behavior for simulated 4D capable flights- is to be used for validations.
V2	CM-0403-A	RTS	Validation of time-based operations' tools within all operation environments	The Extended ATC Planner (EAP) prototype from PJ.09-02 is an expected input for the DSNAs platform for PJ.10-02a validations. The Free Route Concept Description from PJ.06-01 is an expected input for DSNAs platforms for PJ.10-02a validations.
V2	CM-0206 CM-0208A	FTS/RTS	Validation of research prototypes within the TMA operational environment: <ul style="list-style-type: none"> - CD&R Tools TMA (TCT) - Monitoring Aids - Subtle Navigational Awareness Tool - Integration of EPP data into ATM systems 	The Airbus EPP-emulator from PJ.18-06 is an expected input for the ENAV - BULATSA platform for PJ.10-02a validations.

Vx	OI	Type	Validation scenario/objectives	Remarks (e.g. dependencies, links outside SESAR)
V3	CM-0209 CM-0210 CM-0303	FTS/ RTS/ Live Trial	Validation of the above mentioned tools and performance assessment of industrial prototypes & platforms within the En-Route operational environment. Also some aspects related to SPO/MSP will be investigated.	A Traffic Generator output from the PJ.18-06 -including emulated aircraft behavior for simulated 4D capable flights-, MET data from PJ.18-04 are expected inputs for the DSNA platform for PJ.10-02a validations. The Free Route concept description from PJ.06-01 is an expected input for DSNA and ENAV platforms for PJ.10-02a validations. Prototypes developed in PJ.10-02a are an expected input for PJ.06 ENAIRE validation (En-Route).
V3	CM-0403-A	RTS	Validation of time-based operations' tools within all operation environments	The Extended ATC Planner (EAP) prototype from PJ.09-02 is an expected input for the DSNA platform for PJ.10-02a validations.
V3	CM-0206 CM-0208A CM-0304	FTS/ RTS/ Live Trial	Validation of the above mentioned tools and performance assessment of industrial prototypes & platforms within the TMA operational environment.	The prototypes developed for the COOPANS platform are an expected output for PJ.10-01a validations (TMA). The Airbus EPP-emulator from PJ.18-06 is an expected input for the ENAV - BULATSA platform for PJ.10-02a validations.

Validation Approach Solution PJ.10-02b: Advanced separation management:

Within Solution PJ.10-02b activities with regards to the maturity cycles V1 and V2 are foreseen. V1 maturity level is expected to be reached in R8. V2 activities will take place within Wave 1, although the overall V2 maturity is expected to be reached within Wave 2. Due to the size of the Solution, the validation exercises will be grouped to the En-Route and TMA operational environments respectively.

Validation platforms: NATS, ENAV (including LTPs), platform of COOPANS partners, Skyguide, DFS

Controller Tools and Team Organisation for the Provision of Separation in Air Traffic Management

Vx	OI	Type	Validation scenario/objectives	Remarks (e.g. dependencies, links outside SESAR)
V1	CM-0407 CM-0207-B CM-0403-B CM-0607	FTS/RTS	Validation & Prototyping within the En-Route environment: <ul style="list-style-type: none"> - Advanced CD&R tools (e.g. MTCD, TCT further automation steps) - Use of EPP / wind data to enhance trajectory prediction - Advanced Monitoring Aids - Advanced Time based operations tools 	
V1	CM-0408 CM-0208-B CM-0608	FTS/RTS	Validation & Prototyping within the TMA environment: <ul style="list-style-type: none"> - Advanced CD&R tools (e.g. MTCD, TCT further automation steps) - Use of EPP / wind data to enhance trajectory prediction - Advanced Monitoring Aids (e.g. conformance monitoring during CDO) 	The Airbus EPP-emulator from PJ.18-06 is an expected input for the ENAV - BULATSA platform PJ.10-02b validations.
V2	CM-0407 CM-0207-B CM-0306 CM-0403-B CM-0607	FTS/RTS	Validation of research prototypes in the En-Route operational environment: <ul style="list-style-type: none"> - Advanced CD&R tools (e.g. MTCD, TCT including closed loop clearances, further automation steps) - Use of EPP / wind data to enhance trajectory prediction - Advanced Monitoring Aids - Advanced Time based operations tools <p>→ Overall V2 maturity to be expected for Wave 2.</p>	The platform including the prototypes developed are an expected output for the PJ.10-01a validations on the Skyguide platform and PJ.10-01b, PJ.10-01c on the ENAIRE Platform. The Free Route concept description from PJ.06-01 is an expected input for the PJ.10-02b validations.
V2	CM-0408 CM-0208-B CM-0608	FTS/RTS	Validation of research prototypes in the TMA operational environment: <ul style="list-style-type: none"> - Advanced CD&R tools (e.g. TCT including closed loop clearances, further automation steps) - Use of EPP / wind data to enhance trajectory prediction - Advanced Monitoring Aids (e.g. conformance monitoring during CDO) <p>→ Overall V2 maturity to be expected for Wave 2.</p>	The platform including the prototypes developed are an expected output for the PJ.10-01a validations on the COOPANS platform. The Airbus EPP-emulator from PJ.18-06 is an expected input for the ENAV - BULATSA platform PJ.10-02b validations. Activities in preparation to Wave 2 are planned in Wave1.

Validation Approach Solution PJ.10-05: IFR RPAS Integration:

Within Solution PJ.10-05 activities with regards to the maturity cycles V1 and V2 are foreseen. V1 maturity level is expected to be reached in R7. V2 maturity level is expected to be reached in 2019 in Wave 1. In the frame of this Solution 2 V1 and 5 V2 validation exercises have been scheduled.

Validation Platforms: EUROCONTROL, ENAV, DSNA, platform of COOPANS partners

Vx	OI	Type	Validation scenario/objectives	Remarks (e.g. dependencies, links outside SESAR)
V1	Tbd	FTS/RTS	<ul style="list-style-type: none"> - Validation of RPAS integration operational concept - Assessment of minimum performance requirements for RPAS flights 	<p>The concept description from PJ.11 and PJ.13 is an expected input for PJ.10-05 validations.</p> <p>The Free Route concept description from PJ.06 with regards to RPAS operations is an expected input for PJ.10-05 validations.</p>
V2	Tbd	FTS/RTS	<p>Validation of RPAS procedures and RPAS technical capabilities with regards to performance KPA's:</p> <ul style="list-style-type: none"> - In and out of terminal airspace - Within En-Route airspace including evaluation of Satcom datalink latency impact on C2 and ATC Comms - Within co-operative traffic (airspace classes A-D) - Nominal operational procedures - Specific mission and contingency procedures including those related with Satcom C2 Link Loss and Satnav Underperformances - on-board ASAS functions supporting ATC tasks 	<p>The research prototype from PJ.13-01 is an expected input for PJ.10-05 validations on the validation platforms.</p> <p>The PJ.10-05 concept descriptions are an expected output for PJ.11, PJ.13 and PJ.14</p>

OI Tbd: OI-step not yet available in the ATM Master Plan Data Set 14 (needs to be defined).

Validation Plan Solution PJ.10-06: Generic' (non-geographical) Controller Validations

Within Solution PJ.10-06 activities with regards to the maturity cycle V1 are foreseen. V1 maturity level is expected to be reached within R8.

Validation Platform (Concept): NATS

Vx	OI	Type	Validation scenario/objectives	Remarks (e.g. dependencies, links outside SESAR)
V1	SDM_0302	Concept	<p>Validation of tools necessary for flexible use of ATCO resource within particular airspace types.</p> <p>→ Overall V1 maturity to be expected for Wave 2.</p>	<p>The validation platforms within PJ.10-02b are an expected input for the PJ.10-06 validation activities.</p>

1.4 Ambition

Within the European air traffic system there is the continued need to improve the capacity and cost-effectiveness, due to the forecasted traffic increase for the upcoming years and the high cost sensitivity of the airspace users. The European air traffic indicates a gradual increase after several years of stagnation: according to EUROCONTROLS' Statistics and Forecast service (STATFOR) the target of 5% per year for 2014-2021 is confirmed [10]. Furthermore, the cost sensitivity of airspace users has significantly grown over the past years.

The SESAR ATM Target Concept states that “En-Route capacity in the European air traffic network is determined by controller workload” [11]. Therefore, the reduction of controller’s workload is seen as a key element in order to further optimise the productivity or capacity of medium or high-density airspace area [12]. Besides the workload reduction, it is necessary to maintain or increase the current level of safety at the envisaged increased traffic volume or productivity level.

Within the frame of several projects in the SESAR programme a set of controller assistance tools has been developed, prototyped and validated within several real-time simulation exercises. These tools assist controllers in their task for the provision of separation. They aim at a reduction of controller’s workload and at an increase of situational awareness. A subset of the tools is designed to provide their highest operational benefit in Lower Airspace and in Extended Terminal Areas (E-TMA) with high traffic complexity, in particular with a very high percentage of aircraft in vertical transition. Another subset is designed for Upper airspace aiming at an operational environment that provides a higher proportion of overflights.

The controller tools mainly provide assistance in the field of flight path monitoring, conflict detection and resolution advisory. Some of the tools, tested in specific operational environments, have already reached V3 maturity level within the SESAR programme. Other promising system functionality in this field remains at V1 or V2 maturity.

This project is aiming to achieve V3 maturity for the system functionality already described (part of the work foreseen within Wave 2). Furthermore, development actions will be taken in order to ensure that the controller tools are also suitable for the Free Route environment. Available aircraft derived data (e.g. air trajectory data, Mode S Enhanced data) will be analysed in order to improve the underlying 4D trajectories for the controller tools.

This proposal is also targeting at further steps of automation. Resolution Advisory results will be evaluated taking into account measurements like flight efficiency and operator’s preferences in order to actively recommend feasible solutions to controllers. The advisories also address “Best Equipped Best Served” options.

The suitability of Conflict Detection & Resolution (CD&R) tools in a given environment is highly dependent on their reliability and that of the underlying trajectory prediction (TP). The project will therefore define and validate KPIs and associated performance requirements for the CD&R tools and the TP.

Controller workload reduction can be used to merge sectors earlier in case of a traffic decrease or to split later in case higher traffic volumes. However the benefits of the tools described above can be used more efficiently if the work can be distributed in a more dynamical and flexible way. Consequently, in the frame of the SESAR programme new controller team organisations like e.g. multi-sector-planning have also been developed and prototyped.

The concept of multi-sector planning will be further elaborated in order to achieve V3 maturity (part of the work foreseen within Wave 2). The new concept of flight Centric ATC aims at the dedication of separation responsibility in a fully flexible way, changing the current way of controller teams being responsible in a small geographic area (“sector”). Different controllers will be responsible for different flights within the same airspace, thus giving full flexibility for the distribution of aircraft (i.e. workload) to controllers. The concept of collaborative control is providing a first step towards this full flexibility. PJ.10 is aiming at reaching the V3 maturity level for both team organisation concepts. These innovative ideas are relatively new to Air Traffic Management and offer a high potential in allowing more efficient flight profiles for the airspace user while at the same time achieving this goal with less controller, i.e. increasing the cost efficiency of the ANSP.

For the development of the tools and team organisations, the need of all sorts of airspace users have to be taken into account. Therefore, the stakeholder’s interests of e.g. civil, military, general and business aviation, rotorcraft etc. will be considered. Special attention will be drawn onto the integration of RPAS flights with other IFR traffic. One solution is aiming at the full integration of RPAS flights within controller’s operations.

The introduction of controller tools and team organisations also influences regulatory aspects. Nowadays controllers need profound knowledge about their airspace. This knowledge may be less detailed within the new environment. It is, therefore, expected, that controllers may hold their license for a much larger airspace and a higher number of sectors, thus greatly increasing staffing flexibility beyond national borders on a European level. Possibilities for such more generic controller validations will be investigated.

The development and validation activities are expected to provide the basis for the industrialisation for a wide range of products, e.g. ATM system or airframe modules. This will open market opportunities for the European airborne and ground industry both within European markets and beyond. Furthermore, the development and validation of team organisation concepts, operational procedures and airspace structures will strengthen the competitiveness of European ANSPs with regards to provision of flight efficiency and cost effectiveness. In conclusion, the PJ.10 Project will help the consortium members to ensure or reach technological and/or operational leadership within their respective business.

2 Impact

2.1 Expected impacts

The main performance goals for this project include the increase of safety, airspace capacity and cost effectiveness (new sector team organisations and improved human performance). Currently, there are no specific performance goals at solution level available. The Operational Focus Area targets from SESAR 1 need to be adjusted and applied to the solution addressed in this project. The assigned “Operational Performance” ATM Focal Point supports and ensures this alignment.

The different solutions contribute complementary to the ATM performance KPA’s. The summary below explains briefly the benefit mechanisms for the high rated performance expectations and explains in addition the need for coordination at European level.

a) PJ.10-01a High Productivity Controller Team Organisation

KPA / Performance impact: High impact in cost effectiveness and human performance because of less air traffic controller staff compared to traditional (current) one Planner – one Executive team organisation. Envisaged are one Planner for two or more Executives and also Single Person Operations. Safety will be maintained due to the development of new trajectory prediction, conflict detection, conflict and intent monitoring tools on the ground and conformance monitoring in the air.

Needs for coordination: The concepts are primarily intended to be applied within a Unit and are based upon the capabilities of the local FDP and/or Centre architecture to allow the allocation of a single Planner role to several Executive ones.

b) PJ.10-01b Flight Centric ATC

KPA / Performance impact: High impact in flexibility in case of “sudden” demand/capacity changes because of assignment of aircraft to controller based on workload rather than geographical location of the aircraft, high increase in cost effectiveness because of harmonised licences, no Planning Controller, more balanced “utilisation” of controller capabilities; high capacity impact due to workload reduction (e.g. no sector handovers). Frequency occupation and frequency changes will significantly drop which should enable an increase in pilot and controller performance. As only one controller is responsible for the entire trajectory (and not only a small fraction of it as of today), it is expected that this also increases the flexibility of the airspace users.

Needs for coordination: Benefits are scaling with the airspace size, at least Functional Airspace Block (FAB) level envisaged; a lot of similarities with Free Route operations because both concepts need similar enablers in terms of decision support tools for large sizes of airspace.

c) PJ.10-01c Collaborative Control

KPA / Performance impact: High impact in cost effectiveness because less co-ordination workload means more efficient use of air traffic controllers. Workload reduction enables positive impact on human performance. It also expected that flight efficiency improve because of less co-ordination constraints at sector and/or centre boundaries. Moreover, collaborative control allows airspace to be used more freely and efficiently, which increases the flexibility of the airspace users.

Needs for coordination: The application of co-ordination-free transfer of control is likely to be deployed within a Centre. It may be possible at a later juncture to consider broadening the concept to

encompass what are currently OLDI boundaries and enhancing the flight object to allow a similar option of co-ordination-free transfer at an Inter-Centre (network) level.

d) PJ.10-02a Improved Performance in the Provision of Separation

KPA / Performance impact: The controller decision support tools with improved data quality increase safety because of early conflict warnings and alerts to the controller, also in case of deviations from clearance or other planning information. As already shown in SESAR1, this allows a big step in capacity increase because of improved situational awareness and workload reductions for both controllers and flight crews. The impact is very high for this Solution because these tools are a prerequisite enabler for all the sector team Solutions PJ.10-01x. Safety performance enhancement is expected as well, because functionalities such as Monitoring, Conflict Detection and Resolution provide ATCOs with early alerts and offer timely conflict resolution advices.

Moreover, earlier conflict detection induces more strategic dilution solution, which facilitates the provision of a “closed loop” clearance; thus preserving fuel efficiency compared to tactical resolution.

Needs for coordination: Provision of separation between aircraft shall take into account demand and capacity balancing and traffic synchronization needs on a network level. The introduction of a Free Route airspace structure will even increase the importance of the network level. Although, in general, the tools for TMA support will be ANSP / Centre based, there will be the need to consider demand and capacity balancing needs for both arrivals and departures on network level. Additionally, the CD&R tools used in TMA environment with vertical plane resolution support are considered to provide significant benefits to aircraft operators in ensuring the uninterrupted optimal descend and climb profile.

e) PJ.10-02b Advanced Separation Management

KPA / Performance impact: The same benefit mechanism as in Solution PJ.10-02a is provided towards safety and capacity aspects, enhanced by the fact that a higher degree of automation also influences human performance. Conformance and Intent Monitoring tools on the ground and in the air will increase the predictability of flights. The more frequent use of “closed loop” instructions (“open-loop” instructions being still used by in time critical situations) will as well increase the predictability. The new support tools will also increase controller’s situation awareness with Free Routing, in particular in high complexity areas with vertically evolving traffic, when the controller can rely less on sector knowledge and experience, due to more variable conflict geometry. A changed role and new tasks towards flight and sector management needs a proper change management and possibly new training requirements for the controller.

Needs for coordination: same as for solution PJ.10-02a.

f) PJ.10-05 IFR RPAS Integration

KPA / Performance impact: Access to airspace is the biggest benefit because there is a high demand for integrating all categories of RPAS to IFR airspace. There is a high impact but also opportunities for separation provision and integration to IFR traffic because of the inherent characteristics of RPAS: e.g. latency when remotely controlled, different flight awareness of the crew, sensitivity to weather conditions, VFR in IFR environment, ability to comply with all existing manned operational rules. In terms of KPA, the impact to safety, access/equity and capacity needs to be evaluated. The integration of RPAS in IFR environment might induce risks in terms of lack of compatibility between procedures, and flying objects behaviours. The handling of mixed traffic (regular and RPAS) might increase the complexity of the controller’s monitoring tasks notwithstanding opportunities coming from increased automation.

Needs for coordination: RPAS will be integrated and consequently all CNS including associated Air-Ground and Ground-Ground issues will need to be re-assessed for unmanned flight (network level).

g) PJ.10-06 Generic (non-geographical) Controller Validations

KPA / Performance impact: This Solution offers high potential in the long term because generic controller licence scheme on European level would overcome national restrictions and would allow much more flexible employment of controllers in European Area Control Centres (ACCs). This

solution defines the required enablers (e.g. controller tools) and working procedures that must be in place before any regulation or legislation change process can start.

Needs for coordination: on a European level regarding regulatory issues.

Contribution to the development of standards and to regulations forms an integral part for those solutions where a need has been identified or can be anticipated. This is particularly the case for Solution PJ10-05 IFR RPAS Integration. It is expected that the Solution Data Packs at V2 and V3 maturity level provide important inputs to the standardisation work of EUROCAE/RTCA WG-73/SC-228, EUROCAE WG-93. In the same way this also applies to Solution PJ.10-06 Generic Controller Validations with respect to EUROCAE/RTCA WG-51/SC-186 standardisation work. The inputs will be provided via the established communication activities with the SJU as well as via the individual partners in this project, which are members of these working groups.

The National Supervisory Agency (NSA) and the European Aviation Safety Agency (EASA) may be involved in the planning and possible approval of Live and Shadow Mode Trials, planned in Solutions PJ.10-02a by ENAV and in PJ.10-05 by DSNA and Dassault.

There are dependencies with ICAO expert Panels dealing with separation applications and respective CNS enablers (e.g. SASP, OPDLWG, CP). The partners will ensure through their participation at ICAO level that project results will be taken into account for updates of the ICAO PANS-ATM and ICAO Annex 11 for Separation Application. The input material will be produced and reviewed together with SJU before submission to the ICAO level.

With respect to RPAS further dependencies exist with the ICAO RPAS Panel and their work for updating quite a number of SARPs documents and for developing appropriate guidance material. These dependencies will be handled in the same way. A close loop will also be established with EASA regarding their development of the regulatory framework for RPAS.

2.2 Measures to maximise impact

a) Dissemination and exploitation of results

In addition to the common principles, it is foreseen to communicate largely on the contents of the work to be performed in the frame of this project.

The main means for dissemination will be:

- participation in international conferences, presenting project results and achievements,
- meetings, digital newsletters, organisation of workshops and tutorials or other common events,
- publications to high-profile journals (e.g. IEEE Journals), participating ANSP and industry websites.

It is expected that the consortium will submit technical papers to international conferences on the separation management topics covered by this project, thus allowing the project to be presented. In addition, ‘Open Days’ will be conducted after a significant validation has taken place. Stakeholders are invited to see the developed tools and procedures being applied in a realistic target environment, and also allowing the attendees to put ‘hands-on’ and have a first-sight experience of the achieved project results. This in turn also allows the project partners to get important feedback from people not directly being involved.

Furthermore, it is planned to link the dissemination activities of project results to already existing events. As soon as the project is released and initial results or progress can be reported, it is intended to propagate the achievements through events such as the ATM EUROCONTROL-FAA Seminars. Specific events can also be used for such propagation (e.g. the Digital Avionics Systems Conference/DASC, the International Conference on Research in Air Transportation/ICRA or the International Council of the Aeronautical Sciences Congress/ICAS). Ideally, a common approach with existing conferences with SJU presence should be planned, an active role in the ATC-Global or World ATM congress conferences would be a very good showcase.

The target audience for the dissemination would be ATM leaders and airspace users. Changes in the scope of the advanced team organisations and controller decision support tools need to be disclosed at all levels, from

top management to end-users, to allow full buy-in in the new concepts. Also specific stakeholder groups will be addressed, e.g. through presentations at the IFATCA and IFATSEA annual meetings (as part of a social dialogue).

The Project Manager will be in charge of defining the Exploitation Plan. The Exploitation Plan will be presented and updated ahead of Project Management Board meetings. The Exploitation Plan will assess the benefits and quality of the new Solutions. It will control how the results flow into the other SESAR projects' activities (products, processes), will identify eventual spin-off processes or applications, licensing, technical and economic market considerations. Particular attention will be paid on the development of new products or policies including certification aspects as soon as the V3 maturity has been reached (i.e. improved separation performance tools in Solution PJ.10-02a).

Intellectual Property Rights protection and dissemination of knowledge should be based on clear principles and rules, shared by all the members. These principles are predefined by the SESAR JU and should be followed in any case.

b) Communication activities

Most of the project participants are members of several international organisations, associations and forums. In this way, they will be able to present project's results to a large ATM community, through for instance workshops, conferences, and seminars. Another opportunity to communicate project's results will be through presentations to the European Commission or at specific meetings organised by European bodies (e.g. EASA) in Air Transport.

The appointed communication manager co-ordinates all activities in this area. It is envisaged that DFS as project manager takes responsibility for communication.

As an internal communication channel the OneSky extranet is already established. Furthermore, it is planned to build up a database on the OneSky extranet containing all relevant documents produced in PJ.10. At least all programme documentation will be stored in order to have full electronic access to documentation.

The second step, after internally using OneSky extranet, will be the creation of a project's website for PJ.10 external communication. The external accessible website will inform about all public objectives and goals of the project, the consortium members with contact data, it will provide short descriptions of work packages and co-operation activities between partners. In the course of project, a newsletter with current project status and planned meetings will be the means of a regular flow of information about the project's general progress.

Great attention will be paid to the quality of communication with the European Commission, and to the quality of the reporting. For allowing such precise reporting, the consortium has defined a number of deliverables which will ensure a tight follow-up of the works being carried on. These deliverables have been designed as successive milestones for both the partners and the consortium.

The coordinator and the so-called Project Coordination Committee (the leaders of tasks and subtasks) will pay much attention to deliver on due time contractual reports and cost statements to the Commission. A precise planning will be established, to allow precise monitoring of reporting.

3 Implementation

3.1 Work plan — Work packages and deliverables

3.1.1 Project Structure

The project is divided into seven different Solutions; each split into a certain number of activities and to a certain extent, coordinated independently by its SL. The project structure is displayed in Figure 1.

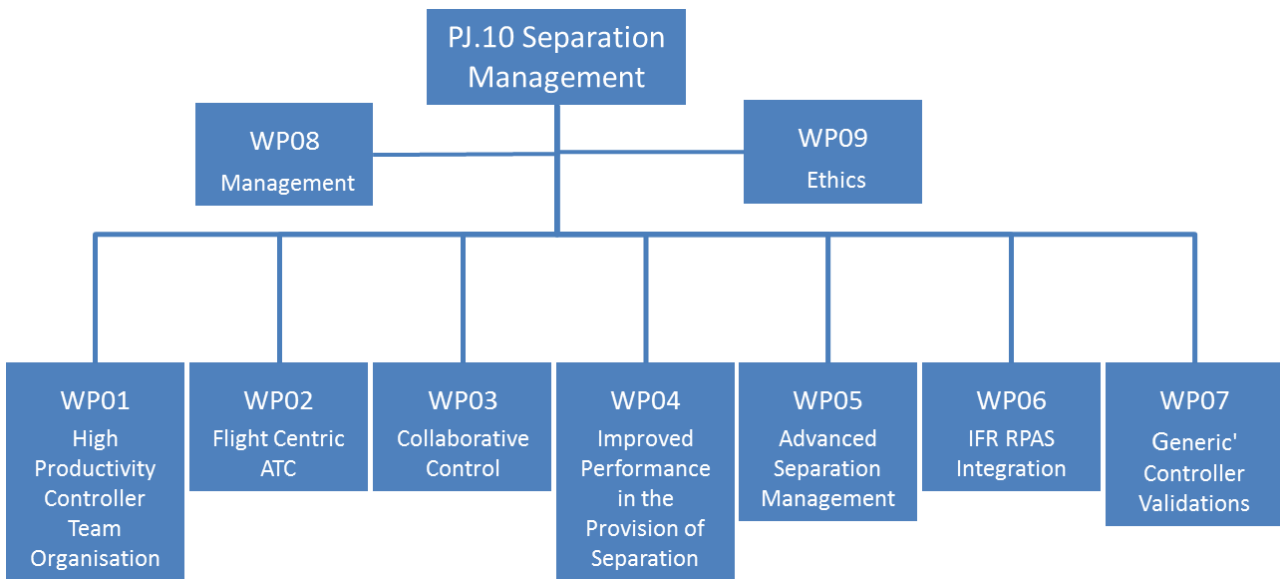


Figure 1: PJ.10 Work Break Down Structure

In order to ensure the appropriate coordination and performance of the activities related to transversal activities, two additional roles are proposed at project level. It consists of two new roles: The Project Content Integration Team, (PCIT) which will be a subset of the ATM Focal Points led by the Project Content Integration Leader (PCIL). The PCIT will have in addition to the responsibilities as an ATM Focal Point, other duties related to the coordination with the transversal projects in order to ensure the suitability of the contributions generated by the different Solutions. See more details of the responsibilities in section 3.2.

Definitions:

'Work package' means a major sub-division of the proposed project i.e. SESAR Solutions.

'Deliverable' means a distinct output of the project, meaningful in terms of the project's overall objectives and constituted by a report, a document, a technical diagram, a software etc.

'Milestones' means control points in the project that help to chart progress. Milestones may correspond to the completion of a key deliverable, allowing the next phase of the work to begin. They may also be needed at intermediary points so that, if problems have arisen, corrective measures can be taken. A milestone may be a critical decision point in the project where, for example, the consortium must decide which of several technologies to adopt for further development. Milestones must be defined in particular to synchronize activities across the project and with other projects.

Figure 2 depicts the duration of Wave 1 maturity cycles⁴ for all Solutions that have a dependency to external projects. All deliverables for the V1 and V2 maturity cycle are planned to be completed at the end of the year of the respective release (R7 – end of 2017, R8 – end of 2018, R9 – end of 2019). However, the maturity level can only be accomplished if the gate review has been passed. It has been assumed that the gate review will take place in summer of the year following the release year (e.g. gate review for R8 in summer 2019). For the V2 maturity cycles within PJ.10-01b and PJ.10-05 it is assumed that all V2 activities will be completed in Wave 1 – only the gate review is assumed to take place thereafter. For the V3 maturity cycle for Solution PJ.10-02a it has been assumed that it will be accomplished in R8 and the gate review takes place in summer 2019. Furthermore, the diagram shows the main input and output flows to other SESAR 2020 projects.

⁴ Assumed project start date is 01/2017 for the sake of planning simplification. However, a project start as early as possible is envisaged and recommended directly after grant signature in autumn 2016.

Controller Tools and Team Organisation for the Provision of Separation in Air Traffic Management

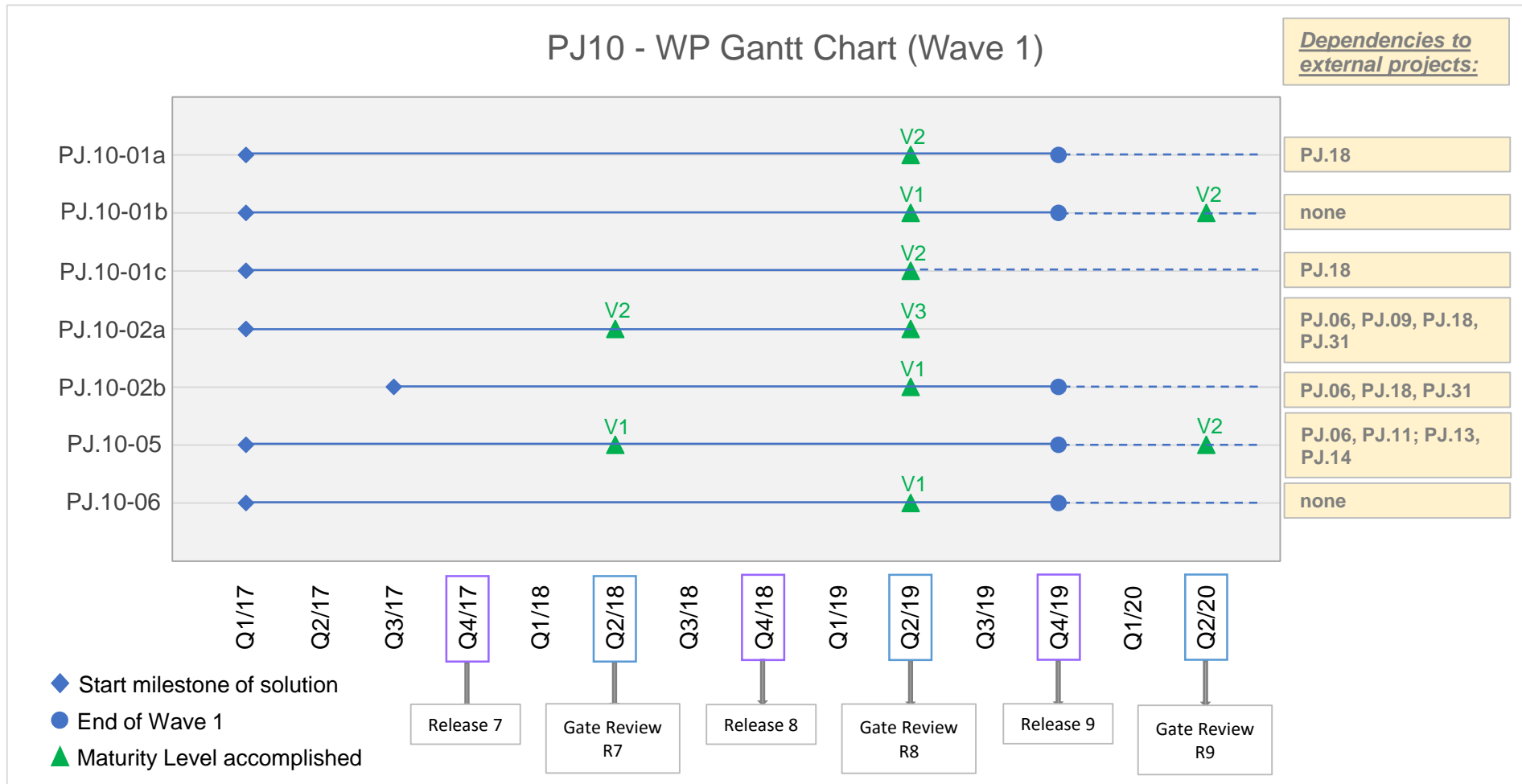
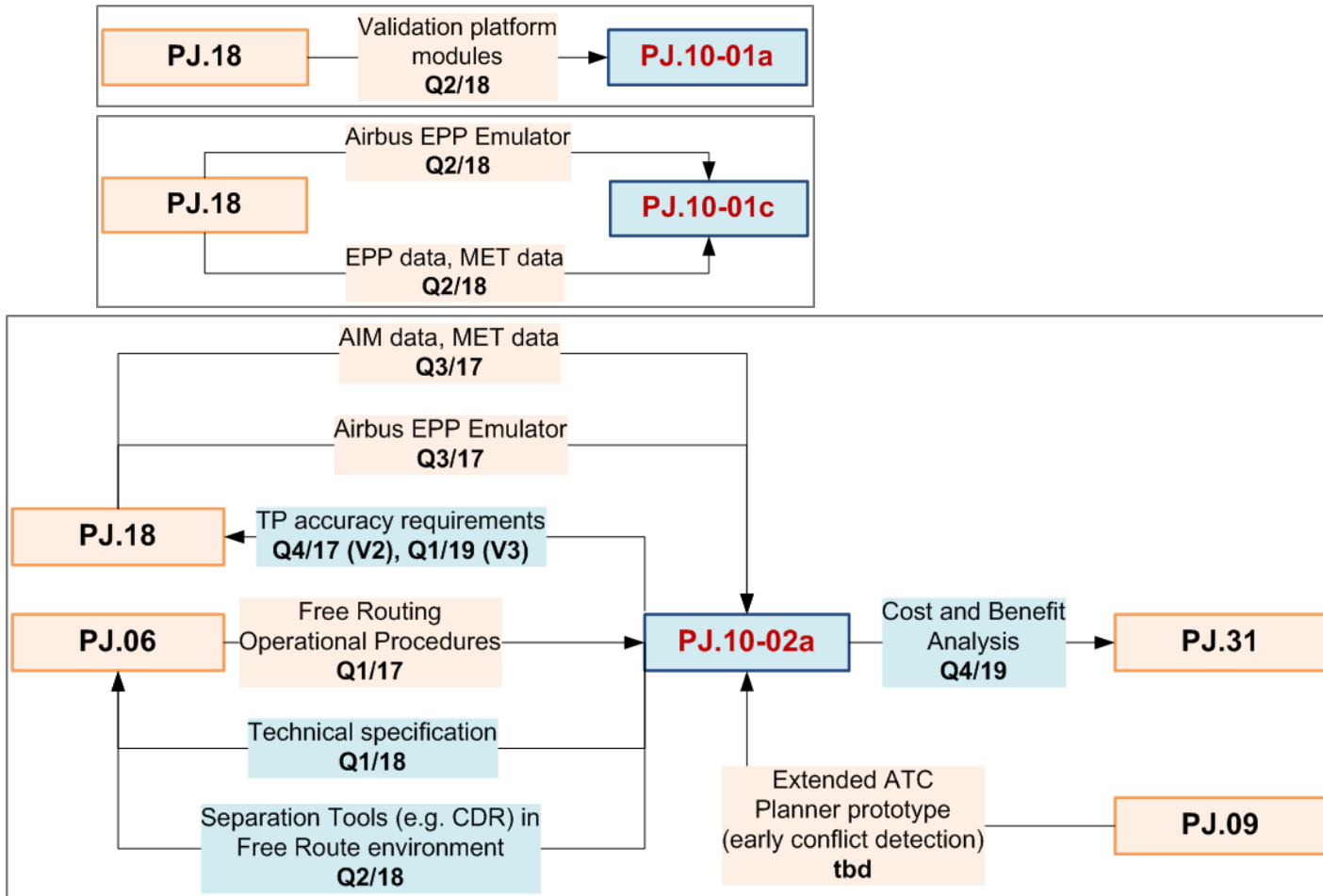


Figure 2: Project 10 Gantt Chart

Controller Tools and Team Organisation for the Provision of Separation in Air Traffic Management



Controller Tools and Team Organisation for the Provision of Separation in Air Traffic Management

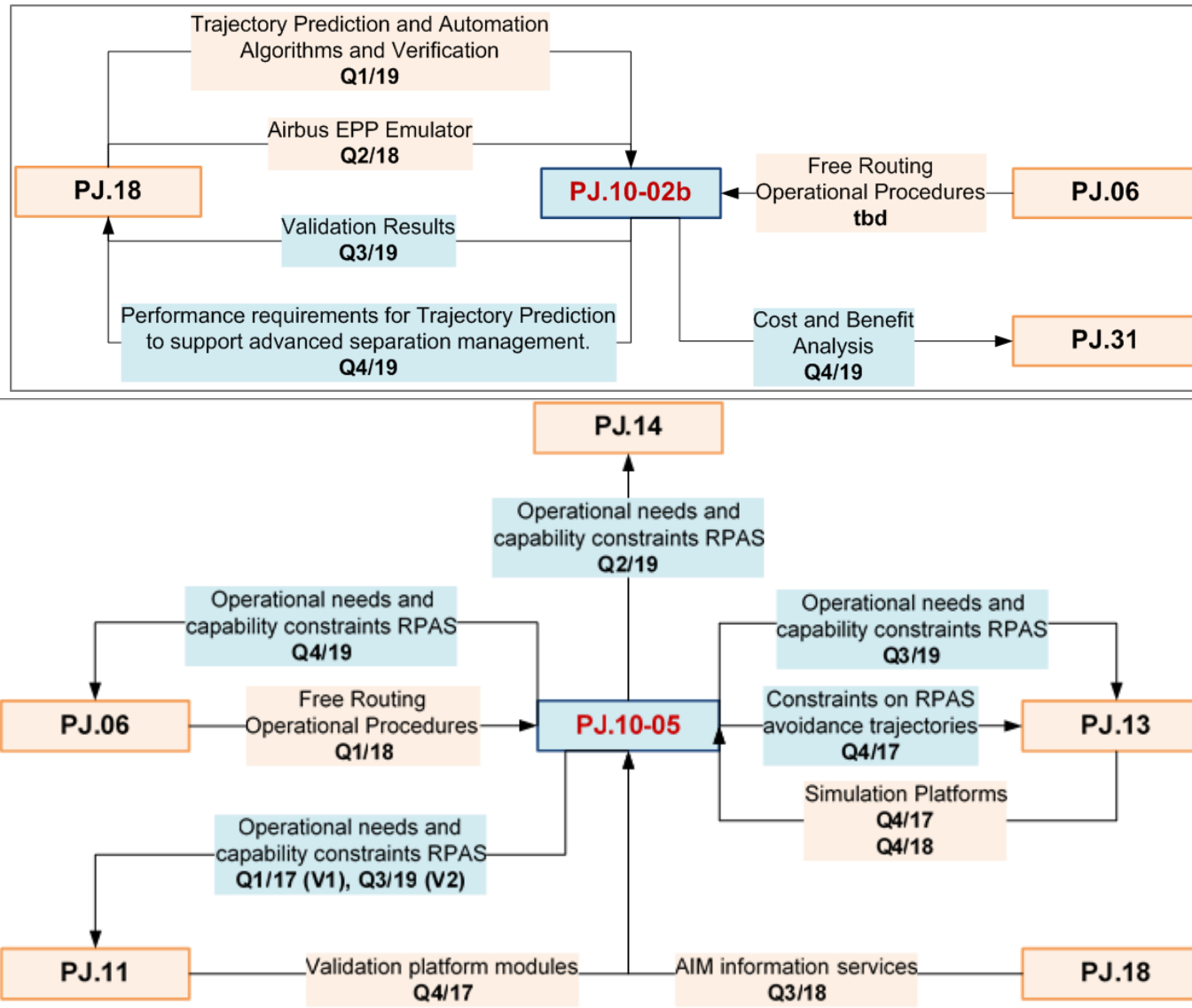


Figure 3: Project Pert Diagrams

Figure 3 (Pert diagram) shows the internal project interfaces and dependencies. The Solutions are in the centre, and all inputs are shown with arrows pointing towards the Solution whereas all outputs are shown with arrows pointing away. The team organisation Solutions PJ.10-01x depend internally on the provision of the controller tools from Solutions PJ.10-02x. Project 18 (4D Trajectory Management) provides EPP data and a validation platform. Solution PJ.10-05 has different external interfaces due to the nature of RPAS integration to projects 06 (Trajectory Based Free Routing), 11 (Enhanced Air and ground Safety Nets), 13 (Air Vehicle Systems) and 14 (CNS). The tool oriented Solutions PJ.10-02x have external interfaces to the projects 06 (Trajectory Based Free Routing), 09 (Advanced DCB), 18 (4D Trajectory Management) and 31 (Initial Trajectory Information Sharing). The detailed dependencies with the expected deliveries and the planned dates can be obtained directly from the PERT diagram.

3.2 Management structure, milestones and procedures

A lean and efficient management structure will be applied that allows for fast decision making to ensure that the pursued objectives are met. The Project Management Plan will further refine management processes in line with the governance rules defined in the Grant Agreement and in the SJU Membership Agreement. The administrative and organisational management activities are hosted in WP08. This approach will allow an effective and efficient assignment of partner contributions, while facilitating separation of research and technology tasks from the administrative work necessary to carry out the project.

The project management structure is composed of two main levels that are presented in Figure 4.

The combined legislative-executive level is composed of the Project Manager (PM) and a set of dedicated panels. The PM, as a central point of reference, participates in the Project Management Board, ensuring the overall coordination and follow-up of Project activities. The PM reports to the SESAR Joint Undertaking (SJU) on behalf of the project partners (e.g. the quarterly project reports). The Project Content Integration Lead ensures that the project content information is consistent across Solutions. At the implementation level Solution Leaders (SLs) manage the execution of technical development and control implementation steps.

3.2.1 Project Manager (PM)

The **Project Manager** acts as the Specific Grant Agreement point of contact (SGA Coordinator) with the SJU for all contractual matters, and is responsible for:

- checking the quality of the deliverables and verifying their completeness and correctness;
- submitting the deliverables and reports on behalf of the SGA beneficiaries;
- the escalation of issues relevant to the Grant Agreement or to the overall SESAR programme and management of changes to the Grant Agreement;
- preparing and contributing to the formal contractual closure of the activity.

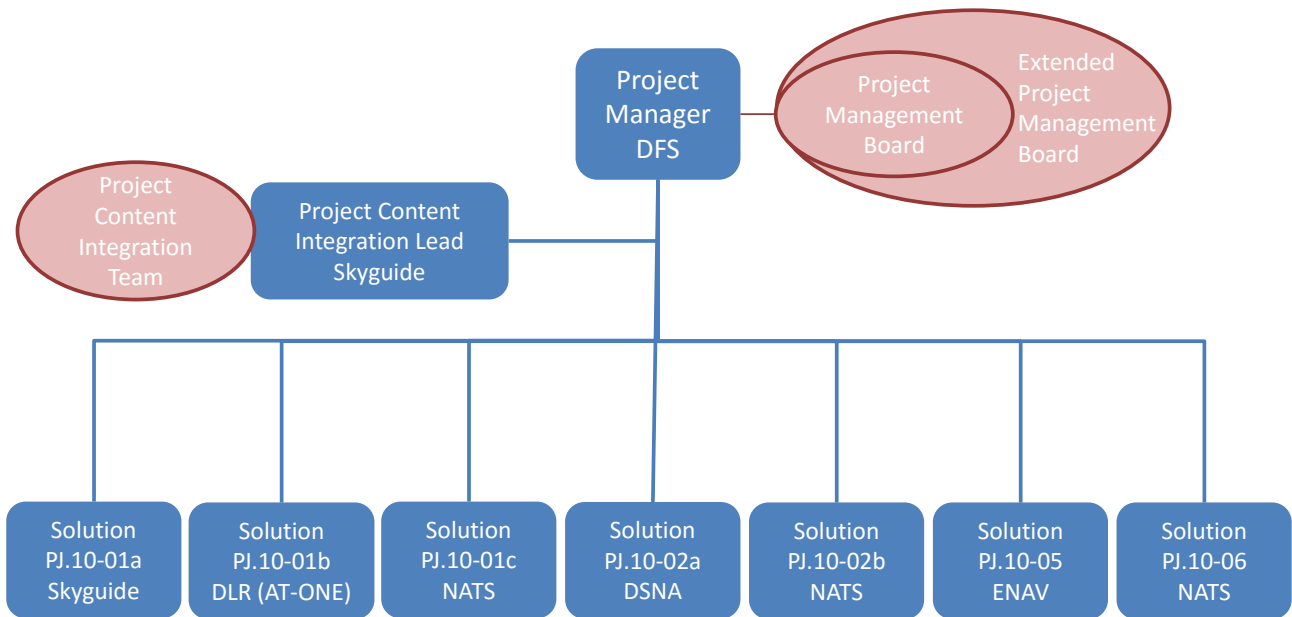


Figure 4: Project Structure for Solution/Enabling Project

In addition, the **Project Manager** is responsible of:

- the timely delivery of the SESAR Solutions or Technological Solutions and Enablers for IRs projects;
- the timely execution of SESAR Solution validation activities for IRs projects;
- the preparation, execution and maintenance of a Project Management Plan and Exploitation Plan;
- the application of common methods, as defined within the Programme Management Plan (e.g. progress reporting, corrective action implementation, project control gates);
- the provision of a comprehensive oversight of the Project and management of the operational relationship between the Members involved at the Project level;
- escalation of issues internal to the project that cannot be resolved by the PMB to the contribution managers of the project partners;
- proper and timely communication of information, within and outside of the project and
- an appropriate preparation and contribution to the operational closure of the project.

In this project, DFS has been appointed as project manager. A brief Curriculum Vitae (CV) of the project manager has been added to section 3.3.

3.2.2 Project Management Board (PMB)

The Project Management Board will ensure that all key management decisions of the project are taken with the full support of contributors of the projects. Decision will be made by consensus of all partners involved in a given Solution or work package, or in the project if the decision applies to the whole project. In case of disagreement, the escalation process foreseen in Appendix F of the SESAR Private Public Partnership Agreement will apply.

The Project Management Board should meet periodically (WebEx or Face to Face as required) to:

- review progress of the project;
- decide corrective actions;
- review project risks and associated mitigation actions;
- review any potential Change Request to the SGA when necessary.

The Project Management Board will be composed of:

- Project Manager (chairman);

- Project Content Integration Lead if any;
- Solution Leads or WP leads;
- Representatives of key contributor to the project (if not represented by above categories).

3.2.3 *Extended Project Management Board (EPMB)*

An Extended Project Management Board meeting (including all contributors of the project) will need to be convened annually at a minimum.

In addition, in case of significant changes to the project, the Extended Project Management Board shall be asked for approval by correspondence, e.g. for:

- critical deliverables of the project :
 - Initial PMP and updates
 - Cost Benefit Analysis' (CBAs, approved by contributors to the Solution)
 - V Data Pack
- Change Request to the SGA.

Decision making principles are the same as for the Project Management Board.

3.2.4 *Solution Lead (SL)*

The Solution Lead (WP Lead) is the person responsible for the operational and technical leading of the Solution. He/She is responsible for the SESAR Solution refinement, the overall management of related validation activities and timely delivery of the Solution deliverables. In particular, the Solution Lead will:

- organise and coordinate the activities of the Solution Team;
- report to the Project Manager on progresses and issues;
- make proposal for update and amendments of the validation roadmap, to be agreed at project level
- ensure consistency within the Solution and in particular of the different deliverables in support of the different maturity evolution/levels (V1, V2 and V3);
- prepare and represent the Solution at the maturity gate, notably responsible for producing the Maturity Report;
- participate to the PMB.

In each Solution, a management task is identified for the Solution Lead.

3.2.5 *Solution Team*

The main role of the Solution Team is to:

- define, validate the SESAR Solution and produce the associated deliverables and prototypes. A project validation roadmap will be agreed at project level. The Solution Team will conduct validations according to the agreed roadmap;
- identify and initiate required changes to the SESAR Solution, including the validation roadmap;
- contribute, under the coordination of the Project Content Integration Lead, to update the relevant sections of Transversal Projects deliverables.

The Solution Team is composed of all contributors to the work of a given Solution.

3.2.6 *Project Content Integration Lead (PCIL)*

The Project Content Integration Lead:

- reports to the Project Manager;
- coordinates and organises the work of the Project Content Integration Team;
- acts as a focal point for interaction with the Transversal Projects, supported by the Project Content Integration Team. Is in particular the focal point for the project's change requests to the project content information.

- The effort of the PCIL is allocated to WP08.

The PCIL role has been assigned to Skyguide. The size of the project and the number of partners and activities does not allow the project manager to act in parallel as PCIL. A brief Curriculum Vitae of the PCIL has been added to the section 3.3.

3.2.7 Project Content Integration Team (PCIT)

The Project Content Integration Team is a virtual team composed of the ATM Focal Points and relevant experts from the Solution Teams.

The role of the Project Content Integration Team is to ensure the technical and operational consistency between the different Solutions developed in one project, consistency with dependant Solutions in other projects and to coordinate interactions with Transversal activities. It ensures that the outputs provided by the projects are compliant with the guidance material provided by Transversal Projects. It shall identify and seek for Solutions for any gaps or conflicting choices between the Solutions of the project in order to ensure the project fulfils its objectives. It also supports the Project Manager for the organisation of the technical gates, and for the communication of project results.

The following Table 1 shows the partners who have taken responsibility for the ATM Focal Points, which are needed in this project:

Table 1: ATM Focal Points in PJ.10

ATM Focal Point	Solution	Partner
CBA expert	10-01a	N.N.
Operational performance expert	10-01b	ENAIRE
Human Performance expert	10-01b	DFS
Technical Architecture expert	10-02a	THALES AIR SYSTEMS
Safety expert	10-02a	ACG/COOPANS
ATM Expert Operations	10-02a	DSNA
Aircraft expertise („other“)	10-02b	AIRBUS
RPAS expert	10-05	ENAV
Security / Cyber security expert	10-05	ENAV
Regulation expert	10-06	SKYGUIDE
Military	10-02a	EUROCONTROL
R&D Solution team Platform Development	10-02a	INDRA, THALES AIR SYSTEMS

3.3 Consortium as a whole

The members of the SESAR Joint Undertaking PPP work and cooperate together to the best of their abilities with a view of implementing SESAR 2020 in a correct, efficient, open and timely manner and of attaining the objectives and the deliverables as envisaged by the ATM Master Plan. The Consortium involves key stakeholders of the Airborne Systems, Ground ATM Systems, Service Provision and EUROCONTROL hence providing a wide range of expertise covering all aspects of EUROPEAN ATM.

This consortium comprises 17 organisations including three consortia from 9 member states of the European Union, and two organisations from two nations beyond the EU. The consortium was carefully selected according to the skills and experiences required to accomplish the proposed work. The operational expertise, which is crucial for the conceptualisation and implementation phase of the project, is found in the strong representation of end-user organisations in the consortium. The work is structured in a very collaborative way throughout all work packages and will ensure the transfer of knowledge and know-how between all participants.

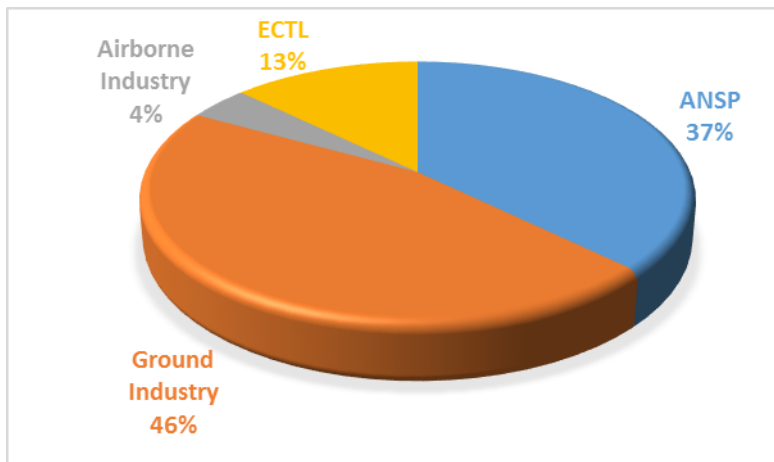


Figure 5: Budget share between stakeholder groups

PJ.10 partners, involved in Wave 1, are:

- Airborne Industry, represented by Airbus SAS (France) and Dassault Aviation (France);
- Ground Industry, represented by Finmeccanica (Italy), FRQ (FSP) (Austria), Indra (Spain), THALES Air Systems (France), SAAB (NATMIG) (Sweden) and DLR (AT-ONE) as research organisation;
- Air Navigation Service Provider, represented by DFS (Germany), ANS CR (B4) (Czech Republic), PANSO (B4) (Poland), ACG/COOPANS (Austria), CCL/COOPANS (Croatia), IAA/COOPANS (Ireland), LFV/COOPANS (Sweden), Naviair/COOPANS (Denmark), DSN (France), ENAIRE (Spain), ENAV (Italy), NATS (United Kingdom), HC (FSP) (Hungary) and Skyguide (Switzerland);
- European Bodies, represented by EUROCONTROL (Belgium).

EUROCONTROL will participate in the project actions without requesting funding. EUROCONTROL will, however, fully engage in the project and in particular is committed to providing the effort, contributions to deliverables and to other activities as set out in this tender and in the accompanying administrative forms.

During the proposal preparation phase it was found necessary because of H2020 implementation constraints applicable to linked third parties to change the initial Thales membership application structure and it was consequently agreed with SJU to split the Thales application into two separate members: Thales Air Systems primarily addressing ground activities, and Thales Avionics primarily addressing airborne activities.

In this project Thales Air Systems is the sole Thales member contributing to the project.

The major European air transport industry and Air Navigation Service Providers are well represented in this project with a clear focus towards applied ATM product development and deployment (and, to less extent, research) which could create business opportunities in the near and mid-term.

Airbus SAS as one of the world leading manufacturer of aircraft, Dassault Aviation as one of the major world player considering bizjet, military aircraft and at the same time Neuron project leader (large fixed wing UAV) bring in their expertise in particular for aircraft avionics and aircraft capabilities. This plays an important role in enhancement of trajectories for separation management. Finmeccanica is a global player in the high-tech sectors and a major operator worldwide in the Aerospace, Defence and Security sectors. Finmeccanica designs and creates products, systems, services and integrated solutions both for the defence sector and for public and private customers of the civil sector, both in Italy and abroad.

All major European ATM suppliers are involved in the development and validation of Controller Decision Support Tools and ATM system improvements, which are essential for the airspace user and air navigation providers. These suppliers represent with their latest product lines (e.g. Thales Air Systems ATM 4-Flight, Indra iTEC) the majority of European installations, and through their participation and knowledge of the system capabilities, they can assure that the project results can be exploited and integrated in their ATM systems. This is essential because exchange of air-ground data and synchronisation of air and ground trajectories are a cornerstone of the envisaged validations. Moreover, industry partners with expert knowledge of RPAS bring in their expertise to ensure the successful integration of RPAS in IFR airspace. Some examples are: Finmeccanica and Telespazio derive expertise in this area from EDA DeSIRE 2 project, several partners from the EDA MIDCAS programme (Cira/ENAV, Finmeccanica, SAAB, Thales, Indra), Dassault Aviation and SAAB from NeuroN project, from SESAR JU RPAS Demonstration projects (DSNA, ENAV, Finmeccanica, Thales, NATS). This includes activities in definition and development of simulation scenarios to support analysis of mission that involves relevant assets as satellites, aircraft or ground facilities (ATC centres).

The knowledge of how to manage air traffic in one of the most complex and dense airspace areas as well as in less complex airspace is provided by the variety of air navigation service providers. The European core area is well represented but also e.g. the parts of northern and Eastern Europe with much stronger forecast figures than in the core area. Some of these ANSP's face major challenges in terms of cost reductions, which can be enabled by the use of the more advanced tools and the new sector team organisations that will be developed and validated. The expertise of the ANSP's comprises among other safety experts, operational ATM experts with active controllers and Human Performance and Validation experts. Some of them also played a major role in validating and promoting the SESAR1 Solutions, and wish to continue this work in the SESAR2020 frame.

This consortium will be complemented by the research centre DLR (AT-ONE) with expertise in applied research and validation activities of all scales. They will also bring in expertise in the field of the Flight Centric ATC which shows in previous validations quite a high potential but is relatively new to the ANSP's. Moreover, Eurocontrol the European Organisation for the Safety of Air Navigation and the co-founder of the SESAR programme, brings in its expertise in the fields of network management, research and validation activities.

The composition of the partners should ensure exploitation of the results because the ATM industry partners will finally integrate the validated tools and required system modifications for advanced separation management functionalities in their ATM systems while a big portion of the potential customers is at the same time formulating and validating the operational and associated technical requirements.

The project management will be carried out by DFS. The German airspace is one of the most complex and challenging environments in Europe, and the company has long experience in managing implementation projects of all scales (from new ATM tools like Arrival Management Systems to complete new ATM systems for all center and tower facilities). Separation Management is regarded as the core business of an ANSP, and through its role of providing air traffic services and as customer of new ATM systems and tools the company is in a good position to successfully manage and facilitate the project needs among all partners.

Rationale for participation of non-EU organisation Skyguide from Switzerland

Skyguide is the Swiss Civil and Military Air Navigation Services Provider. They are located in the European Core Area. 59% of the services are provided within the national boundaries and 41% within airspace delegated from European neighbours. Skyguide operates one airspace from two Area Control Centres, situated in Geneva and in Wangen in the Zurich area. As a fully integrated Civil and Military Service provider, they operate the Swiss Air Defence & Direction Centre (ADDC) for the OAT operations. Skyguide is also present on 12

regional civilian and military airfields throughout the country. Skyguide is setting up the capability of running a virtual centre, i.e. operating one centre from two locations and setting the premises for future sector-exchange capabilities with foreign ANSPs.

Skyguide was core-member of the EUROCONTROL FASTI (First ATC Support Tools Implementation) programme as from 2005 and declared as a FASTI pioneer, at the time already making use of fully electronic environment. Operations are equipped with CPDLC capability and make use on a daily basis of 4d Trajectory based ATC Support tools (conflict detection and conflict resolution tools, monitoring aids, inter-sector coordination tools). In addition, Skyguide has set up an advanced R&D platform equipped with new functionalities such as “what-if” and “what-else” functions or 4D-trajectory management. They intend also to migrate to a Multi-Sector Planner configuration, some initial validations have been performed in the frame of FASTI, in collaboration with ENAV.

Skyguide has a dedicated SESAR platform available that offers 16 positions.

Rationale for participation of non-EU organisation Thales Australia Limited

In Australia, Thales Australia Limited, based in Melbourne Australia, has key experience and expertise for oceanic and transcontinental Air Traffic Management (ATM) and has been serving the Asia- Pacific region and beyond in Air Traffic Management Systems since 1995, following the award in 1994 of the Australian Advanced Air Traffic control System (TAAATS) by Airservices Australia (Air Navigation Service Provider responsible for Australia’s sovereign airspace).

Thales Australia Limited is uniquely positioned in the Asian Pacific region with ATM systems in operation in key countries including Australia (nationwide TAAATS system) China (Beijing, Shanghai, Guangzhou, Hefei and Tianjin), Singapore (LORADS-III operational in October 2013), Thailand or French Polynesia to name a few. The industrial footprint in China through Beijing EasySky Technology Ltd also contributes to an intimate understanding of the ATM operational requirements and needs in the region.

Thanks to his 350+ highly skilled technical personnel and its close collaboration with the other Thales ATM industrial sites in France, United Kingdom and USA, Thales Australia ATM is a technology partner of choice ready to foster the development of new technologies and facilitate deployment of ATM advances defined and validated in SESAR such as ATFM or SWIM in Asia Pacific.

Also the CASIA (Centre for Advanced Studies in ATM) represents a unique creative workspace dedicated to ATM research focused on Asia Pacific. Inaugurated in March 2011, this state-of-the-art innovation laboratory hosts demonstrations of Thales latest products and prototype and is used as a platform for R&D activities. It is connected to an ecosystem of 4 Thales Laboratories worldwide, SkyCentre (France Paris), The Link (France Toulouse) and NextGen Innovation Lab (USA Arlington) to reinforce research collaboration, including leading Universities, public research laboratories and industry players, thus promoting SESAR outcomes in a large region of the world where air traffic is growing at a high rate.

As affiliate in the Thales group entity, Thales Australia ATM was already part of the SESAR1 programme with a significant contribution to WP10 (En-Route & Approach ATC Systems) projects and participating to the validation of several SESAR solutions.

Curriculum Vitae of key personnel

Two key persons are responsible for management and steering of the project execution. These are the project manager and the project content integration lead. Below you can find the curriculum vitae which show the qualification and experience.

CV Project Manager:

Dr.-Ing. Jörg Bergner, mail address: joerg.bergner@dfs.de

Nationality: German

Born: 1973

Professional Experience

DFS Deutsche Flugsicherung GmbH, Germany

Project Manager <i>SESAR Project 5.4.2 “Co-Operative Planning in the TMA”</i>	2010 – present
Task Lead <i>SESAR Project 4.7.6 “En-Route Trajectory and Separation Management”</i>	2012-2013
Workpackage Lead <i>iPort, Federal Aeronautical Research Programme (LuFo IV-2)</i>	2009-2010
Workpackage Lead <i>WFF, Federal Aeronautical Research Programme (LuFo IV)</i>	2007-2009
Subworkpackage Lead <i>K-ATM, Federal Aeronautical Research Programme (LuFo III)</i>	2006-2007

Technische Universität Darmstadt, Germany

Institute of Gas Turbines and Aerospace Propulsion

Project Engineer “Transonic Compressor Rig”	2000 - 2005
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Education

Technische Universität Darmstadt, Germany

Institute of Gas Turbines and Aerospace Propulsion

„Doktor-Ingenieur“	2006
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Department of Mechanical Engineering

„Diplom-Ingenieur“	2000
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CV Project Content Integration Lead:

Eng. Pascal Latron

pascal.latron@skyguide.ch

Nationality: French

Professional Experience

Skyguide Air Navigation Service ltd – Geneva CH

Skyguide SESAR Content Manager <i>coordination of Skyguide activities in SESAR (associate partnership with DFS and DSNA, Large Scale demonstrations)</i>	2011 – present
Head of OPS Capability development unit <i>Management of team. Preparation of the future operations capabilities. Support to Ops business unit managers and Chief Of Operations. Senior Operational expert : Concept of Operations set-up in line with the company strategy, Ops Evolution Roadmap.</i>	2008 – 2015
FASTI Project Manager <i>Project organisation and management of Eurocontrol FASTI activities in Skyguide</i>	2006 - 2007

Controller Tools and Team Organisation for the Provision of Separation in Air Traffic Management

Operational senior expert <i>Set-up of the skyguide Concept of Operations and Operation Evolution Plan</i>	2005 – 2006
"System Engineering" <i>Coflight Programme : operational, functional and architecture specifications and design</i>	2004 – 2005
"System Engineering" <i>ATMAS Programme : operational, functional and architecture specifications and design</i>	2001 – 2004
Steria – France	
Deputy Project Manager <i>Skyguide – Geneva : Regulation function automation</i>	2000 – 2001
Project Manager <i>Eurocontrol (Bretigny) : Multi Cockpit Simulator replacement</i>	1998 – 2000
Deputy Project Manager <i>Eurocontrol (Bretigny) : PHARE demonstration 3</i>	1994 – 1998
Thomson-CSF Training & Simulation – France	
Project Manager <i>Responsible for delivery of Airbus A340 simulator to Gulf Air and Air France</i>	1992 – 1994
Software Project Leader <i>Airbus A320 and A340 Full Flight Simulators</i>	1988 – 1992
Software developer <i>Simulator Certification: Preparation and assistance to Airbus simulator certification with Aviation Authorities (FAA, JAA). Development of Flight and Aerodynamic software Development of simulation software for airborne equipment (Flight controls, Flight Management, Flight guidance)</i>	1986 – 1988

Education

Université de Technologie de Compiègne (UTC) <i>University of Waterloo, Ontario, Canada</i>	1986
Software Engineer degree	
DEUTEC (Université de Technologie de Compiègne)	1983
Diplôme d'Etudes Universitaires de l'Université de Technologie de Compiègne	

3.4 Resources to be committed

As per Section 3.5 of the amended Annual Work Programme, due to annual budget constraints of the SJU, the SJU contribution to the Action shall be broken down into several instalments. The first instalment ("First SJU Contribution" of the Action), corresponding to the initial "maximum grant amount" as per Article 5.1 of the Grant Agreement, will be calculated in proportion of:

- the maximum grant amount after evaluation for the Action,
- the number of grants awarded under the IR call, and
- the 50M€ SJU budget available.

On the basis of the First SJU Contribution for this Action established at a maximum grant amount of 5,352,250.18 EUR, it is clarified that as a consequence, at the date of signature of the Grant Agreement and without prejudice to the total amount of the budget agreed for this Action, notwithstanding the activities

described in the Annex 1, the work to be performed under the First SJU Contribution as per Article 5.1 of the Grant Agreement is limited as summarized below:

- D8.1 Project Management Plan
- D8.3 Quarterly Progress Report 01
- D8.4 Quarterly Progress Report 02
- D9.1 H - Requirement No. 1 (Ethics WP)
- D9.2 POPD - Requirement No. 2 (Ethics WP)
- D9.3 NEC - Requirement No. 3 (Ethics WP)
- D9.4 M - Requirement No. 4 (Ethics WP)

Any further SJU contribution resulting from further budget availability, will be implemented through a Grant Amendment as per Section 3.5 of SJU amended AWP and will result in an update of the Maximum Grant Amount in Article 5.1 of the Grant Agreement. The Grant Amendment shall also modify article 21 of the Grant Agreement with an update of the pre-financing payment for the Action.

The level of SJU contributions and pre-financing of the grant amendments will be established in accordance with the SJU Single Programming Document (SPD) as approved by the Administrative Board.

In the event of unavailability of further SJU Budget, beneficiaries may terminate their participation in the action as per article 50.2 and this shall not be regarded as a case of improper termination.

Table 3.4b: ‘Other direct cost’ items (travel, equipment, other goods and services, large research infrastructure)

The tables below are fulfilled only for those participants whose sum of the costs for ‘travel’, ‘equipment’, and ‘goods and services’ exceeds 15% of their personnel costs (according to the budget table in section 3 of the proposal administrative forms).

Participant Number/Short Name	Cost (€)	Justification
2 / AIRBUS		
Travel	6.840	Travels in Europe
Equipment	155.415	A320 Flight Test Hours
Other goods and services	-	
Total	162.255	

Participant Number/Short Name	Cost (€)	Justification
2 / AIRBUS: LTP AI OPS		
Travel	18.311	Travels in Europe
Equipment	66.400	Integration Simulator Hours
Other goods and services	-	
Total	84.711	

Controller Tools and Team Organisation for the Provision of Separation in Air Traffic Management

Participant Number/Short Name	Cost (€)	Justification
21 / LFV/COOPANS		
Travel	37.667	Standard travel cost
Equipment	467.873	Update & maintenance of IBP. LFV owns and operates the COOPANS IBP validation platform in Malmoe for all COOPANS partners. The IBP is the current NORACON IBP with modifications to be enable integration of SESAR 2020 prototypes.
Other goods and services	1.877	Audit
Total	507.417	

Participant Number/Short Name	Cost (€)	Justification
PANSA (B4)		
Travel	18 000 €	covers: <ul style="list-style-type: none"> ▪ coordination meetings at solution level, ▪ validation coordination meetings
Equipment	17 400 €	covers: <ul style="list-style-type: none"> ▪ amortization of the validation platform
Other goods and services	5 500 €	covers: <ul style="list-style-type: none"> ▪ audits
Total	40 900 €	

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Participant Number/Short Name PANSA (B4) LTP UNIWARSAW	Cost (€)	Justification
Travel	14 000 €	covers: <ul style="list-style-type: none"> ▪ validation participation, ▪ project meetings, ▪ workshop participation
Equipment	21 000 €	covers: <ul style="list-style-type: none"> ▪ V2 validation task: simulation tool (T04-02-04, T02-02-05, T05-02-04) and Mini-cluster built of hardware required for development of software for the relevant tasks (database and modelling) (T04-02-05). ▪ V3 validation task: hardware required for the provision of operational mode of work of the Decision Support Tool (Subtle Navigational Factors Awareness Tool) (T04-03-05).
Other goods and services	70 000 €	covers: <ul style="list-style-type: none"> ▪ services related to validation preparation (HPC costs, data storage + processing infrastructure usage), ▪ gold open access publication fees, ▪ validation platform specific costs, ▪ audits, research consumables, technical books and publications, office supplies, maintenance
Total	105 000 €	

Participant Number 15 / ANS CR (B4)	Cost (€)	Justification
Travel	47 000,00 €	Travel cost covers validation participation, project meetings, coordination meetings at solution level, validation coordination meetings, international workshop/conference participation.
Equipment	11 000,00 €	Depreciation costs of validation platform.
Other goods and services	2 000,00 €	Auditing costs
Total	60 000,00 €	

4. Members of the consortium

4.1 Participants (applicants)

4.1.1 Companies profile

4.1.1.1 DFS (coordinator)

Organisation	1 DFS	Air Navigation Service Provider
Description	<p>DFS Deutsche Flugsicherung GmbH (DFS) is responsible for Air Traffic Control (ATC) in Germany and is headquartered in the town of Langen. It is a company organised under private law and 100% owned by the Federal Republic of Germany.</p> <p>The main business of air navigation services provided by DFS is defined by the tasks set out in Section 27c of the German Aviation Act (LuftVG). DFS provides air traffic services as a sovereign function, coordinates the air traffic flow and manages airspace utilisation (as a company entrusted with State functions). For this purpose, it develops and operates air traffic service systems as well as communications, surveillance and navigation systems. DFS operates control centres in Langen, Bremen, Karlsruhe and Munich, a unit within the Maastricht Upper Area Control Centre of EUROCONTROL as well as 16 control towers at Germany's designated international airports. With its approximately 5,900 operational and administrative staff, DFS ensures that approximately three million flights under Instrument Flight Rules (IFR) reach their destinations safely and on time each year.</p> <p>For further information visit us at: www.dfs.de</p>	
Previous experience	<p>Selected Publications:</p> <p>Increasing Capacity or Productivity with Controller Assistance Tools in High Complexity Airspace, 13.09.2015, Katharina Reinhardt, Dr. Matthias Poppe, Stephan Herr, 34th Digital Avionics Systems Conference, Prague</p> <p>The Usability of ADS-C EPP Data for Air Traffic Control Applications, 13.09.2015, Eliana Haugg, Matthias Poppe, Stephan Herr, Thomas Pütz (DFS); Jiří Svoboda, Róbert Šošovička (Honeywell), 34th Digital Avionics Systems Conference, Prague</p> <p>Test Flights to Demonstrate Effectiveness of a Ground-Based Detect and Avoid Integration Concept, 01.10.2014, Andreas Udovic, Hans de Jing, Jürgen Vielhauer, Handbook of Unmanned Aerial Vehicles. ISBN: 978-90-481-9706-4 (Print) 978-90-481-9707-1 (Online)</p> <p>Paving the Way to Free Flight – ASAS Separation in the Upper European Airspace, 14.08.2013, Helge Lenz (DLR), Christoph Möhlenbrink (DLR), Eliana Haugg, American Institute of Aeronautics and Astronautics, Aviation 2013, Los Angeles</p> <p>Optimal Control – A new Approach to Automation in Air Traffic Control, 08.07.2013, Dr. Matthias Poppe, Markus Hochstrasser, Leif Walter, Jutta Heinz</p> <p>Interdisciplinary Science for Innovative Air Traffic Management (ISIATM), 8.-10. Juli 2013</p> <p>SECTORLESS ATM – Analysis and Simulation Results, 23.09.2010, Bernd Korn, Christiane Edinger, Sebastian Tittel (DLR), Thomas Pütz, Bernd Mohrhard (DFS), 27. ICAS-Konferenz (International Council of the Aeronautical Sciences)</p> <p>Evaluation of Conceptual Changes in Air Traffic Control using Task-Based Workload Models, 23.09.2010, Stephan Herr, 27. ICAS-Konferenz (International Council of the Aeronautical Sciences)</p> <p>Task-based workload models for the evaluation of conceptual changes in air traffic control, 09.10.2009, Stephan Herr, 8. Berliner Werkstatt Mensch-Maschine-Systeme</p>	

SECTORLESS ATM – A Concept to increase En-Route Efficiency, 09.09.2009, Bernd Korn, Christiane Edinger, Sebastian Tittel, Dirk Kügler (DLR), Thomas Pütz, Oliver Hassa, Bernd Mohrhard (DFS), Deutscher Luft- und Raumfahrtkongress 2009 der DGLR

Towards SESAR Performance Targets – The Super-Highway Approach, 11.12.2008, Dr. Matthias Poppe, Thomas Hellbach, AIAA Aviation Technology, Integration, and Operations Conference (ATIO 2008)

Validation of unmanned Aircraft Systems (UAS) Inegration into the Airspace – The VUSIL Project, 16.10.2008, Dr. Joachim Vogt, Andreas Udovic, Deutscher Luft- und Raumfahrtkongress 2008

Development and Validation in Air Traffic Control by Means of Real-Time Simulations, 02.07.2008, Stephan Herr, Michael Teichmann, Tim Gesekus, Conference-for-Systemics-Informatics-and-Cybernetics

DFS DEUTSCHE FLUGSICHERUNG GMBH aligning their Research & Development Needs for the SINGLE EUROPEAN SKY AIR TRAFFIC MANAGEMENT RESEARCH PROGRAMME (SESAR), 05.07.2007, Dr. Thomas Bierwagen, CEAS European Air and Space Conference and Deutscher Luft- und Raumfahrt Kongress 2007

Automation in Air Traffic Control, 07.11.2006, Dr. Thomas Bierwagen, Dr. Andreas Tautz, Dr. Michael Poppe, Deutscher Luft- und Raumfahrt Kongress 2006, 6.-9.11.2006, Braunschweig

Introduction of a New Methodology to Assess the Capacity of Air Traffic Management Systems, 21.07.2006, Dr. Thomas Bierwagen, Dr. Andreas Tautz, 3rd International Conference on Cybernetics and Information Technologies, Systems and Applications

AUTOMATION in Air Traffic Management, 26.06.2006, Dr. Andreas Tautz, Dr. Matthias Poppe, 3rd International Conference on Cybernetics and Information Technologies, Systems and Applications

The DFS ADAM methodology assessing capacity benefits of ATM systems, 26.06.2006, Dr. Thomas Bierwagen, Dr. Andreas Tautz, 2nd International Conference on Research in Air Transportation

Previous projects:

EPISODE 3, Single European Sky implementation support through validation, FP6, 2004-2010, Key Performance Targets for the future ATM system

TORCH, Technical, economical and operational assessment of an ATM concept for the year 2005, FP4, 1999-2000, consolidated operational concept including benefit assessment

MAEVA, A Master ATM European Validation Plan, FP5, 2000-2003, developing validation strategy

AVENUE, An ATM validation environment for use towards EATMS, FP4, 1998-2000, provision of a validation platform capable of supporting large scale demonstration and validation

S-WAKE, Assessment of wake vortex safety, FP5, 2000-2003, development of tools for assessing appropriate (safe) wake vortex separation distance

C-ATM, Co-operative Air Traffic Management - phase 1, FP6, 2004-2006, among other: Advanced tools to support Separation Management, Flight Data processing and Flow Management

	<p>Gate-to-Gate, Validation of a European ATM gate to gate operational concept for 2005 – 2010, FP5, 2002-2005, Operational concept development and validation</p> <p>WAKENET2 Europe, European thematic network for aircraft wake turbulence, FP5, 2003-2006, wake turbulence phenomena (safety, capacity and operations)</p> <p>DFS has contributed within the frame of SESAR 1 to the following separation management related projects:</p> <ul style="list-style-type: none"> • Project 4.2 Consolidation of operational concept definition and validation including operating mode and air-ground task sharing • Project 4.7.2 Separation Task in En Route Trajectory based environment • Project 4.8.1 Enhanced safety nets for en-route & TMA operations <p>Within these projects DFS was responsible for the conduct of the following V2 and V3 validation exercises: VP-066, VP-171, VP-594, VP-175, VP-332.</p> <p>Within SESAR phase 1 has built or increased its expertise in the fields of:</p> <ul style="list-style-type: none"> • operational concept development, • both research and industrial prototype development and verification • validation planning, execution and evaluation
<p>Entity Profile matching the task</p>	<p>Air Navigation Service provider (ANSP), including job profiles of air traffic controllers, Air Traffic Management (ATM) specialists in the fields of safety, human factors, software engineering, validation specialists.</p>
<p>Contribution</p>	<p>In DFS, there is a need for improved separation provision and sector management in order to suit e.g. Free Route operational environment and Mixed Mode operations based on Area Navigation (RNAV) and Required Navigation Performance (RNP) specifications. In addition, new system functionalities and further steps of automation provide the chance to achieve significant operational benefits with regards to safety, capacity/productivity and cost-efficiency. New enhanced ATC tools and the development of new concepts are also required, to allow for different controller team and sector structures to suit various airspace structures like Free Route, various traffic levels and complexities. Also the need for higher controller productivity is a high priority in DFS, which needs to be addressed with new team organisations in order to decrease ATC related costs.</p> <p>PJ.10 Project Management: DFS intends to take responsibility for project management and co-ordination (lead role).</p> <p>Solution PJ.10-01b Flight Centric ATC: As a basic principle of Flight Centric ATC, a controller is no longer in charge of managing the entire traffic within a given sector. Instead, he is now responsible for a certain number of aircraft throughout their flight segment within a given airspace whereas other controllers are responsible for a certain number of different aircraft within the same airspace. This way of traffic control will not change the basic responsibilities given to the controller: The basic task of the controller will remain untouched: he has to ensure a conflict-free flight. The “Flight Centric ATC” team organisation is expected increase controller’s productivity and capacity.</p> <p>Within PJ.10-01b DFS intends to participate with controllers and operational experts to a V2 validation conducted by DLR and to conduct a V3 validation (joint validation with solution PJ.10-02b).</p> <p>Solution PJ.10-02a Improved performance in the provision of separation: This SESAR solution aims at improving the provision of separation in the En-Route and Terminal Manoeuvring Area (TMA) operational environment. Vertical and</p>

longitudinal separation will be ensured by tactical ATC intervention; however these instructions will be limited as much as possible through the use of enhanced tools and aircraft data which will allow predicting with low uncertainty the present and future aircraft positions. Conformance monitoring will assist the controller in maintaining situational awareness and relieving him from routine tasks.

Within PJ.10-02a DFS intends apply the controller assistance tools functionality to other partner’s ATM systems and to support V2 validation activities at other partner’s sites. Thus it shall be ensured that the controller assistance tools allow for capacity and productivity increase not only within the German, but also the European operational environment.

Furthermore the future development of the functionality will be ensured through conceptual activities and operational demonstrations.

Solution PJ.10-02b Advanced separation management: This SESAR Solution is the continuation of solution PJ.10-02a. In addition to solution 02a, vertical and longitudinal separation will be ensured by interventions recommended by the automated system that have to be confirmed by controllers and in exceptional cases by controller intervention.

Within PJ.10-02b DFS intends to conduct a V2 validation and a V3 validation (joint validation with solution PJ.10-01b).

Solution PJ.10-05 IFR RPAS integration: Airspace where IFR services are provided can be extremely complex, and there are many challenges surrounding the integration of Remotely Piloted Aircraft Systems (RPAS) into these environments. Research needs to be conducted to investigate ways in which RPAS may be able to use a technical capability or procedural means to comply with ATC instructions.

DFS intends to ensure that the RPAS integration is appropriate and feasible from the operational point of view.

4.1.1.2 AIRBUS

Organisation	2	AIRBUS	Industry
Description	<p>Airbus is a leading global manufacturer of the most innovative commercial aircraft. Its comprehensive product line comprises highly successful families of aircraft, from the single-aisle A320 Family to the double-deck A380.</p> <p>Over the last 45 years, Airbus has built a reputation on reacting to market demands, developing and evolving its products to meet the needs of customers and the wider world. As such, technological innovation has been at the core of Airbus’ strategy since its creation.</p> <p>The A320neo (new engine option) is the latest upgrade to the A320 Family. These new A319, A320 and A321 models feature new engines and large wingtip devices known as Sharklets. Together they result in a 15% fuel-burn reduction, corresponding to an annual CO2 reduction of 3,600 tonnes per aircraft.</p> <p>In the wide-body segment, the A350 XWB brings together the very latest in aerodynamics, design and advanced technologies to shape the efficiency of medium- to long-haul operations. The aircraft’s innovative all-new carbon fibre reinforced plastic fuselage results in lower fuel burn as well as easier maintenance. Meanwhile, the combination of low operating costs, flexibility and optimised performance makes the A330 Family popular with an ever-increasing operator base.</p> <p>The A380 provides airlines with the best opportunities to optimise revenue across their networks, with more seats for growth, connecting traffic and higher yields by offering more capacity when and where people want to fly.</p>		

<p>Previous experience</p>	<p>Airbus has thorough ATM knowledge of commercial air transport operations. More specifically for this operational project:</p> <ul style="list-style-type: none"> • Airbus has been a key player of 4D trajectory activities performed in SESAR1, in particular through the leadership of projects 09.01 “Airborne Initial 4D Trajectory Management” and 09.02 “Airborne Full 4D Trajectory Management & 4D contract capability”, achieved by the development of the avionics prototype used by the Large Scale SESAR Demonstration Activity “PEGASE (Providing Effective Ground and Air Data Sharing via EPP (EPP Extended Projected Profile))”. In SESAR 1 context, • Airbus has then been closely associated to various aspects the 4D trajectory management: from the operational concept definition up to the validation activities and the way aircraft downlinked information could be optimally used (e.g. coordination of a task force in support of Pilot Common Project – ATM function #6 “initial trajectory information sharing”). • Airbus has a key expertise with regard to aircraft behaviour according to various separation technics (i.e. lateral, vertical, speed adjustments) that can be selected by the ATC.
<p>Entity Profile matching the task</p>	<p>As the leader aircraft manufacturer, capable of managing large complex programmes. Airbus staffs are highly skilled professionals, competent and motivated in their fields and well accustomed to working within an international, multicultural environment.</p>
<p>Contribution</p>	<p>Airbus will contribute to Solutions PJ.10-02a, and PJ.10-02b. For detailed Airbus contribution description, please refer to section 3 of this Technical Annex.</p> <p>Of course, as the major global aircraft manufacturer, capable of managing large complex programmes, Airbus is also ready and willing to lead the Airborne Industry Coordination.</p>

4.1.1.3 Naviair/COOPANS

Organisation	3 Naviair/COOPANS	Air Navigation Service Provider
<p>Description</p>	<p>Naviair is a 100% state owned company originating in “Statens Luftfartsvæsen” founded in 1938. Headquarter is located in Copenhagen (TWR/APP/En-route) and subdivisions are located in Roskilde, Billund, Århus, Rønne and Ålborg (TWR/APP) and in Vagar & Nuuk (FIS/FIC).</p> <p>Naviair has three main divisions - Operations, Technical Maintenance and ATM Projects & Engineering supported by Corporate Services.</p> <p>Naviair is a member of COOPANS Consortium consisting of 5 Air Navigation Service Providers: Austro Control (ACG), Croatia Control (CCL), Irish Aviation Authority (IAA), Luftfartsverket (LFV) and Naviair. Cooperation between COOPANS partners goes beyond SESAR – partners has for a long time worked together with Thales under a common framework agreement in a joint program based on the incremental development of a common ATM platform.</p> <p>The overarching goal for COOPANS is to enable each individual ANSP to achieve financial savings through cost, resource, and competence sharing and to meet the EU objective of harmonizing ATM systems. This work is now expanded to Research & Innovation by the establishment of the COOPANS Consortium.</p> <p>Naviair has many years of experience, both in the delivery of Air Traffic Services; design of concepts and in development, validation and implementation of Air Traffic Management tools. The company is certified ISO 9001.</p>	
<p>Previous experience</p>	<p>Naviair has participated in SESAR via NORACON consortium in the following WPs:</p>	

	<p>WP00 SESAR2020 preparation 00.14, 00.15</p> <p>WP3 Validation infrastructure adaptation and integration: 3.2.1, 3.2.2, 3.3.2, 3.3.3 WP5 TMA Operations: 5.3, 5.6.1, 5.6.4, 5.6.7, 5.9</p> <p>WP6 Airport Operations: 6.8.4</p> <p>WP7 Network Operations: 7.5.4</p> <p>WP 8 Information Management: 08.1.3, 8.1.5, 8.1.9, 8.3.4, 8.3.10</p> <p>WP 10 En-Route & Approach ATM Systems: 10.2.1, 10.2.3, 10.3.1, 10.3.8, 10.9.4, 10.10.3</p> <p>WP 14 SWIM Technical Architecture: 14.1.3, 14.4</p> <p>WP 16 R&D Transversal Areas: 16.2.3, 16.6.2</p> <p>WP B Target Concept and Architecture Maintenance: B4.2, B4.3, B4.5</p> <p>WP C Master Plan Maintenance: C2 & C3</p> <p>Development of separation management tools and safety tools –Implementation of 4D trajectory management ATM system (2004-2007) (COOPANS since 2012).</p> <p>Implementation of Free Route H24 in DK/SE FAB (2011).</p>
Entity Profile matching the task	<p>Naviair has a lot of expertise in development of separation and safety tools. The previous ATM-system (CATCAS 1988-2008) was developed in-house, and many of the experts involved is now working with Thales on development of the functionalities in the current ATM-system TopSky.</p> <p>Expertise is present in the company in many areas:</p> <ul style="list-style-type: none"> • Development and supervision of operational concepts • Safety concepts & Safety Assessments • Airport safety support tools • Collaborative Decision Making • Air traffic forecast/Capacity planning incl. runway capacity enhancement • CWP design • Development and implementation of ATM systems & Tools (common development and implementation of TopSky) • Trajectory management (core functionality in TopSky) • Development and implementation of safety and monitoring tools (core functionality in TopSky – 4D MTCD) • Flight procedures, special approach procedures (incl. RNAV) • Performance Based Navigation • Validation and Integration • Participation in European deployment activities (IDSG) • Human Performance Assessment
Contribution	<p>Naviair will participate with operational experts (ATCOs) with focus on concepts and operational issues.</p>

4.1.1.4 DSNA

Organisation	4	DSNA	Air Navigation Service Provider
Description	<p>DSNA (Direction des Services de la Navigation Aérienne) is the national Air Navigation Services Provider of France. DSNA is entrusted with the provision of air traffic services, associated communication, navigation and surveillance services and aeronautical</p>		

	<p>information services in all airspace under French responsibility and at designated airports. DSNA is member of A6, FABEC and SESAR JU. DSNA has supported the principle of the SESAR programme since its inception, has participated as a major contributor to its definition phase study and is a major active contributor to the current development phase.</p>
<p>Previous experience</p>	<p>Publications:</p> <p>SESAR 1 P04.02 D98 & D08 En Route Detailed Operational Description Step 1 and 2</p> <p>SESAR 1 P04.02 D97 En Route Concept Validation Strategy document Step 1</p> <p>SESAR 1 P04.07.02 D22 Preliminary Operational Service and Environment Definition (OSED)_4</p> <p>SESAR 1 P04.07.02 D37 Free Route Operational Service and Environment Definition (OSED) for Step 1 - iteration 2</p> <p>Previous projects:</p> <p>In SESAR 1 DSNA led more particularly :</p> <ul style="list-style-type: none"> • WP04 (En Route operations) • P04.07.02 (Separation Task in En Route Trajectory based environment) • “Ground-Based Separation provision in En Route” Operational Focus Area (OFA 03.03.01) • Free Route Operational Focus Area (OFA 03.01.03) • P04.02 (Consolidation of operational concept definition and validation including operating mode and air-ground task sharing – En Route) <p>DSNA was also involved or led various projects in WP3, WP4, WP5, WP6, WP7/13, WP B, WP C...</p>
<p>Entity Profile matching the task</p>	<p>DSNA has extensive experience of research, development, validation and implementation of advanced trajectory prediction and conflict detection concepts and tools for separation management. This is a key topic where DSNA has played a significant role in the current SESAR 1 Programme as WP4 leader and project 4.7.2 manager. As a core part of ATC service provision, the work to be carried out in SESAR 2020 is of strategic importance to DSNA in order to meet the future traffic demand.</p> <p>DSNA has been involved in the SESAR JU RPAS Demonstrators ODREA and TEMPAERIS. In these projects, the feasibility of RPAS integration in civil airspace has been demonstrated. DSNA experience of such projects and the tight collaboration with industrial people is very relevant for SESAR 2020 RPAS solutions.</p>
<p>Contribution</p>	<p>DSNA will lead the Solution PJ.10-02a and contribute to the Solutions PJ.10-01b, PJ.10-01c and PJ.10-05.</p> <p>For information, DSNA will also contribute to the Solution PJ.10-02b in Wave 2 only, which is not covered by the present call.</p> <p>In continuation with its current activities, DSNA will pursue its strong involvement to enhance tools developed in SESAR 1 such as What-if, Conflict Resolution, Extended ATC Planner. These activities will take place in a Free Route environment with current or dynamic sectorisation. A contribution to Flight Centric ATC, Collaborative Control and IFR RPAS Integration topics is also planned.</p> <p>As an ANSP, DSNA can also provide operational and to some extent technical experts (incl. regulation expert).</p>

4.1.1.5 ENAIRE

Organisation	5 ENAIRE	Air Navigation Service Provider
Description	<p>The Spanish Business Public Entity “Entidad Pública empresarial ENAIRE”, hereinafter referred to as “ENAIRE”, is the entity designated by the Spanish State to provide Air Navigation Services for En-Route and Approach phases, ruling seven En-Route/TMA ATC Centres and 22 Control Towers, being one of the major Air Navigation Service Providers in Europe.</p> <p>Airspace under ENAIRE control includes the Peninsula Ibérica (except Portugal), Balearic and Canary Island, and part of North Atlantic, West Mediterranean and West Sahara.</p> <p>ENAIRE is a major European company in ATM, R&D and project management in the field of Airspace and Air Navigation and a founding member of the A6 alliance, which represents the ANSPs common view within SESAR programme.</p> <p>ENAIRE has already been an active part of SESAR programme from the very beginning and has substantially contributed as a SJU member in the different fields of airport and air navigation services management, planning and provision, and other ATM R&D related activities, in order to support the cooperative accomplishment of the European ATM Target Network and the associated European ATM Master Plan. As a quantitative illustration of this commitment, the more than 90 SESAR projects in which ENAIRE has been involved up to the present could be mentioned, playing a leading role in 16 of them.</p> <p>As a services provider and also as owner of related systems and infrastructure, proactive promoter of research and development activities which are at the leading edge and highly experienced executor of validation and system integration processes, ENAIRE expects to maintain its participation in the SJU as one of its major members in those areas of activity where its technical and managerial expertise and know-how, systems and projects can bring the most added value to the deployment of the European ATM Master Plan.</p> <p>The added value provided to SESAR 2020 by ENAIRE and its linked third parties is based in the large set of available assets:</p> <ul style="list-style-type: none"> • Up to seven En-Route/TMA ATC centres, covering both continental and oceanic airspaces, fitted with an advanced and evolving ATM system (SACTA/LIS ATM and in the future iTEC). Four of them, those covering the continental Spanish airspace, interconnected and working as a network; • Platforms are able to assume validations and simulations in a wide range of maturity levels, covering from the more immature phases of the R&D till complex simulations using both industrial products and also prototypes; • Air traffic controllers (ATCOs) from different ACC’s, who are familiar with traffics, contingencies and events of multiple characteristics; and also from towers of different categories; • Engineers/ATCOs with vast expertise on the definition of future CNS and ATM. <p>Paving the way for deployment of mature concepts, especially those included in the PCP, will constitute a paramount and permanent priority for ENAIRE.</p>	
Previous experience	<p>Previous projects:</p> <p>ENAIRE has already been participating in different projects related to Separation Management in En-Route and TMA environments, not only in the SESAR 1 context but also in the iTEC collaboration with our partners INDRA, NATS, LVNL and DFS (iTEC is a joint project – among the mentioned companies – to develop the new generation of Flight Data Processing System and Controller Working Position). This makes ENAIRE to count on a great expertise in this field.</p>	

	<p>ENAIRE has contributed within the frame of SESAR 1 to the following separation management related projects:</p> <ul style="list-style-type: none"> • Project 4.2, Consolidation of operational concept definition and validation including operating mode and air-ground task sharing; • Project 4.7.3, Use of Performance Based Navigation (PBN) for En Route Separation Purposes; • Project 4.7.8, Controller Team Organisation, roles and responsibilities in a trajectory based operation within En-Route airspace (including multi-sector planner); • Project 5.7.2, Development of 4D Trajectory-Based Operations for separation management using RNAV/PRNAV; • Project 5.7.3, Controller Team Organisation, Roles and Responsibilities in a Trajectory Based Operation (including Multi-Sector Planner). <p>Within these projects, ENAIRE has participated in both operational concept development and has been also responsible for the conduct of several V2 validation exercises (VP-738, VP-741, VP-267 and VP-196).</p> <p>Additionally, ENAIRE and its linked third parties has contributed to several Framework Programme (FP) projects such as:</p> <ul style="list-style-type: none"> • EPISODE 3, Single European Sky Implementation support through validation, FP6, 2004-2010, Key Performance Targets for the future ATM system. • RESET, Reduced Separation Minima, FP6, 2006 – 2009, identification of reductions in separation minima. • GATE TO GATE, Validation of a European ATM gate to gate operational concept for 2005 – 2010, FP5, 2002-2005, operational concept development and validation. <p>Regarding deployment activities, the Spanish Automated Air Traffic Control System (SACTA) has been continuously evolved. One example could be the following TENT-T project:</p> <ul style="list-style-type: none"> • FRASAI, TENT-T, 2014, Free Routing concept implementation in Santiago – Asturias sector. <p>Finally, ENAIRE is currently taking part in two SJU promoted RPAS demonstration initiatives:</p> <ul style="list-style-type: none"> • ARIADNA, Activities on RPAS Integration Assistance and Demonstration for operations in Non-segregated Airspace; <p>DEMORPAS, Demonstration Activities for Integration of RPAS in SESAR.</p>
<p>Entity Profile matching the task</p>	<p>Operational Expert, ATC system expert, En-Route and App Air Traffic Controllers, validation expert, human factors expert and performance expert.</p>
<p>Contribution</p>	<p>ENAIRE is highly interested in the improvement of provided air navigation service in En-Route and TMA phase, especially in terms of capacity and quality of service (i.e. QoS). The final development, industrialization and deployment of ground supporting tools such as conflict detection and resolution tools and ground-based conformance monitoring tool, are keystone for improving those Key Performance Indicators (KPIs), meeting also at least the existing safety levels. With that objective in mind, ENAIRE would be deeply involved in the operational validation activities that would be executed on an Industry Based Platform (IBP, iTEC-based). These activities would aim to evolve the concept and its supporting technology from a V2 maturity level to a final V3 maturity level.</p>

ENAIRE will count on advanced iTEC IBP for the validation activities on the varied operational scenarios available in the large south Mediterranean and Atlantic (including oceanic) areas. The use of automation for separation management together with the advantage of new staffing schemes (new roles) in the OPS room and the different complexity environments, including very high complexity transition airspace, will also be central aspects in the validation activities.

ENAIRE is also committed to improve TMA traffic management exploring operational solutions from a holistic point of view by the extensive use of automation (MTCD, AMAN), improved communications and systems interoperability and airspace design together with new operational roles (MSP, Single Person Operation – SPO). In this way the increased predictability will be complemented with a better tactical management of flows and an optimal resolution of tactical conflicts.

Finally, ENAIRE will be involved in the RPAS integration tasks, providing support to validation activities.

4.1.1.6 ENAV

Organisation	6 ENAV	Air Navigation Service Provider
Description	<p>ENAV is one of the major European Air Navigation Service Providers in terms of volume of controlled airspace, number of flights managed, investments in technology innovation and R&D.</p> <p>ENAV is a Joint-Stock Company, 100% owned by the Italian Ministry of Economy and Financial Planning, in charge of the provision of air navigation services within the airspace and the airports placed under its own responsibility by the Italian Government.</p> <p>In particular, the company has the responsibility for the provision of the following institutional services:</p> <ul style="list-style-type: none"> • Air Traffic Control; • Aeronautical communications and radio-navigation; • Aeronautical Information Service and Management; • Aeronautical cartography and obstacle charts; • Airspace and flight procedure design; • Airport air-side operations design; • Aeronautical meteorology; • Maintenance and logistics management of CNS/ATM systems; • Flight inspection; • Recruitment, Training and Licensing of ANS Personnel; • R&D and studies on any matter related to ATS. <p>Staffed by more than 4.100 people, its H.Q. are located in Rome; Its ATS infrastructure includes four ACC, 19 APP units, 27 TWR units and 20 AFIS units plus a broad variety of CNS/ATM systems and assets spread all over the country to guarantee continuous operations, extensive service cover and adequate systems redundancy.</p> <p>About 2.0 million flights per year are safely managed in a complex operating scenario with significant operational and economic performance results internationally acknowledged.</p>	

ENAV has an outstanding expertise in Air Traffic Management operations and services, in the development and validation of concepts, system prototypes and procedures for the continuous improvement of its operational performance, in providing its staff with a continuous competency up-dating and operational training, in assisting the supply industry to design and engineer new systems to safely support the ATM operational personnel in their highly demanding tasks.

About its involvement in international activities/panels, ENAV is member of SJU since 2007, member of the SDA Consortium in charge of the SESAR Deployment management, member of A6 Group (strategic alliance amongst some of the largest and most influential European ANSP), member of CANSO (Civil Air Navigation Services Organisation), member of European CANSO CEO Committee (EC3) as well as member of ESSP (European Satellite Services Provider).

In addition to the above participation, ENAV experts are actively involved in the most important committees, working groups, expert panels dealing with CNS/ATM matters with special regard to ADS, ASAS, A-SMGCS, VHF digital communication systems, Satellite Navigation Systems (e.g. EGNOS and Galileo), advanced automated Flight Data Processing Systems and Surveillance Data Processing Systems (e.g. 4-Flight/Coflight).

In line with its mission, ENAV, through its participation in the BLUE MED FAB, is playing a leading role in the Mediterranean Area by promoting synergies with other Service Providers and of neighbouring regions in support of the Single European Sky Implementation.

ENAV Group includes the three 100% controlled companies: Techno Sky S.r.l., SICTA and ENAV Asia-Pacific.

More recently, ENAV invested 61M\$ by purchasing 12,5% of Aireon, a U.S. Company, founded by Iridium group and owned 51% by NAVCANADA. The company intends to deploy the first global surveillance satellite system by 2018, exploiting Automatic Dependent Surveillance – Broadcast (ADS-B) OUT technology and the mandates which will impose, to most commercial aviation around the world, to equip their aircraft with ADS-B OUT transponders.

Previous experience

Previous projects:

ENAV is involved in R&D, strategic planning, technical co-operation and service provision programs with international organisations (e.g. SESAR Joint Undertaking, EUROCONTROL, European Commission, ESSP) and foreign countries, aiming at contributing to the advancement of ATM technology and processes and at improving the service level provided.

ENAV has a long lasting experience in international initiatives and has been participating, managing, coordinating and actively contributing to several international projects and large scale researches, developments and validations.

Previous R&D projects:

- SESAR 1 (WPB, WPC, WP3, WP4, WP5, WP6, WP7, WP8, WP10, WP12, WP13, WP14, WP15, WP16)
- SESAR 1 Very Large Scale Demonstrations:
- ATC Full Datalink (AFD)
- WE-FREE
- MEDALE
- RACOON
- FREE SOLUTIONS

	<ul style="list-style-type: none"> • BEYOND (H2020, 2015-2017) • DARWIN (H2020, 2015-2018) • SAWSOC (FP7, 2013-2016) • GAMMA (FP7, 2013-2017) • FUTURE SKY SAFETY (H2020, 2015-2019) • OPTIMAL (FP6, 2004-2008) • AD4 (FP6, 2005-2007)
<p>Entity Profile matching the task</p>	<p>ENAV profiles matching the tasks include:</p> <ul style="list-style-type: none"> • ATM Operational expert • Air Traffic Controllers • Human factors expert • RPAS expert • Safety expert <p>All those skills will be made available by ENAV to prepare and conduct ad hoc validation activities (as Real Time Simulation – RTS).</p>
<p>Contribution</p>	<p>ENAV will lead the Project Solution PJ.10-05 and contribute to the Project Solutions PJ.10-01a, PJ.10-01c, PJ.10-02a and PJ.10-02b.</p> <p>Specifically, ENAV will focus on the typical one Planner to several Executive Controllers MSP organisations and concentrate on the efficient and safe distribution of responsibility for traffic and separation management across the team, in order to address at V3 level the OI Step CM-0303 "Sector Team Operations Adapted to New Responsibilities in En route, 1 Planning to several Tactical Controllers team structure". Contribution to the concept development for the OI Step CM-0304 is also proposed. (PJ.10-01a)</p> <p>Moreover, ENAV intends to focus on advanced controller tools which allow reduction and change in coordination procedures and sector team role related to operating procedures in En-Route, in order to address and to validate the OI Step CM-0306 "Sector Team Operations Adapted to New Responsibilities and Operating Procedures involving reduced Coordination in En route", at V2 level. Contribution to the concept development for the OI Step CM-0305 is also proposed. (PJ.10-01c)</p> <p>Contribution to the solution PJ.10-02a will be dedicated to the assistance to be provided to the controllers for their separation tasks by enhanced tools with improved technical functionalities and with innovative Human Machine Interface (HMI) features, both in the En-route and TMA operational environments. The OI Steps that will be addressed at V2 and V3 level: CM-0209 "Conflict Detection and Resolution in En Route using trajectory data in Predefined and User Preferred Routes environments"; CM-0210 "Ground Based Flight Conformance Monitoring in En Route using Trajectory Data"; CM-0206 "Conflict Detection and Resolution in the TMA using trajectory data", CM-0208-A "Automated Ground Based Flight Conformance Monitoring in the TMA in Step 1". Contribution to the concept development for the OI Steps CM-0605, CM-0606 and CM-0403-A is also proposed.</p> <p>Contribution to the validation of enhanced conflict detection and resolution and enhanced monitoring aids with innovative HMI features, both in the En-Route and TMA operational environments, in order to address at V2 level the OI Steps CM-0207-B "Automated Ground Based Flight Conformance and Intent Monitoring in En Route in Step 2", CM-0407 "Enhanced Conflict Detection and Resolution in En Route", CM-0208-B "Automated Ground Based Flight Conformance and Intent Monitoring in the TMA" and</p>

	<p>CM-0408 "Enhanced Conflict Detection and Resolution in the TMA". Contribution to the concept development for the OI Steps CM-0607, CM-0608 and CM-0403-B is also proposed. (PJ.10-02b)</p> <p>Validation work will be addressed in Fixed and Free Route environments for En-route phase of flight.</p> <p>ENAV will also investigate RPAS operations (PJ.10-05) in and out in TMA during transition from / to En-Route airspace according to IFR rules.</p> <p>In line with solution activities the following potential enablers could be considered:</p> <ul style="list-style-type: none"> • ATC Procedures design • ATC and remote pilots roles and responsibilities definition • ATC and remote pilots working methods definition • Detect & Avoid (D&A) system • Definition criteria for operating in TMA areas in IFR rules • Compliance with multiple ATC instructions • Procedures in case of loss of voice communication, C2 or in an emergency
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4.1.1.7 Finmeccanica

Organisation	7	Finmeccanica	Industry
Description		<p>Finmeccanica is a global player in the high-tech sectors and a major operator worldwide in the Aerospace, Defence and Security sectors. Finmeccanica is based in Italy, has about 47,000 employees (latest updates 11/30/2015), of whom about 37% abroad, and in 2014 recorded 14.6 billion euro in revenues and received orders in the amount of 15.6 billion. Gianni De Gennaro has been the President since 4 July 2013 and Mauro Moretti has been the CEO and General Manager since 15 May 2014.</p> <p>Finmeccanica designs and creates products, systems, services and integrated solutions both for the defence sector and for public and private customers of the civil sector, both in Italy and abroad.</p> <p>The wide range of defence and security solutions that Finmeccanica offers governments, private citizens and institutions includes every possible intervention scenario: airborne and terrestrial, naval and maritime, space and cyberspace. In close contact with local customers and partners, Finmeccanica works every day to strengthen global security, provide essential physical protection and cybersecurity services for people, territories and infrastructure networks and supports scientific and technological research.</p> <p>Finmeccanica operates in about 20 countries with offices and industrial plants in all of the five continents and can rely on a very large network of subsidiaries, joint ventures and international partnerships, with significant industrial presence in three main markets, United Kingdom, Poland and United States and structured partnerships in the most important high potential markets in the world. The new Finmeccanica is the culmination of a radical renewal and transformation process: from a financial holding company to a great integrated industry focused on four activity sectors:</p> <ul style="list-style-type: none"> • Helicopters • Aeronautics • Aerostructures • Electronics Defence and Security Systems • Space 	

Finmeccanica operates through seven divisions that have inherited the activities of its 100% owned companies (AgustaWestland, Alenia Aermacchi, Selex ES, OTO Melara and WASS):

- Helicopters
- Aircraft
- Aerostructures
- Airborne & Space Systems
- Land & Naval Defence Electronics
- Defence Systems
- Security & Information Systems

Finmeccanica also retains Parent Company and Corporate Centre functions for participated companies and joint ventures not included in the divisional scope. These are: the US subsidiary DRS Technologies, which deals with the supply of products, services and integrated support for the military, intelligence agencies and defence companies; ATR, the joint venture established with Airbus Group for the manufacture of regional aircraft; MBDA, the joint venture established with BAE Systems and Airbus Group for missile systems; Telespazio and Thales Alenia Space, the two joint ventures established with Thales as part of the Space Alliance, for satellite services and the manufacture of satellites and orbiting infrastructures, respectively.

Previous experience

Previous projects:

Finmeccanica S.p.a. involvement in the ATC domain extends to the participation several programs; among others:

- SESAR – The European program carried out by a large Consortium of stakeholders (Air Navigation Service Providers, Aircraft Operators, Airport Companies, Eurocontrol, etc.) for the implementation of the Single European Sky concept for the operational and technical interoperability in Europe
- EMMA1 – Preoperational validation of A-SMGCS level 1, 2 (ICAO Spec.)
- SWIM-SUIT – A European program carried out by a Consortium led by Finmeccanica S.p.a. for the technical implementation of the System Wide Information Management (SWIM) concept, i.e. the information sharing among different actors (Air Navigation Service Providers, Aircraft Operators, Airport Companies, CFMU, etc.)
- Faraway I /Faraway II – Fusion of Radar and ADS data through two way data link
- ADS MEDUP – ADS Mediterranean Upgrade Program
- MFF– Mediterranean Free Flight
- EGNOS – European Geo-stationary Navigation Overlay System
- HLM – High Level Modeling for ATM system design through advanced modeling technique
- ICOG IOP – Feasibility and high level specification for IOP between European FDP
- CFMU FOS – EUROCONTROL study to investigate how to integrate a CFMU FOS with the ATC FOSs defined by ICOG.
- CARDAMOM – Advanced CORBA 3 based middleware for ATM domain application
- CATM – Ground Based Collaborative Management
- Coflight – A project for the design, development, testing and deployment of a European Flight Data Processing System based on a middleware CORBA compliant

	<p>In the frame of SESAR project, Finmeccanica was responsible for providing and supporting the platforms, prototypes and mock-up for the following SESAR1 WPs: WP3, WP4, WP5, WP6, WP7, WP8, WP9, WP10, WP12, WP13, WP14, WP15, WP16 and WPB.</p> <p>Especially for WP 10.04.01 (Enhanced Tools for Conflict Detection and Resolution), Finmeccanica was in charge of platform and prototypes development for supporting the verification and validation activities conducted in the EXE-04.03-VP-798.</p> <p>FINMECCANICA was also involved in the participation of MedALE R&D project.</p>
Entity Profile matching the task	Industrial global player in the high-tech sector, including job profiles of system engineer, software and architecture specialists, validation and platform experts, aircraft and RPAS experts.
Contribution	<p>Finmeccanica will participate to the project as technical contributor. In particular the contribution will consist in:</p> <ul style="list-style-type: none"> - within PJ10-1A, Finmeccanica is going to be involved as prototype supplier in validation activities that will be performed in the frame of solution PJ10-2A as well as reviewer of concept description and development - within PJ10-1C, Finmeccanica is going to be involved as prototype supplier in validation activities that will be performed in the frame of solution PJ10-2B as well as reviewer of concept description and development - within PJ10-2A, Finmeccanica is going to be involved as prototype supplier in validation activities that will be performed jointly with solution PJ10-1A as well as reviewer of concept description and development. The aim is to use enhanced tools with improved technical functionalities to assist controllers in their separation tasks, performing assessments on the benefits resulting from the introduction of these functionalities in the ATM system. - within PJ10-2B, Finmeccanica is going to be involved as prototype supplier in validation activities that will be performed jointly with solution PJ10-1C as well as reviewer of concept description and development. The aim is to continue the development of platform, prototypes and concepts started in the frame of PJ10-2A and PJ10-1A - within PJ10-5, Finmeccanica is going to be involved as prototype supplier in validation activities. The aim is to investigate RPAS operations in and out in terminal airspace during transition from / to en-route airspace according to IFR rules. Finmeccanica, with its prototype, will also support the validation of the following aspects: <ul style="list-style-type: none"> • RPAS automated capability dealing with the management of the separation issues in coordination with ATC, • interoperability between the DAA application for RPAS and the ASAS applications of the ATM framework.

4.1.1.8 Skyguide

Organisation	8	Skyguide	Air Navigation Service Provider
Description	Skyguide is the civil and military ANSP of Switzerland.		

Skyguide performs its services under a legal mandate issued by the Swiss Confederation and the Federal Office of Civil Aviation (FOCA), Switzerland's national aviation authority. This mandate requires Skyguide to ensure the safe, fluid and cost-effective management of air traffic in Swiss airspace and in the adjacent airspace of neighbouring countries that has been delegated to its control. Skyguide's legally-prescribed duties and tasks entail providing civil and military air navigation services, aeronautical information and telecommunications services and the technical services required to install, operate and maintain the associated air navigation systems and facilities.

Skyguide is fully committed to its public service mandate. Switzerland's Air Navigation Service Provider is an entrepreneurially-minded and customer-focused joint-stock company under Swiss private law which has its head office in Geneva.

Skyguide manages En-Route operations from Geneva and Zurich Area Control Centres (ACC), and further provides Terminal and Aerodrome control operations for Geneva and Zurich international airports and for regional and military airports located in Alpnach, Bern, Buochs, Dübendorf, Emmen, Grenchen, Locarno, Lugano, Meiringen, Payerne, St. Gallen-Altenrhein and Sion regional airports.

Located in the middle of the European ATM Network, Skyguide is able to provide front-end expertise of a dynamic ANSP, dealing with the highest density and complexity airspace of Europe. In 2015, Skyguide handled 1.4 Million IFR flights, 204000 VFR flights and 2400 tactical air force missions with a very high safety and punctuality levels. In order to ensure the required level of performance in this really specific operational environment, Skyguide adopts innovative approaches in various domains like new technologies (e.g. satellite navigation), advanced automated ATC support tools and HMIs, centralised ATC data processing systems. As confirmed by the European air traffic control agency Eurocontrol, Skyguide has continuously both increased airspace capacity and enhanced the punctuality of the flights over the past 10 years.

For further information visit us at: www.skyguide.ch

Previous experience

Previous projects:

SESAR 1 :

Skyguide is associate partner of DSNA and DFS and contributes in following Work Packages:

- **WP-4.2 (DSNA):** Consolidation of operational concept definition and validation including operating mode and air-ground task sharing
- Skyguide has the lead on the Detailed Operational Description (En-route CONOPS)
- **WP-4.3 (DSNA):** Integrated and pre-operational validation & cross-validation
- IOP validation exercises
- Free Route validation exercises performed on Skyguide SCCD platform
- **WP-4.7.1 – WP13.2.3 (DFS):** Complexity Management in En-Route Dynamic - Demand Capacity Balancing
- STAM Measures validation exercises
- Flight Adherence to Constraints for regulated flight at arrival
- **WP-10.2.5 (DSNA):** Flight Object IOP System Requirement & Validation
- Participation to IOP Requirements
- **WP-C2 (DSNA):** Deployment Performance Planning and Reporting
- Participation to the Master Plan maintenance

- **WP-16.6.5 (DFS):** Human Performance Support and Coordination Function
- **WP-B4.4 (DSNA):** Workstation, Service Interface Definition
- Definition of interface between CWP and external services
- Set-up of a demonstrator using Coflight services connected to skyvisu HMI
- **OFA-03.01.01 (DSNA):** Free Route and Advanced Flexible Use of Airspace
- Participation to the Free Route & AFUA concept
- Free Route exercises Validation on Skyguide SCCD platform

In addition Skyguide is participating to several large scale demonstrations:

- **WeFree (Air France):** Week-end Free Route trials (Swiss, Italy and France airspace)
- **Fairstream (DSNA):** Enhanced Arrival Management trials
- **Pegase (Airbus):** "Providing Effective Ground & Air data Sharing via Extended projected profile"
- **iStream (DSNA):** "Integrated SESAR Trials for Enhanced Arrival Management"
- **Free Solutions (ENAV):** "Free Route Environmental and Efficient Solutions"
- **ODP (DFS):** "Optimised Descent Profile"
- **AAL (Netjets):** "Augmented Approach"
- **PROuD (IDS):** PBN Rotorcraft Operations Under Demonstration

Other European Programmes:

- **Eurocontrol FASTI:** First Air traffic control Support Tools Implementation programme. Awarded as FASTI Pioneer
- **FASTI SYSCO:** Full Electronic System Intercentre Coordination live trials
- **CATS (Eurocontrol):** Contract Based Air Transportation System simulation

Entity Profile matching the task

Air Navigation Service Provider including profiles:

Operational expertise:

- En-Route and TMA air traffic controllers acting in one of the most complex ATC environment
- Ops experts : experts already contributing to SESAR 1

Simulator expertise:

- Simulator team use to prepare and run R&D simulation

Technical Development expertise:

- Major software developments of the operational system
- Dedicated software development team for R&D.

Safety expertise:

- Safety expertise – operation expertise

Human Performance expertise:

	<ul style="list-style-type: none"> • HP team expertise – operation expertise
<p>Contribution</p>	<p>Within the core area, Skyguide shall be innovative in all fields of ATC/ATM in order to provide required performance to the ATM network. Therefore Skyguide is already operating ATC/ATM with advanced ATC tools and is willing to further investigate new system functionalities and new steps of automation and team organisation.</p> <p>Solution PJ.10-01a High Productivity Controller Team Organisation:</p> <p>New team structures such as the combined role of SPO and the MSP will be explored in this solution. Objectives of this new roles are to have a Planner responsible for the airspace under the executive control of two or more independent Executive Controllers (1P-nE) with the purpose to balance the workload among them. The Solution focuses on the typical one Planner to several Executive Controllers MSP organisations and concentrates on the efficient and safe distribution of responsibility for traffic and separation management across the team.</p> <p>Skyguide intends to lead PJ.10-01a Solution and conduct a V2/V3 validations with controllers and operational experts using the platform developed also for PJ.10-02a and PJ10-02b.</p> <p>Solution PJ.10-02a Improved performance in the provision of separation:</p> <p>This SESAR solution aims at improving the provision of separation in the En-Route and TMA operational environment. Vertical and longitudinal separation will be ensured by tactical ATC intervention; however these instructions will be limited as much as possible through the use of enhanced tools and aircraft data which will allow predicting with low uncertainty the present and future aircraft positions. Conformance monitoring will assist the controller in maintaining situational awareness and relieving him from routine tasks.</p> <p>Within PJ.10-02a Skyguide intends to validate controller assistance tools functionalities in a wide environment including neighboured airspace and largely involving airborne side. It shall ensure that the operational concept and associated controller assistance tools will allow for capacity and productivity increase within a European operational environment.</p> <p>Solution PJ.10-02b Advanced separation management:</p> <p>This SESAR Solution is the continuation of solution PJ.10-02a. In addition to solution 02a, vertical and longitudinal separation will be ensured by interventions recommended by the automated system that have to be confirmed by controllers and in exceptional cases by controller intervention.</p> <p>Within PJ.10-02b Skyguide intends to conduct V3 validation in a wide environment including neighboured airspace and largely involving Airborne side. It shall further ensure that the operational concept and associated controller assistance tools will allow for capacity and productivity increase within a European operational environment.</p> <p>Solution PJ.10-06 Generic' (non-geographical) Controller Validations:</p> <p>This SESAR Solution aims at studying more flexibility in the ATCO validation regime by identify the human, system and procedural needs for new controller roles. Objective is to define for example generic “sector-type validations” that would allow a controller to operate in any airspace classified as a particular type. It will also define what additional aids (information, support in emergencies, fall-back modes of operation, etc.) are needed in addition to the pure sector and separation management ones to allow a safe operation with more flexibility of controller deployment.</p> <p>Within PJ.10-06 Skyguide intends to perform V1 validation. Skyguide will contribute to several activities in the above solutions:</p> <ul style="list-style-type: none"> • OSED/SPR/INTEROP, • V1 Validation Plan,

- V1 Validation exercise,
- V1 Validation Report.

4.1.1.9 SAAB (NATMIG)

Organisation	9 SAAB (NATMIG)	Ground Industry
Description	<p>Saab AB is part North European ATM Industry Group (NATMIG) Consortium. NATMIG is a member of SESAR 1. The NATMIG consortium consists of Airtel ATN (SME - Ireland), Saab AB (multinational industrial concern - Sweden) and Stiftelsen SINTEF (non-profit research foundation - Norway) , where the latter one will be the coordinator.</p> <p>While Saab originates in military and civil aircraft manufacturing and is one of the few companies in the world with the ability to develop, integrate and maintain complete aircraft systems, we are today active in several transport modes and a global supplier in the ATM domain.</p> <p>Saab’s over 75 years of history in aeronautics, over 4000 civil and military aircraft produced and as well as our broad involvement in ATM businesses, provide a solid background and deep competence in aeronautics in general and RPAS in specific. For the future we plan to continue to be able to provide market-leading aeronautical products including manned and unmanned (RPAS) products that can operate safely in civil airspace, as well as solutions to facilitate others to allow safe RPAS operations in their airspace, whether it's an RPA, a Detect & Avoid system or related ATM components.</p> <p>Saab is a global supplier in the ATM domain and Saab has a long history of developing and delivering ATM solutions. Saab has pioneered future concepts such as the Remote Tower, which in operational use in Sweden and is undergoing trials in several other countries. In total, Saab has deployed 240 ATM systems and subsystems to serve over 60 customers in 40 countries. Our air traffic management systems and tools serve 18 of the 20 busiest airports in the world, 10 of the 12 largest Air Navigation Service Providers (ANSPs), and the 3 largest airlines by passenger count. Saab ATM systems guide 2 million aircraft movements each month via our airport surface safety systems.</p> <ul style="list-style-type: none"> • 	
Previous experience	<p><u>Past experience</u></p> <p>This list provides sample activities with relevance for PJ10-05 Please see 2014 Expression of Interest for further details. Ongoing activities of relevance are summarized above.</p> <ul style="list-style-type: none"> • Automatic Ground Collision Avoidance System (Auto-GCAS) • Automatic Air Collision Avoidance System (Auto-ACAS) • Sense/Detect & Avoid Technology Demonstration (D&A) • MIDCAS – The European Sense & Avoid Project (D&A) • RPAS Definition Phase: Leading Detect and Avoid (activity 1) • ERSG RPAS Roadmap: main contributor • National projects,e.g.: <ul style="list-style-type: none"> - RPAS integration studies including e.g. ATC simulations with ANSP of Sweden (LFV) - Remote Technology Demonstration (RPAS + Remote Tower) <p><u>Ongoing programs and activities, e.g.:</u></p> <ul style="list-style-type: none"> • MIDCAS/MIDCAS Standardisation Support Phase (D&A) • ERA (Enhanced RPAS Operations) program (ATOL, Auto-TAXI, Automation and Emergency Recovery/Contingency) 	

Controller Tools and Team Organisation for the Provision of Separation in Air Traffic Management

	<ul style="list-style-type: none"> • Standardization: Permanent members and actively working in EUROCAE (WG-73, WG-75); permanent members and coordinating with RTCA SC-228; (sole advisor to ICCAIA in the new ICAO RPAS Panel. • Regulation: Member and actively working in JARUS; coordinating closely with EASA as well as National Safety Agencies • In-house development: RPA (e.g. Skeldar, Neuron), RPS, Detect & Avoid (including traffic & collision avoidance algorithms, sensor fusion etc.), Emergency recovery/contingency solutions, pilot stations and more.
Entity Profile matching the task	<p>Saab’s over 75 years of history in aeronautics, over 4000 civil and military aircraft produced and as well as our broad involvement in ATM businesses, provide a solid background and deep competence in aeronautics in general and RPAS in specific.</p> <p>As an OEM in the aeronautical business, we have all skills required to design and integrate aeronautical products as well as a strong focus on R&D.</p> <p>Saab long term commitment on the topic of RPAS and specifically separation and collision avoidance, accumulates to a very strong holistic understanding of the topic and a development capability for such systems that includes excellent system design, integration and safety knowledge together with a leading knowledge for avoidance technologies. In addition, Saab has strategic partnership and a long history of working with the relevant ATM stakeholders.</p>
Contribution	Saab (NATMIG) will focus on coordination with PJ.13-01 and support PJ.10-05 requirements and validation planning activities.

4.1.1.10 NATS

Organisation	10 NATS Air Navigation Service Provider
Description	<p>NATS (En Route) plc is the core business and the sole provider of ATC services for aircraft flying ‘en route’ in UK airspace and the eastern part of the North Atlantic. It is regulated by the UK Civil Aviation Authority (CAA) within the framework of the European Commission’s Single European Sky (SES) and operates under licence from the UK Secretary of State for Transport. It operates from two ATC centres at Swanwick in Hampshire (England) and Prestwick in Ayrshire (Scotland).</p> <p>NATS (En Route) plc purpose is to provide safe, efficient and effective air traffic control services to aircraft operating within airspace where such services are either required or provided, specifically providing:</p> <ul style="list-style-type: none"> • En-Route and Terminal Air Traffic Control (ATC) for all UK airspace under a 30 year operating licence to UK Government. In 2015, NATS handled over 2.2 million flights, carrying more than 200 million passengers safely through some of the busiest and most complex airspace in the world. • The design and management of airspace, engineering project and maintenance activities for ANS communications, navigation and surveillance systems, and IT and network management. • Cross business support to UK Ministry of Defence (MoD) which includes the provision of a joint ATC service in the UK FIR, and support to communications systems, radar, facilities and training. • Provision of Instrument Flight Procedure design services, publication of the International Air Pilot Publication (IAIP), Notice to Airmen (NOTAM) documentation, data management and charting services for the UK.

	<ul style="list-style-type: none"> • Consultancy services to UK and overseas customers in air traffic management, airspace design, instrument flight procedures, control tower system integration and transition, safety management, engineering, project management. • Training of ATC staff, both as ab-initio controllers, for transition to new airspace or facilities and via supplementary courses including Supervisor Management, On Job Training and Incident Management. • Training of engineering staff.
<p>Previous experience</p>	<p>Previous projects:</p> <p>NATS knowledge and experience</p> <p>NATS has proven experience of designing separation management tools in R&D, refining and maturing these concepts through prototyping and validations, to deliver a product suitable for implementation. NATS’ iFACTS tools deployed in the En-Route operation have delivered measureable and significant improvements to capacity, safety and efficiency of our En-Route operation. NATS is involved in the SESAR 1 separation management projects that cover both the En-Route and TMA operational environments. We have created both planner and tactical controller tools to suit a number of sector team arrangements pertinent to such environments. Underpinning these achievements are advancements to Trajectory Prediction (TP), MTCDD and flight-path and conformance monitoring, These are capable of being enhanced using datalink technology and PBN, to form the next generation of Separation Management tools. NATS has experience of RPAS from our involvement in the highly successful, SESAR-funded Project CLAIRE, which examined the integration of RPAS operations into controlled airspace.</p>
<p>Entity Profile matching the task</p>	<p>NATS has experience in ATCO decision support tools from initial research through to implementation. NATS will provide our capabilities in research, concept development, validation and the prototype development of tools and procedures. NATS’ expertise in tools design with a rigorous understanding of current and future ATC principles will be key to the successful development of advanced concepts for separation management.</p>
<p>Contribution</p>	<p>In Project PJ.10, NATS will be involved in Solutions PJ.10-01c, PJ.10-02b, PJ.10-05 and PJ.10-06.</p> <p>PJ.10-01c</p> <p>NATS will lead this Solution and develop the concept of Collaborative Control that will be compatible with the needs of current and future operations (including Systemised and Free Route operations), building on the tools and concepts developed in PJ.10-02b and liaising with the Multi-Sector Planner and Flight Centric ATC concepts in PJ.10-01a and PJ.10-01b. Early maturity validations undertaken in Wave 1 will prove the viability and applicability of the concept.</p> <p>PJ.10-02b</p> <p>NATS will lead this Solution and develop the concept and supporting tools for Advanced Separation Management that will be compatible with the needs of current and future operations (including Systemised and Free Route operations). These developments are expect to deliver significant levels of automation, building upon the tools and concepts developed in PJ.10-02a and the concepts developed in PJ.10-01a, PJ.10-01b and PJ.10-01c. Early maturity validations will prove the viability and applicability of the concept and tools.</p> <p>PJ.10-05</p> <p>NATS will contribute to the development and validation of concepts that address the definition and sharing of contingency situations, the integration of RPAS into Class A-E airspace, and the impact on airspace capacity of long-duration and novel RPAS missions in a trajectory-based operation.</p>

PJ.10-06

NATS will lead this Solution and will evaluate the potential for, and needs of, controllers to be able to operate safely and efficiently in airspace for which there is no specific (geographical) ATCO validation assuming the tools and concepts developed in PJ.10-01 and PJ.10-02. For efficiency reasons, NATS plan close co-operation between PJ.10-06 and PJ1.0-01c and PJ.10-02b, including at Solution management level, and anticipate the potential for joint validations between these Solutions that would cover all concepts.

4.1.1.11 Dassault

Organisation	11 Dassault	Industry
Description	<p>With more than 8000 military and civil aircraft delivered to 83 countries over the past 60 years and having logged nearly 28 million flight hours to date, Dassault Aviation is a major player in the Aeronautics field.</p> <p>On the one hand, more than 2,200 Falcons are today in operation worldwide, for the benefit of companies, major economic magnates and governments; they cover from 3350nm (Falcon 2000 S) up to 6450nm (Falcon 8X can connect Paris to Singapore).</p> <p>On the other hand, over 1000 combat aircraft produced by Dassault Aviation, ranging from the Mirage III to the Rafale, are currently in service in nearly thirty countries.</p> <p>Dassault Aviation is also fully involved in UAV/UCAV programs as:</p> <p>Main contractor of nEUROn, a European UCAV technology demonstrator program, which successfully completed its maiden flight on December, 1st 2012 and has completed its demonstration program; Co-developper, with BAE, of the Future Combat Air System decided by French and British Governments at the Brize Norton Summit on January, 31st 2014; Initiator of the joint proposal, with AIRBUS DEFENCE and SPACE and ALENIA AERMACCHI, for the development of a Male System called MALE 2020, for Medium Altitude long-range surveillance missions.</p> <p>The Research and Development employs nearly one quarter of the 9000 people company's workforce. Fundamental and pre-competitive research is usually carried out in close co-operation with universities, research institutes and other industrial partners via a wide international network.</p> <p>Dassault Aviation is part of ACARE and is a founding member of the JU Clean Sky and member of its Governing Board.</p> <p>Within European framework research programs, Dassault Aviation has led numerous PCRD projects.</p> <p>Within National context, Dassault Aviation is member of CORAC (Council for Civil Aeronautics Research), created in July 2008 following commitments made in late 2007 during the Grenelle Environment Forum and is member of the Steering Committee.</p>	
Previous experience	<p>Previous projects:</p> <p>Dassault Aviation has a long experience on the user side of ATM, designing, integrating and certificating avionics systems to allow safe and efficient operations and traffic insertion (within their respective requirements) of civil aircraft, military aircraft, and even UAVs.</p> <p>Dassault Aviation has been the first to receive CAT III operational qualification on the Falcon 900EX equipped with Head-Up Guidance System and is also pioneer in innovation on flight controls (Fly by wire systems).</p>	

	<p>Dassault Aviation has also developed large relationships with airports and National ANSPs, to evaluate new types of approaches (e.g. CDA, SBAS based) and has been the first in Europe to use published LPV (Pau – France).</p> <p>Dassault Aviation has developed a good knowledge of many ATM stakeholders, mainly through the participation in standardisation working groups (EUROCAE...), standards harmonisation of operations working groups, implementation of regulatory guidance and procedures that will support the introduction of new concepts and in the validation of safety compliance of the systems.</p> <p>Dassault Aviation participates to ASD ATM committee, ICB SES, GIFAS ATM.</p> <p>Dassault Aviation participated, as Airspace user representative, to SESAR definition phase and SESAR 1, through EBAA consortium.</p> <p>Dassault Aviation participates to SESAR 1 open call AAL project.</p>
Entity Profile matching the task	<p>Technical Directorate will contribute to projects. In those Directorates, expertise will mainly be through, Prospective Department, Navigation and Flight Guidance Systems Department, Certification Department.</p>
Contribution	<p>Dassault Aviation will contribute to the solution PJ.10-05. Dassault Aviation plans to participate to the refinement of the RPAS integration CONOPS that will be initiated into the PJ.19. Dassault Aviation will also ensure RPAS integration will have no impact on Business jet operations and definition This refinement will lead to the definition of use cases where Dassault Aviation will introduce its knowledge of large fixed wings RPAS (more than 150kg). It will also provide the platform data necessary to evaluate the integration concepts using the solutions as coming out of PJ.03, PJ.11 and PJ.13.</p>

4.1.1.12 *Thales Air Systems*

Organisation	12	Thales Air Systems	Industry
Description	<p>Thales Air Systems, from takeoff to touchdown and everything in between.</p> <p>World leader in ATM, Thales Air Systems offers integrated gate-to-gate solutions, from pre-flight to landing, ensuring airport safety, efficient traffic handling operations, data sharing on aircraft and seamless handover operations between territories. Thales Air Systems has the largest installed base of solutions and technologies with over 360 TopSky - ATM Solutions, 7,000 nav aids, 700 surveillance radars, and 1,800 ADS-B and multilateration equipment.</p> <p>Thales Air Systems is trusted by key ATM decision makers across 170 nations, and helps key decision makers master complexity and make timely decisions for better outcomes.</p> <p>At the forefront of all major modernisation initiatives around the world</p> <p>Growing aircraft numbers make Air Traffic Management more complex. Thales Air Systems’ ATM solutions help to make the skies safer, greener and more efficient.</p> <p>A key player in all major ATM modernisation initiatives, ICAO Aviation System Block Upgrades (ASBU), SESAR and NextGen, Thales Air Systems focuses on international harmonization. Our product roadmaps are aligned with ICAO ASBU concepts, NextGen and SESAR.</p> <p>Thales Air Systems has a leading role in Advanced Air Traffic Services activities and in their application to Free Route operations in the on-going SESAR programmes.</p>		
Previous experience	<p>Previous projects:</p> <p>SESAR 1: Thales has been involved in all SESAR 1 Work Packages. Thales Air Systems has been co-leader for :</p>		

	<ul style="list-style-type: none"> • WP10 (En-Route & Approach ATC Systems) • WP 14 (SWIM technical architecture) <p>Thales Air Systems has contributed to the SESAR 1 activities on ground-based separation through support to the definition and the validation of the concept, definition of the technical specifications and development of prototypes and industrial platforms.</p> <p>Thales Air Systems has contributed within the frame of SESAR 1 to the following ground-based separation management related projects:</p> <ul style="list-style-type: none"> • Project 4.7.2 Separation Task in En Route Trajectory based environment • Project 10.4.1 Enhanced tools for conflict detection and resolution • Project 10.4.2 Precision Conformance Monitoring • Project 10.4.3 Safety Nets adaptation to new modes of operation <p>Within these projects Thales Air Systems has supported the following V2 and V3 validation exercises: VP-497, VP-798</p> <p>TAAATS provides the Air Traffic Management Service (En-Route and Approach) for the whole of Australia and for the related oceanic areas as well as the civil-military co-ordination. It is the only system in the world that simultaneously provides fully integrated ADS/CPDLC facilities and allows integrated display of radar tracks, ADS-C tracks, ADS-B tracks and flight plan tracks.</p> <p>NESACC aims at providing the Air Traffic Management Service (En-Route and Approach) for the whole north east of China controlling around 60% of Chinese total air traffic. Air traffic control of areas outside radar coverage is also provided. The Beijing, Shanghai and Guangzhou ATC centres are connected to the 3 control towers of the largest Chinese airports.</p> <p>COOPANS regroups Swedish, Danish, Irish, Austrian and Croatian service providers who define and implement together with Thales Air Systems the stepped evolution of their nation-wide ATM system. Among other innovative functionalities, the TOPSKY ATC system implements RNAV, automated inter-centre co-ordination and advanced controller tools, in particular an efficient MTCO function.</p> <p>4FLIGHT aims at providing Air Traffic Management Services for En-Route for the whole French airspace. 4FLIGHT includes the new generation Flight data Processing Systems Coflight developed for DSN, ENAV and Skyguide, in partnership with Selex Electronic Systems (Italy). Coflight is based on CORBA middleware, new architecture concepts and in line with the EUROCONTROL eFDP specifications. 4FLIGHT includes the latest HMI technology providing a human centric' solution, designed by controllers for controllers for more operational efficiency. The controller is supported with intuitive interaction tools and quick comprehension of the air situation without cluttering the display.</p>
<p>Entity Profile matching the task</p>	<p>Thales Air Systems proposes several profile/expertise for the project development:</p> <ul style="list-style-type: none"> • System engineering expert for technical specification checking, • Validation platform integrator for development and support of the IBP necessary for the validation thread, • Dedicated software development team for R&D, • Technical architecture expert.
<p>Contribution</p>	<p>PJ.10 Project Management: Thales Air Systems intends to participate to the project management and co-ordination.</p>

Solution PJ.10-01a Flight Centric ATC: This Solution develops concepts of operation and identifies the nature of system support required for operating in team structures that are not the usual Planner-Executive (1P-1E) two-person ATC sector team. In particular, the combined role for SPO and the MSP where a Planner has responsibility for the airspace under the executive control of two or more independent Executive Controllers (1P-nET). The main objective aims at the tactical provision of separation between aircraft. To this end the MSP is able to adjust flight profiles and/or the internal (executive) sector boundaries so that workload is balanced between the Executives. In the upper airspace, the MSP team supports an operation tending towards free-route concepts while in the lower air and particularly TMA operations, a more systemized operation is developed to improve predictability and capacity through reduced tactical intervention.

In the scope of solution PJ.10-01a Thales Air Systems intends to contribute to the development of the concept elements of this solution, analyze and review operational requirements to evaluate the impacts of the concept elements on the ATC systems.

Thales Air Systems also intends to contribute to the definition of the technical requirements and to the validation of the solution, through the development of prototypes and their integration in an integrated validation platform (IBP). This IBP will be designed to support validation exercises in PJ.10-01a and PJ.10-02a.

Solution PJ.10-01b Flight Centric ATC:

As a basic principle of Flight Centric ATC, a controller is no longer in charge of managing the entire traffic within a given sector. Instead, he is now responsible for a certain number of aircraft throughout their flight segment within a given airspace whereas other controllers are responsible for a certain number of different aircraft within the same airspace. This way of traffic control will not change the basic responsibilities given to the controller: The basic task of the controller will remain untouched: he has to ensure a conflict-free flight. The “FlightCentric ATC” team organisation is expected increase controller’s productivity and capacity.

In the scope of solution PJ.10-01b Thales Air Systems will provide expertise in ATC system and architecture, analyse and review operational and technical requirements to evaluate the impact of the solution on current ATC systems.

Solution PJ.10-01c Collaborative Control:

The solution results in a concept of operation for Collaborative Control (i.e. co-ordination by exception rather than co-ordination by procedure).

With this Solution concepts such as release-on-contact, “porous” sector boundaries, sharing of airspace, flight intent and controller intent are all investigated. These concepts support reduced need for co-ordination agreements (so reduced workload), fewer boundary constraints (so improved aircraft profiles), the application of constraints to aircraft trajectories at the point where the particular separation resolution is needed (which may be mid-sector rather than on the boundary) and the ability to combine sectors into MSP teams (enhancing the concepts developed in Solution PJ.10-01a).

In the scope of Solution PJ.10-01c Thales Air Systems will provide expertise in ATC system and architecture, analyse and review operational and technical requirements to evaluate the impact of the solution on current ATC systems.

Solution PJ.10-02a Improved performance in the provision of separation:

This SESAR Solution aims at improving the provision of separation in the En-Route and TMA operational environment. Vertical and longitudinal separation will be ensured by tactical ATC intervention; however these instructions will be limited as much as possible through the use of enhanced tools and aircraft data which will allow predicting with low uncertainty the present and future aircraft positions. Conformance monitoring will assist the controller in maintaining situational awareness and relieving him from routine tasks.

Within solution PJ.10-02a Thales Air Systems intends to contribute to the development of the concept elements of this solution, analyze and review operational requirements to evaluate the impacts of the concept elements on the ATC systems.

Thales Air Systems also intends to contribute to the definition of the technical requirements and to the validation of the solution, through the development of prototypes and their integration in an integrated validation platform (IBP). This IBP will be designed to support validation exercises in PJ.10-01a and PJ.10-02a.

Solution PJ10-02b Advanced separation management:

This SESAR Solution is the continuation of Solution PJ.10-02a. In addition to Solution 02a, vertical and longitudinal separation will be ensured by interventions recommended by the automated system that have to be confirmed by controllers and in exceptional cases by controller intervention.

Within solution PJ.10-02b Thales Air Systems intends to contribute to the development of the intermediate concept elements of this Solution, analyse and review operational requirements to evaluate the impacts of the concept elements on the ATC systems.

Thales Air Systems also intends to contribute to the intermediate definition of the technical requirements, to start developing prototypes which will be used during Wave 2 validations.

Solution PJ.10-05 IFR RPAS integration:

Airspace where IFR services are provided can be extremely complex, and there are many challenges surrounding the integration of RPAS into these environments. Research needs to be conducted to investigate ways in which RPAS may be able to use a technical capability or procedural means to comply with ATC instructions.

In the scope of solution PJ.10-05 Thales Air Systems will provide expertise in ATC system and architecture, analyse and review operational and technical requirements to evaluate the impact of the solution on current ATC systems.

4.1.1.13 INDRA

Organisation	13 INDRA	Industry
Description	<p>Indra is a global technology, innovation and talent company. It is on the cutting edge of high value-added solutions and services for the Transport and Traffic, Energy and Industry, Public Administration and Healthcare, Financial Services, Security and Defence and Telecom and Media sectors. The company operates in more than 149 countries and has more than 39,000 employees worldwide, focusing on developing innovative solutions that meet the needs of the most demanding clients. Indra ranks second in Europe by R&D spent, investing close to €195m during the last year.</p> <p>With the aim to provide our customers with comprehensive, full and turnkey solutions, Indra product range covers the whole range of Air Traffic Management Systems, including Surveillance, Automation, Communications, Simulators and NAVAIDs.</p> <p>At Indra we have developed air traffic management systems that are deployed across the world, with over 4,000 installations in 160 countries. We are positioned as the market’s leading supplier of air traffic management and communications, navigation and surveillance (ATM-CNS) systems. In the field of R&D, we are one of the leading companies in the SESAR programme, the key technology behind the Single European Sky initiative.</p>	
Previous experience	<p>Previous projects:</p>	

	<p>Indra has the in-depth experience and products necessary to undertake any Air Traffic Management programme, with both a proven international management approach and a history of responsible program execution. That experience, together with a solid technology base, permanent innovations and quality in processes and projects are the pillars sustaining Indra leadership position in Air Traffic Management, completely oriented towards customer needs and aimed to provide our customers with the highest level of service.</p> <p>Indra is the world leader for Flight Data Processing Systems, having supplied over 40 installations worldwide and has grown to be leader Air Traffic Management system supplier in Europe. In December 2008, Indra supplied Eurocontrol with the new next-generation interoperable Flight Data Processing System at Maastricht Upper Area Control Centre, one of the busiest and most complex En-Route Air Traffic Control Centres in Europe.</p> <p>The implementation of this Flight Data Processing System is a high technological advance directed to improve the safety, capacity, efficiency and environmental performance of Air Traffic management in Europe, and actively contributing to achieving the European’s Commission Single European Sky objectives.</p> <p>Indra has been selected by the most advanced European Air Navigation Service Providers to develop the future Air Traffic Management systems following the Single Sky Concept, through the iTEC Program (Interoperability Through European Collaboration). This is currently formed by ENAIRE (Spain), DFS (Germany), NATS (United Kingdom) and LVNL (The Netherlands), with Indra as industrial partner.</p> <p>Since 2009, Indra is full member of the SESAR Joint Undertaking, participating in more than 120 projects within the Programme and co-leading both WP10 (En-Route and Approach ATC) and WP12 (Airports), as well as playing a key role in many projects under WP14 (SWIM), WP15 (Non-Avionics CNS) and WP13 (NIMS).</p>
<p>Entity Profile matching the task</p>	<p>Indra as industrial partner, provides the project with the following profiles/experience:</p> <ul style="list-style-type: none"> • System engineering expert for technical specification and prototype development, • Technical architecture expert and • Validation platform integrator.
<p>Contribution</p>	<p>PJ.10 Project Management: Indra will support to the project management and co-ordination when required.</p> <p>Solution PJ.10-01a: Indra will contribute with its technical expertise in the following activities:</p> <ul style="list-style-type: none"> • Analysis and review the operational concept and operational requirements specified in the related deliverables (OSD/SPR/INTEROP), • Analyse and review operational requirements to evaluate the impacts of the concept elements on the ATC systems. • Review the validation objectives and results as described in the VALP and VALR deliverables, • Contribute to the technical solution definition, development and update of the technical requirements derived from the operational concept with contribution to the TS/IRS deliverables. <p>Solution PJ.10-01b: Indra will contribute with its technical expertise in the following activities:</p>

- Contribute to the development of the operational concept,
- Analyse and review the operational requirements specified in the related deliverables (OSD/SPR/INTEROP), to evaluate the impacts of the concept elements on the ATC systems,
- Analyse and review the validation objectives and results as described in the VALP and VALR deliverables,
- Contribute to the technical solution definition, development and update of the technical requirements derived from the operational concept with contribution to the TS/IRS deliverables, leading this activity,
- Develop prototypes to support the Flight Centric ATC and ensure a conflict-free flight, to be integrated in the validation platform,
- Provide and sustain system platforms integrating prototypes in a consistent ATC system environment in close coordination with solutions PJ.10-02b.

Solution PJ.10-01c: Indra will contribute with its technical expertise in the following activities

- Contribute to the development of the operational concept,
- Analyse and review the operational requirements specified in the related deliverables (OSD/SPR/INTEROP), to evaluate the impacts of the concept elements on the ATC systems,
- Analyse and review the validation objectives and results as described in the VALP and VALR deliverables,
- Contribute to the technical solution definition, development and update of the technical requirements derived from the operational concept with contribution to the TS/IRS deliverables, leading this activity,
- Develop prototypes supporting the operation for collaborative control using “porous” sector boundaries to reduced need for co-ordination agreements, boundary constraints allowing the application of constraints to aircraft trajectories at the point where the particular separation resolution is needed,
- Provide and sustain system platforms integrating prototypes in a consistent ATC system environment in close coordination with solutions PJ.10-02b.

Solution PJ.10-02a: Indra will contribute with its technical expertise in the following activities

- Contribute to the development of the operational concept,
- Analyse and review the operational requirements specified in the related deliverables (OSD/SPR/INTEROP), to evaluate the impacts of the concept elements on the ATC systems,
- Review the validation objectives and results as described in the VALP and VALR deliverables,
- Contribute to the technical solution definition, development and update of the technical requirements derived from the operational concept with contribution to the TS/IRS deliverables,

- Develop prototypes to enhance tools detecting and predicting conflicts, with low uncertainty, and monitoring of the aircraft trajectory deviation to assist the controller to manage separation provision and to maintain situational awareness,
- Integrate developed prototypes in a consistent ATC system environment in close coordination with PJ.06.

Solution PJ10-02b: Indra will contribute with its technical expertise in the following activities:

- Contribute to the development of the operational concept,
- Analyse and review the operational requirements specified in the related deliverables (OSD/SPR/INTEROP), to evaluate the impacts of the concept elements on the ATC systems,
- Analyse and review the validation objectives and results as described in the VALP and VALR deliverables,
- Contribute and lead to the development and update of the technical requirements with contribution to the TS/IRS deliverables,
- Develop prototypes to assist controllers for the automatic detection and resolution of aircraft trajectory conflicts and/or complex situations and monitoring of the aircraft trajectory deviation from the calculated ground trajectory, to be integrated in the validation platform,
- Provide and sustain system platforms integrating prototypes in a consistent ATC system environment in close coordination with solutions PJ.10-01b and PJ.10-01c,
- Participate to the management of the solution and contribute to the overall planning of the supported validations.

Solution PJ.10-05:

Indra will contribute with its technical expertise in the following activities:

- Analysis and review the operational concept and operational requirements specified in the related deliverables (OSD/SPR/INTEROP),
- Analyse and review operational requirements to evaluate the impacts of the concept elements on the ATC systems,
- Analyse and review the validation objectives and results as described in the VALP and VALR deliverables,
- Contribute to the technical solution definition, development and update of the technical requirements derived from the operational concept with contribution to the TS/IRS deliverables.

Solution PJ.10-06: Indra will contribute with its technical expertise in the following activities:

- Analysis and review the operational concept and operational requirements specified in the related deliverables (OSD/SPR/INTEROP),
- Analyse and review operational requirements to evaluate the impacts of the concept elements on the ATC systems.

4.1.1.14 EUROCONTROL

Organisation	14 EUROCONTROL	European Organisation
Description	<p>EUROCONTROL, the European Organisation for the Safety of Air Navigation, is an intergovernmental Organisation with 41 Member States, committed to building, together with its partners, a Single European Sky that will deliver the ATM performance required for the 21st century. EUROCONTROL employs more than 1,900 highly qualified professionals spread over four European countries. Their expertise is deployed to address ATM challenges in a number of key roles:</p> <ul style="list-style-type: none"> • The Network Manager has extended the role of the former Central Flow Management Unit to proactively manage the entire ATM Network (nearly ten million flights every year), in close liaison with ANSPs, airspace users, the military and airports. • The Maastricht Upper Area Control Centre provides an air traffic control service for the Netherlands, Belgium, Luxembourg and northern Germany. • The Central Route Charges Office handles billing, collection and redistribution of aviation charges. • The organisation is developing the Centralised Services initiative, which will open up some services to market competition on a pan-European level, generating significant savings and making for greater operational efficiency. • It supports the European Commission, EASA and National Supervisory Authorities in their regulatory activities. • It provides a unique platform for civil-military aviation coordination in Europe. • Finally, EUROCONTROL is a major player in European ATM research, development and validation and in this respect makes the largest contribution to the SESAR Joint Undertaking. 	
Previous experience	<p>Publications:</p> <p><u>Research Paper:</u></p> <p>Sector-less Air Traffic Management - Vu Duong, Gilles Gawinowski, Jean-Pierre Nicolaon, Darren Smith - 4th USA / Europe Air Traffic Management R&D Seminar Santa Fe, 3-7 December 2001</p> <p><u>Publications:</u></p> <p>E-OCVM - European Operational Concept Validation Methodology</p> <p>FASTI - Operational Performance Requirements Analysis for the Conflict Detection Tool (CDT)</p> <p>EUROCONTROL Specification for Medium-Term Conflict Detection</p> <p>EUROCONTROL Specification for Monitoring Aids</p> <p>EUROCONTROL Specification for Trajectory Prediction</p> <p>RPAS related:</p> <p>EUROCONTROL Human Factors for UAS - ATM Integration</p> <p>EUROCONTROL UAS C3 Channel Saturation Study Final Report</p> <p>EUROCONTROL sponsored: Generic UAS ATM safety assessment baseline scenario 2 – IFR & VLOS</p>	

	<p>Previous projects:</p> <p>SESAR – Single European Sky ATM Research</p> <p>FASTI - First Air Traffic Control (ATC) Support Tools Implementation</p> <p>MTCD Live Trials at Malmo ACC, Roma ACC and Maastricht UAC</p> <p>EPISODE 3 - Validation of the Air Traffic Management operational concept</p> <p>GTG - Gate-to-Gate Programme</p> <p>EATM – European Air Traffic Management Programme</p> <p>PHARE - Programme for Harmonised ATM Research in EUROCONTROL</p>
<p>Entity Profile matching the task</p>	<p>EUROCONTROL will provide experts in the fields of:</p> <ul style="list-style-type: none"> • ATC Operations, Procedures and Working Methods • Military ATC Operations and Systems • Systems Engineering • Concept Validation • Modelling and Simulation
<p>Contribution</p>	<p>Solution PJ.10-01b Flight Centric ATC:</p> <p>EUROCONTROL will contribute to the development of the Flight Centric ATC concept for medium and high complexity airspace and to the validation of certain aspects such as flight assignment strategies, traffic and complexity management, workload reduction and ATC tools performance through fast-time simulations.</p> <p>Solution PJ.10-02a Improved performance in the provision of separation:</p> <p>EUROCONTROL will contribute to the definition and validation of ATC tools performance requirements through modelling, fast-time simulation and real-time simulation exercises.</p> <p>Solution PJ.10-02b Advanced separation management</p> <p>EUROCONTROL will contribute to the definition and validation of concepts aimed at reducing controller workload and increasing flight efficiency and predictability through the use of closed-loop clearances.</p> <p>Solution PJ.10-05 IFR RPAS integration:</p> <p>EUROCONTROL will contribute to the validation of certain aspects of RPAS integration such as communications latency, aircraft performance, and contingency.</p>

4.1.1.15 ANS CR (B4)

<p>Organisation</p>	<p>15 RIZENI LETOVEHO PROVOZU CESKE REPUBLIKY STATNI PODNIK Service Provider</p>
<p>Description</p>	<p>Air Navigation Services of the Czech Republic (ANS CR), the state enterprise provides public Air Traffic Services in the airspace of the Czech Republic, at Prague Airport and 3 regional Airports of Brno, Ostrava and Karlovy Vary. En route services are provided as integrated with the MIL.</p> <p>It provides specialized aviation training in its own Training Centre of ANS CR/Czech Air Navigation Institute (CANI) and offers also the training for pilots in its subsidiary company the Czech Aviation Training Centre (CATC) on aircraft simulators, both units being part of the Aviation Academy Group.</p>

	<p>The part of ANS CR organization is the Flight Inspection Service Unit providing the flight checking within Czech Airspace as well as outside on a commercial basis.</p> <p>ANS CR is a member of the FAB Central Europe (FAB CE).</p> <p>ANS CR is constituent entity of B4 Consortium.</p>
<p>Previous experience</p>	<p>EMMA project:</p> <ul style="list-style-type: none"> • Project number: TREN/04/FP6AE/SI2.374991/503192. • Project sponsored by EC (Sixth Framework Programme), 24 partners, 9 countries, 3 international airports, 2004-2006. • ANS CR supported the operational concept, user requirements, data provision, validation test preparation and also provided test platform. <p>EMMA2 project:</p> <ul style="list-style-type: none"> • Project number: TREN/04/FP6AE/SI2.374991/503192 • Project sponsored by EC (Sixth Framework Programme), 21 partners, 9 countries, 4 international airports, 2006-2009. • ANS CR supported the operational concept, user requirements, data provision, validation test preparation and also provided test platform. <p>Malorca project:</p> <ul style="list-style-type: none"> • Project Proposal number: 698824 • Project sponsored by Horizon 2020 (EU Research and Innovation programme), 5 partners, 4 countries, 2016-2017 • Malorca - Machine Learning of Speech Recognition Models for Controller Assistance • ANS CR is responsible for Operational Concept Document, data provision to build improved Assistant Based Speech Recognizer prototype and evaluation of the proposed. • ANS CR already participated on the validation trials for AcListant® system in Braunschweig in 2014 and 2015. The main goal was to prove that the ASR components improve the assistant planning system. <p>INSuRE project:</p> <ul style="list-style-type: none"> • Project Number: RPAS.02, SESAR 1 Demonstration Activities. <p>October 2013 – December 2015. ANS CR led the operational activities at the selected aerodrome and the dedicated safety analysis.</p>
<p>Entity Profile matching the task</p>	<p>ANS CR (B4) has a vast expertise in ATM operational and technical domains, performance management and analysis, business case and information management.</p> <p>Experience relevant to the project PJ.10 includes ATM Operational services (En-Route, TMA), development, prototyping and operation of specific technical tools e.g. conflict alerts and AgentFly simulator (tool provided by ANS CR (B4) Linked Third Parties (CTU and AgentFly Technologies Ltd.)), System architecture design, Project and Quality management, validation (FTS, RTS), ATM Safety assessment (provided by Linked Third Party - Integra A/S), Airspace organisation (En-Route, TMA), computational and data science, especially in modelling live processes and phenomena, machine learning application and analysis of big unstructured datasets.</p> <p>Additional to the abovementioned expertise and experience ANS CR can support the project PJ.10 by its knowledge in the areas of ATM Operational Concept (En-Route, TMA), ATC, airspace users and airport operators requirements, development of pan-European Air Traffic management network solutions, encompassing Civil/Military dimension and SESAR programme objectives knowledge specific to the project.</p>
<p>Contribution</p>	<p>PJ.10-01b</p>

ANS CR (B4) will contribute to PJ.10 by providing the ATC expertise in the sectorless airspace FTS. Simulation will be conducted using AgentFly tool developed by the Linked third parties (CTU and AgentFly Technologies ltd.) focusing on workload reduction in a sectorless environment through the intelligent assignment strategies and dynamic airspace configuration and required performance of CD&R tools to support sectorless operations.

PJ.10-02a

ANS CR (B4) will be responsible for providing validation side for the FTS / RTS validation aiming at definition of required minimum performance specifications for CD&R.

PJ.10-02b

ANS CR (B4) will, for CD&R Single Closed Clearance requirements, be responsible to provide validation side aiming at FTS / RTS validation of CD&R tools to support traffic stability using closed clearances.

- ANS CR (B4) Linked Third Party (Integra A/S) will be responsible for addressing the safety aspects of the activities, in particular pre validation safety assessments, refinement of safety requirements post validation and their integration into the SPR.

4.1.1.16 FRQ (FSP)

Organisation	16 FREQUENTIS AG	Industry
Description	<p>Frequentis AG, member of SESAR1, is an international expert for communication and information systems for control centres with safety-critical tasks. Frequentis AG maintains a worldwide network of subsidiaries and local representatives in more than 50 countries to ensure closeness to our customers.</p> <p>Frequentis AG successfully designs and supplies systems and solutions for the domains of communication, networks, SWIM, aeronautical information management, and airport traffic optimization, both in service and infrastructure as well as in the visualisation part of the independent CWP; based on service oriented and open, standardised architecture.</p> <p>In SESAR1 we have demonstrated remarkable achievements towards the next generation ATM system architecture. Special interest is given to the users of ATM systems. Our expertise and tooling guarantees early indications of the future user acceptance.</p> <p>Frequentis AG is member of the Frequentis SESAR Partners consortium together with the companies HUNGAROCNTRM MAGYAR LEGIFORGALMI SZOLGALAT ZARTKORUEN MUKODO RESZVENYTARSASAG and Atos Belgium and was founded in 2014 for the main purpose of joining SESAR2020 activities. Frequentis SESAR Partners is member of the SESAR Joint Undertaking.</p> <p>The consortium is comprised of companies having a variety of complementary capabilities. Having former SESAR1 experience within its framework, an ANSP whose expertise will result in early feedback loops during certain projects, and the wide range IT, data management and security expertise of the consortium forming entities, Frequentis SESAR Partners believes in the high added value of its participation in SESAR2020 efforts.</p>	
Previous experience	<p>Relevant Previous projects:</p> <p>SESAR 1 P15.02.04 - Development of future terrestrial Datalink (LDACS1)</p> <p>CoLB - National research project</p> <p>LDACS1 Specification - EUROCONTROL Study (with three partners)</p>	

	B-AMC Study - EUROCONTROL Study (with three partners) B-VHF - Coordinator of EC FP6 Project (11 Partner)
Entity Profile matching the task	Frequentis AG will support the project with expert staff with knowledge and capabilities in the following areas: <ul style="list-style-type: none"> - Air Traffic Control Radio Communications - Digital Signal Processing skills in Algorithm Design, Simulation - ATC Voice and Data Communication know how
Contribution	Frequentis AG contribution will focus on 10.01b: <ul style="list-style-type: none"> - Communication Analysis: Study conduction, expertise, analysis, suggestions, study documentation - Communication WS: expertise, analysis, suggestions. - Communication Sim: Communications HMI - Integration Sim: expertise, analysis, suggestions with focus on voice communication.

4.1.1.17 DLR (AT-ONE)

Organisation	17 DLR (AT-One)	Research
Description	<p>Deutsches Zentrum für Luft-und Raumfahrt e. V. (German Aerospace Center) is coordinating the AT-One Consortium, DLR (AT-One). The AT-One consortium is formed by the German Aerospace Center (DLR) and the Netherlands Aerospace Centre (NLR). AT-One combines the strength of DLR and NLR by joining their capabilities with respect to innovative and independent Air Traffic Management research and implementation support.</p> <p>DLR (AT-One) is the national aeronautics and space research centre of the Federal Republic of Germany. Its extensive research and development work in aeronautics, space, energy, transport and security is integrated into national and international cooperative ventures. In addition to its own research, as Germany's space agency, DLR has been given responsibility by the federal government for the planning and implementation of the German space programme. DLR is also the umbrella organisation for the nation's largest project management agency. DLR has approximately 8000 employees at 16 locations.</p> <p>Several DLR (AT-One) research institutes are participating in SESAR which are shortly introduced in the following:</p> <p>DLR (AT-One) Institute of Flight Guidance develops innovative air traffic concepts – from the idea towards the implementation. The goal is to ensure an air transport system that is safe, efficient, environmentally friendly and reliable. In the field of air traffic management (ATM) and airports, the institute acts as a supplier of know-how and ideas while balancing the conflicting interests between fundamental research and applied science. As the largest German research facility for flight guidance, it strives to validate and deliver solutions to one of the greatest challenges in aviation – how to increase the efficiency and capacity of air transport in a safe and green way. Key tasks of the institute are to explore how the interplay of flight guidance on board and on the ground is optimized and how the complex interdependencies between the increasingly optimized aviation systems can be handled in a robust and resilient manner.</p> <p>DLR (AT-One) Institute of Communications and Navigation develops and investigates new systems and methods for radio transmission and positioning. Its work in aviation focusses on enabling technologies for air-traffic management. The Institute has a profound</p>	

expertise in communications, navigation, and surveillance (CNS) technologies. It actively performs research and development in air-ground, air-air, and satellite communications as well as on the networking concept for the future communications infrastructure. In navigation, the Institute has largely contributed to the development of GBAS as well as future ARAIM. It has developed means to protect navigation systems from harmful interference, spoofing and space weather effects and conceptualized integrity monitoring standards for all phases of flight.

The DLR (AT-One) Institute of Atmospheric Physics focusses on the research of the physical and chemical processes of the atmosphere and meteorological applications. On both regional and global scales, the relevant processes and changes of the state of the atmosphere are quantified and systematically investigated using remote sensing, research aircraft and computational models. The knowledge of dynamical, cloud physical, and chemical processes constitute the basis for many aeronautical applications.

DLR (AT-One) Institute of Flight Systems is active in the topics of flight mechanics and measurement and system technology of all flying systems. The Institute has extensive knowledge in wake turbulence and aviation flight safety, originating from numerous wake-vortex related research projects.

DLR (AT-One) Air Transport Systems is conducting research in the field of understanding the system complexity in air transportation. The portfolio comprises of concepts, preliminary designs and the optimization of sub systems, as well as the simulation and assessment of entire air transportation systems with respect to economic and ecological sustainability. DLR Air Transportation Systems has several years of experience with the design and the assessment of new concepts and technologies for future air transportation.

Previous experience

Publications:

Birkmeier, Bettina, Daniel Diethei, Karsten Straube, Marcus Biella, Sebastian Tittel, Color schemes for a sectorless ATM controller working position, Proceedings of the 34th Digital Avionics Systems Conference (DASC), Prague, Czech Republic, 2015.

Birkmeier, Bettina, Feasibility analysis of sectorless and partially automated air traffic management, PhD Dissertation as DLR Forschungsbericht 2015-12, ISSN 1434-8454, 2015.

Birkmeier, Bettina, Bernd Korn, Five transition strategies for sectorless ATM, Proceedings of the 33rd Digital Avionics Systems Conference (DASC), Colorado Springs, CO, USA, 2014.

Birkmeier, Bettina, David Martín, Karsten Straube, Marcus Biella, Preliminary safety assessment for a sectorless ATM concept, Proceedings of the 32nd Digital Avionics Systems Conference (DASC), Syracuse, NY, USA, 2013.

Birkmeier, Bettina, Marcus Biella, Safety net for a sectorless ATM concept, Proceedings of the 31st Digital Avionics Systems Conference (DASC), Williamsburg, VA, USA, 2012.

Birkmeier, Bettina, Julia Schmid, Angela Rebecca Schmitt, Bernd Korn, Change of controller tasks in a sectorless ATM concept – first results, Proceedings of the 12th Integrated Communications Navigation and Surveillance Conference (ICNS), Herndon, VA, USA, 2012.

Birkmeier, Bettina, Bernd Korn, Frank Ole Flemisch, First findings on the controller’s mental model in sectorless air traffic management, Proceedings of the 30th Digital Avionics Systems Conference (DASC), Seattle, WA, USA, 2011.

Biella, Marcus, Bettina Birkmeier, Bernd Korn, Christiane Edinger, Sebastian Tittel, Dirk Kügler, Operational feasibility of sectorless ATM, Proceedings of the International Conference of the European Aerospace Societies (CEAS), Venice, Italy, 2011.

Angela Rebecca Schmitt, Christiane Edinger, and Bernd Korn. Balancing controller workload within a sectorless ATM concept. CEAS Aeronautical Journal, 2:35–41, 2011.

	<p>Birkmeier, Bettina, Christiane Edinger, Sebastian Tittel, Bernd Korn, Dirk Kügler, First results on flight rules and conflict avoidance maneuvers for a sectorless ATM concept, Proceedings of the 11th Integrated Communications Navigation and Surveillance Conference (ICNS), Herndon, VA, USA, 2011.</p> <p>Birkmeier, Bettina, Bernd Korn, Dirk Kügler, Sectorless ATM and advanced SESAR concepts: Complement not contradiction, Proceedings of the 29th Digital Avionics Systems Conference (DASC), Salt Lake City, UT, USA, 2010.</p> <p>Bernd Korn, Christiane Edinger, Sebastian Tittel, Thomas Pütz, Bernd Mohrhard, Sectorless ATM — analysis and simulation results, Proceedings of the 27th international congress of the aeronautical sciences (ICAS), Nice, France, 2010.</p> <p>Bernd Korn, Christiane Edinger, Sebastian Tittel, Dirk Kügler, Thomas Pütz, Oliver Hassa, Bernd Mohrhard, Sectorless ATM — a concept to increase en-route efficiency, Proceedings of the 28th digital avionics systems conference (DASC), Orlando, FL, USA, 2009.</p> <p>Thomas Pütz, Oliver Hassa, Bernd Mohrhard, Bernd Korn, Christiane Edinger, Dirk Kügler, Airspace management 2020: Flying without sectors: Sectorless ATM research Programme — entire trajectory control in a large airspace, Proceedings of the eighth innovative research workshop & exhibition (INO), Brétigny-sur-Orge, France, 2009.</p> <p>Previous projects:</p> <p>LRM2020 study (2008-2009): Joint study between DFS Deutsche Flugsicherung and Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR) (commissioned by DFS) to investigate feasibility of sectorless ATM on principle.</p> <p>TeFiS (Technologie für Flugverkehrsmanagement in großen Strukturen) LuFo project (2014-2016): Subcontractor of DFS to investigate details of sectorless ATM.</p>
<p>Entity Profile matching the task</p>	<p>Job profiles of researchers and scientists specialized on sectorless air traffic control, air traffic management, safety, human factors. Software engineering, validation specialists. Possibly test pilots.</p>
<p>Contribution</p>	<p>Solution PJ.10-01b Flight Centric ATC: DLR (AT-One) intends to take responsibility for Solution Management and coordination (lead-role).</p> <p>As a basic principle of Flight Centric ATC, a controller is no longer in charge of managing the entire traffic within a given sector. Instead, he is now responsible for a certain number of aircraft throughout their flight segment within a given airspace whereas other controllers are responsible for a certain number of different aircraft within the same airspace. This way of traffic control will not change the basic responsibilities given to the controller: The basic task of the controller will remain untouched: he has to ensure a conflict-free flight. The Flight Centric ATC team organisation is expected increase controller’s productivity and capacity.</p> <p>DLR (AT-One) intends to contribute its eight-year experience on sectorless ATM and research results to SESAR.</p> <p>Within PJ.10-01b, DLR (AT-One) intends to conduct together with HC (FSP). a V2 baseline validation which compares (actual) controller numbers, number of voice communications with demand in sectorless ATM. AT-One will plan and coordinate the validation and provide experts and the validation platform TrafficSim.</p> <p>DLR (AT-One) intends to conduct together with HC (FSP). a V2 integration simulation including voice communication, non-standard situations and assignment in high complexity airspace. AT-One will plan and coordinate the validation and provide experts and the validation platform TrafficSim.</p>

DLR (AT-One) will possibly conduct a V2 validation together with DFS.

4.1.1.18 ACG/COOPANS

Organisation	18 ACG/COOPANS	Air Navigation Service Provider
Description	<p>Austro Control is a state-owned limited liability company.</p> <p>Location: The headquarter is located in Vienna and subdivisions are situated in Linz, Salzburg, Klagenfurt, Graz and Innsbruck.</p> <p>Organizational setup: Two main divisions - Air Navigation Services (operational functions) comprising Air Traffic Management, Engineering Services, Meteorological Services and Aviation Agency (regulatory matters) supported by corporate services</p> <p>Governance structure: A Supervisory Board and a Management Board is responsible for the corporate governance. An audit committee is also established.</p> <p>The primary business of the ANS part of Austro Control is the provision of air navigation services, pursuing the basic principle of a high level of air traffic safety in compliance with Single European Sky framework.</p> <p>Austro Control is a member of COOPANS Consortium consisting of 5 Air Navigation Service Providers: Austro Control (ACG), Croatia Control (CCL), Irish Aviation Authority (IAA), Naviair and Luftfartsverket (LFV). Cooperation between COOPANS partners goes beyond SESAR – partners has for a long time worked together with Thales under a common framework agreement in a joint program based on the incremental development of a common ATM platform. The overarching goal for COOPANS is to enable each individual ANSP to achieve financial savings through cost, resource, and competence sharing and to meet the EU objective of harmonizing ATM systems. This work is now expanded to Research & Innovation by the establishment of the COOPANS Consortium.</p> <p>Austro Control has many years of experience in the delivery of Air Traffic Services, the design of concepts and in development, validation and implementation of Air Traffic Management tools.</p> <p>The enterprise is certified according to ISO 9001.</p>	
Previous experience	<p>Austro Control has participated in SESAR via NORACON consortium in the following WPs:</p> <p>WP00 SESAR2020 preparation: 00.15</p> <p>WP3 Validation infrastructure adaptation and integration: 03.03.02, 03.03.03</p> <p>WP5 TMA Operations: 05.03.00, 05.06.02, 05.06.04, 05.06.07, 05.07.02, 05.09</p> <p>WP6 Airport Operations: 06.05.05, 06.06.01, 06.07.01, 06.08.08, 06.09.03</p> <p>WP7 Network Operations: 07.05.04</p> <p>WP8 Information Management: 08.01.01, 08.01.06, 08.03.03, 08.03.06, 08.03.10</p> <p>WP10 En-Route & Approach ATM Systems: 10.02.01, 10.02.03, 10.03.01, 10.03.08, 10.07.01, 10.10.03</p> <p>WP12 Airport Systems : 12.02.01, 12.06.03</p> <p>WP13 Network Information Management Systems: 13.02.02</p> <p>WP14 SWIM Technical Architecture: 14.02.03, 14.04</p> <p>WP16 R&D Transversal Areas: 16.01.01, 16.06.01, 16.06.01.b</p>	

	<p>WP B Target Concept and Architecture Maintenance: B.04.05</p> <p>WP C: Master Plan Maintenance C.02, C.03</p> <p>The current ATM systems' core functionality is 4D trajectory based</p> <p>Medium Term Based Conflict Detection (MTCD). ACG/COOPANS has experience from implementation and deployment of Free Route airspace and all related system functionalities/tools/concepts etc. ACG as part of COOPANS has experience from trajectory management, cross-border Free Route airspace and separation management in Free Route airspace.</p>
Entity Profile matching the task	<p>Expertise can be offered in many areas:</p> <ul style="list-style-type: none"> • Development and supervision of operational concepts • Safety concepts & Safety Assessments • Air traffic forecast/Capacity planning incl. runway capacity enhancement • CWP design • Development and implementation of ATM systems & Tools (common development and implementation of TopSky) • Trajectory management (core functionality in TopSky) • Development and implementation of safety and monitoring tools (core functionality in TopSky – 4D MTCD) • Performance Based Navigation • Validation and Integration
Contribution	<p>ACG will contribute to the project by providing ATM operational experts as well as safety resources.</p>

4.1.1.19 CCL/COOPANS

Organisation	19 CCL/COOPANS	Air Navigation Service Provider
Description	<p>Croatia Control is a state-owned limited liability company.</p> <p>Location: The company headquarters is located in Velika Gorica and the subsidiaries (regional ATC centres) are located in Pula, Rijeka, Lošinj, Split/Brač, Zadar, Dubrovnik and Osijek.</p> <p>Divisions: Air Traffic Management, Technical Division, Aeronautical Meteorology, Military Operations and Human Resources Management, Legal and Financial Affairs.</p> <p>Governance structure: Company Assembly, Supervisory Board and Management-Director General. The Company Assembly consists of the Minister of the Maritime Affairs, Transport and Infrastructure – Chairman, Minister of Finance and the Minister of Defence. The Supervisory Board monitors the activities of the organization. The Director General manages and represents the organization.</p> <p>The primary business of Croatia Control is provision of air navigation services, pursuing the basic principle of a high level of air traffic safety in compliance with Single European Sky framework, and Croatia Control has been certified for provision of the following services:</p> <ul style="list-style-type: none"> • Air Traffic Services (ATS) • Communication, Navigation and Surveillance Services (CNS) • Aeronautical Information Services (AIS) • Aeronautical Meteorological Services (MET) 	

	<p>Croatia Control is a member of COOPANS Alliance consisting of 5 Air Navigation Service Providers: Austro Control (ACG), Croatia Control (CCL), Irish Aviation Authority (IAA), Naviair and LFV. The cooperation between COOPANS partners goes beyond SESAR – partners have for a long time worked together with Thales under a common framework agreement in a joint program based on the incremental development of a common ATM platform. The overarching goal for COOPANS is to enable each individual ANSP to achieve financial savings through cost, resource, and competence sharing and to meet the EU objective of ATM systems harmonisation. This cooperation is now expanded to Research & Innovation by the establishment of the COOPANS Consortium.</p> <p>Croatia Control has many years of experience, both in the delivery of Air Traffic Services and the design of concepts as in the development, validation and implementation of Air Traffic Management tools.</p> <p>Croatia Control is ISO 9001, ISO 14001 and BS OHSAS 18001 certified.</p>
<p>Previous experience</p>	<p>Croatia Control has an extensive experience in:</p> <ul style="list-style-type: none"> • Definition and validation of support and separation tools in EUROCAT-E system since 2001. • Development of the current ATM systems’ core functionality is 4D trajectory based MTCB. • Definition, validation and implementation of FRA • Definition, validation and implementation of trajectory management, cross-border FRA and separation management in FRA. • Development, validation and implementation of separation management tools and safety tools – implementation of 4D trajectory management ATM system as a part of COOPANS since 2012.
<p>Entity Profile matching the task</p>	<p>Croatia Control as a part of COOPANS has a long experience in cooperating with industry partner Thales at expert and management level for the development of core ATM system EUROCAT-E and TopSky since 2001. TopSky is one of the most modern ATM systems in the world, and Croatia Control together with COOPANS partners are continuing to develop the ATM system in anticipation of future European Mandates and SESAR in a cost efficient manner.</p> <p>Many of the Croatia Control’s experts had been working in EUROCAT-E developments and implementation, and now are working with COOPANS partners and Thales on development of the functionalities in the TopSky. COOPANS has particular expertise in the development of common operational solutions, the development of ATM functions and ATC support tools and future concepts of operations.</p> <p>Croatia Control has experience in many areas related to this project, as for example:</p> <ul style="list-style-type: none"> • Development and supervision of operational concepts • Safety concepts & Safety Assessments • CWP design • Development and implementation of ATM systems and tools • Trajectory management (core functionality in EUROCAT-E and TopSky) • Development and implementation of safety and monitoring tools (core functionality in EUROCAT-E and TopSky – 4D MTCB) • Free route (implemented cross border direct routes and FRA within Zagreb, Sarajevo and Belgrade FIRs, known as SEAFRA) • Validation and Integration • Participation in European deployment activities (IDSG) • Human Performance Assessment • ATM expert – Operations • ATFCM Expert – Operations

Controller Tools and Team Organisation for the Provision of Separation in Air Traffic Management

	<ul style="list-style-type: none"> • ATC User Requirements
Contribution	As ANSP, Croatia Control can firstly provide operational and, to some extent, technical experts. The current ATM systems' core functionality is 4D trajectory based Medium Term Based Conflict Detection (MTCD). Croatia Control as a part of COOPANS has experience from implementation and deployment of Free Route airspace and all related system functionalities/tools/concepts etc. Croatia Control has experience from trajectory management, cross-border Free Route airspace and separation management in Free Route airspace.

4.1.1.20 IAA/COOPANS

Organisation	20 IAA/COOPANS	Air Navigation Service Provider
Description	<p>Irish Aviation Authority is a state owned limited liability company</p> <p>Locations: The headquarter is located in Dublin and subdivisions are located in Shannon and Cork</p> <p>Divisions: Two main divisions - Operations and Strategy, Technology and Training supported by corporate services. Furthermore Irish Aviation Authority has a Safety Regulation Directorate, as Irish Aviation Authority oversees and regulates the implementation of standards for the Irish civil aviation industry.</p> <p>Governance structure: Irish Aviation Authority has a Board of Directors having responsibility for the corporate governance.</p> <p>Irish Aviation Authority (IAA) is a member of COOPANS Consortium consisting of 5 Air Navigation Service Providers: Austro Control (ACG), Croatia Control (CCL), Irish Aviation Authority (IAA), Naviair and LFV. Cooperation between COOPANS partners goes beyond SESAR – partners has for a long time worked together with Thales under a common framework agreement in a joint program based on the incremental development of a common ATM platform. The overarching goal for COOPANS is to enable each individual ANSP to achieve financial savings through cost, resource, and competence sharing and to meet the EU objective of harmonizing ATM systems. This work is now expanded to Research & Innovation by the establishment of the COOPANS Consortium.</p> <p>Irish Aviation Authority (IAA) has many years of experience, both in the delivery of Air Traffic Services; design of concepts and in development, validation and implementation of Air Traffic Management tools.</p> <p>The enterprise is certified ISO 9001.</p>	
Previous experience	<p>Irish Aviation Authority (IAA) has participated in SESAR via NORACON consortium in the following WPs:</p> <p>WP5 TMA Operations (5.3, 5.6.1,5.6.4, 5.6.7, 5.9), WP6 Airport Operations (6.7.1), WP 10 En-Route & Approach ATM Systems (10.2.1, 10.3.8, 10.10.3), WP 16 R&D Transversal Areas (16.4.3, 16.6.1), WP C Master Plan Maintenance (C3)</p>	
Entity Profile matching the task	<p>Dublin TMA Operations experience of Point Merge implementation, including procedures design to ensure no conflicting of arrival departure trajectories.</p> <p>En-route operational experience of MTCD refinement and implementation.</p> <p>Project experts involved is now working with Thales on development of the functionalities in the current ATM-system TopSky.</p> <p>Expertise in the following areas:</p>	

	<ul style="list-style-type: none"> • Safety concepts & Safety Assessments • Airport safety support tools • Collaborative Decision Making • Air traffic forecast/Capacity planning incl. runway capacity enhancement • CWP design • Development and implementation of ATM systems & Tools (common development and implementation of TopSky) • Trajectory management (core functionality in TopSky) • Development and implementation of safety and monitoring tools (core functionality in TopSky – 4D MTCD) • Flight procedures, special approach procedures (incl. RNAV) • Performance Based Navigation • Validation and Integration
Contribution	Operational ATCO and system experts.

4.1.1.21 LfV/COOPANS

Organisation	21 LfV/COOPANS	Air Navigation Service Provider
Description	<p>Luftfartsverket (LFV) is a state enterprise with headquarter located in Norrköping, Sweden. LFV has subdivisions located in 22 different sites, most important being in Stockholm (Arlanda) and Malmö (Sturup), where the two area control centres are located.</p> <p>LFV has three main divisions:</p> <ul style="list-style-type: none"> • Operational Systems & Development • ATM Operations • Sales, International Affairs & Business Development <p>All supported by corporate services.</p> <p>Governance Structure:</p> <p>LFV has a Board of Directors having responsibility for the corporate governance. The Director general is appointed by the Board of Directors.</p> <p>LFV is a member of COOPANS Consortium consisting of five Air Navigation Service Providers: Austro Control (ACG), Croatia Control (CCL), Irish Aviation Authority (IAA), Naviair and Luftfartsverket (LFV). Cooperation between COOPANS partners goes beyond SESAR- partners has for a long time worked together with Thales under a common framework agreement in a joint program based on the incremental development of a common ATM platform. The overarching goal for COOPANS is to enable each individual ANSP to achieve financial savings through cost, resource, and competence sharing and to meet the EU objective of harmonizing ATM systems. This work is now expanded to Research & Innovation by the establishment of the COOPANS Consortium.</p> <p>Luftfartsverket (LFV) has many years of experience, both in the delivery of Air Traffic Services; design of concepts and in development, validation and implementation of Air Traffic Management tools.</p> <p>LFV has an extensive experience and a close interaction with the industry and Swedish Transport Agency, developing new technology. The effect of this is a flexible product portfolio of functional and cost efficient solutions, like the development of Remote Tower Services (RTS) that went from idea to reality in record time.</p> <p>The enterprise is certified ISO 9001.</p>	

<p>Previous experience</p>	<p>LFV has participated, contributing to and also been leading projects in SESAR 1 via NORACON Consortium in the following WPs:</p> <p>WP00 SESAR2020 preparation: 00.14, 00.15</p> <p>WP3 Validation infrastructure adaptation and integration: 03.01.01, 03.02.01, 03.02.02, 03.03.02, 03.03.03</p> <p>WP4 En-route Operations : 04.08.04, 04.10</p> <p>WP5: TMA Operations 05.03.00, 05.06.01 (Lead), 05.06.02, 05.06.04, 05.06.07, 05.07.02, 05.09</p> <p>WP6 Airport Operations: 06.06.02, 06.07.01, 06.08.01, 06.08.02, 06.08.04, 06.08.08, 06.09.03(Lead)</p> <p>WP7 Network Operations: 07.05.02, 07.05.03, 07.05.04</p> <p>WP8 Information Management: 08.00 (Lead), 08.01.03, 08.01.04, 08.01.05, 08.01.06, 08.01.09, 08.03.00, 08.03.03, 08.03.04, 08.03.06, 08.03.10</p> <p>WP9 Aircraft Systems : 09.48</p> <p>WP10 En-Route & Approach ATM Systems: 10.02.01, 10.02.03, 10.03.01, 10.03.08, 10.04.04, 10.07.01, 10.09.04, 10.10.03</p> <p>WP12 Airport Systems : 12.02.01, 12.04.06, 12.04.07, 12.04.08, 12.04.10</p> <p>WP14 SWIM Technical Architecture: 14.01.03, 14.04</p> <p>WP15 Non-Avionic CNS System: 15.01.06, 15.01.07, 15.02.04, 15.04.05.a, 15.04.05.b</p> <p>WP16 R&D Transversal Areas: 16.01.02, 16.04.01, 16.04.03, 16.04.04, 16.05.04, 16.06.01.b</p> <p>WP B Target Concept and Architecture Maintenance: B.04.01, B.04.02, B.04.03, B.0</p> <p>WPC Master Plan Maintenance: C.02, C.03</p> <p>Development of separation management tools and safety tools –Implementation of 4D trajectory management ATM system (2004-2007) (COOPANS since 2012).</p> <p>Implementation of Free Route H24 in DK/SE FAB (2011).</p> <p>LFV has worked together with SAAB in the Midcas project which will be inputs to development for future RPAS implementation.</p>
<p>Entity Profile matching the task</p>	<p>LFV has expertise in development of separation and safety tools. The development of S2000 (now Thales TopSky) was defined, evaluated and validated by huge involvement of LFV operational and Human Factors experts many of these competencies are now working with Thales within the COOPANS context on future developments of functionalities within the TopSky ATM system.</p> <p>Expertise is present in the company in many areas:</p> <ul style="list-style-type: none"> • Remote airport ATC • Development and supervision of operational concepts • Safety concepts & Safety Assessments • Airport safety support tools • Collaborative Decision Making • Air traffic forecast/Capacity planning incl. runway capacity enhancement • CWP design • Development and implementation of ATM systems & Tools (common development and implementation of TopSky) • Trajectory management (core functionality in TopSky)

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	<ul style="list-style-type: none"> • Development and implementation of safety and monitoring tools (core functionality in TopSky – 4D MTCD) • Flight procedures, special approach procedures (incl. RNAV) • Performance Based Navigation • Integration, validation and analysis of test result • Extended lab environment including NARSIM and Thales IBP • Participation in European deployment activities (IDSG) • Human performance assessment
Contribution	<p>LFV will contribute with operational experts (ATCOs) with focus on concepts, operational issues and evaluations additionally safety and Human Performance expertise will be provided.</p> <p>The current ATM systems’ core functionality is 4D trajectory based Medium Term Based Conflict Detection (MTCD). LFV work within the COOPANS context has generated experience from implementation and deployment of Free Route airspace and all related system functionalities/tools/concepts etc.</p> <p>Further, LFV has experience from trajectory management, cross-border Free Route airspace and separation management in Free Route airspace.</p>

4.1.1.22 Airtel (NATMIG)

Organisation	22 Airtel (NATMIG)	Ground Industry
Description	<p>Airtel ATN Ltd is a part of North European ATM Industry Group (NATMIG) Consortium. NATMIG is a member of SESAR 1. The NATMIG consortium consists of Airtel ATN (SME - Ireland), Saab AB (multinational industrial concern - Sweden) and Stiftelsen SINTEF (non-profit research foundation - Norway).</p> <p>Airtel is an SME which has an extensive line of ATN & FANS data link products and technology used in 35 countries worldwide. Its operational systems include ATN/OSI routers deployed on more than 2,500 aircraft. Its ground systems include Air/Ground Data Link Servers deployed in several European Countries and Air/Ground routers used in VDL Mode-2 networks. It provides data link test and monitoring equipment. It has developed experimental version of future data link systems such as ATN/IPS, SATCOM and AeroMACS.</p> <p>Airtel is providing Test and Monitoring equipment to the FAA DCIS program. It has extended its research collaboration to include organisations in China. It is also providing Data Link networking equipment in collaboration with Russian companies.</p> <p>Airtel also provides Data Link test services and products in support of Aircraft Data Link certification for ACARS, FANS and ATN/OSI, in particular EU Data Link and US DCIS aircraft testing.</p>	
Previous experience	Not applicable.	
Entity Profile matching the task	Not applicable, Airtel (NATMIG) initially will not participate directly in this action.	
Contribution	Support to participating NATMIG members if required	

4.1.1.23 Sintef (NATMIG)

Organisation	23	SINTEF (NATMIG)	Ground Industry
Description	<p>SINTEF is a part of North European ATM Industry Group (NATMIG) Consortium. NATMIG is a member of SESAR 1. The NATMIG consortium consists of Airtel ATN (SME - Ireland), Saab AB (multinational industrial concern - Sweden) and Stiftelsen SINTEF (non-profit research foundation - Norway).</p> <p>SINTEF carries out contract research in a wide range of scientific and technical areas. Our business model spans from basic research with main focus on applied research to commercialisation of results into new business ideas. SINTEF employs more than 2250 employees from 70 different countries. The main office is in Trondheim, Norway, and SINTEF has offices in several locations both in Norway and abroad.</p> <p>Our business area SINTEF ICT is continuously specialising in leading edge information and communications technology (ICT), and forms the technology basis for our ATM activities. SINTEF ICT provides research based expertise and technology in the areas of: micro- and sensor systems, electronics, communication, optical systems, computational software, information systems as well as security and safety.</p> <p>SINTEF's main areas of interest are:</p> <ul style="list-style-type: none"> • ATM Architecture and content integration • Remote Tower • GBAS • Human Computer Interface • Optimisation in airport and airspace management, including DCB. 		
Previous experience	Not applicable.		
Entity Profile matching the task	Not applicable, SINTEF (NATMIG) initially will not participate directly in this action.		
Contribution	Support to participating NATMIG members if required		

4.1.1.24 LPS SR (B4)

Organisation	24	Letové prevádzkové služby Slovenskej republiky, štátny podnik	Air Navigation Service Provider
Description	<p>Founded by the Ministry of Transport, Construction and Regional Development of the Slovak Republic in January 2000, LPS SR (Letové prevádzkové služby Slovenskej republiky, štátny podnik) is a state enterprise providing Air Navigation Services, including Air Traffic Services, Aeronautical Telecommunication Services, Aeronautical Information Services, as well as Search and Rescue, in the Slovak Republic.</p> <p>With a total staff of 495 (including 114 ATCOs) and altogether nine Operational units, among them one ACC (Bratislava), two APPs (Bratislava, Košice), five TWRs (Bratislava, Košice, Piešťany, Poprad, Žilina) and Central ATS Reporting Office (Bratislava), LPS SR controls the Slovak airspace (Bratislava FIR) of the total size of 48,800 km² and provides ATC services at five designated Slovak international airports as well as within small parts of the Hungarian airspace.</p>		

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	<p>In 2015, LPS SR provided services to 467,863 IFR flights, marking an annual 7.2% increase, which was preceded by a 9.8% increase in 2014 caused by substantial re-routings due to total closure of parts of the neighbouring Ukraine’s airspace, while ensuring the highest standards of safety (acceptable level of safety for incidents of the severity A and B in 2014: 0.35 ALS/TLS) and minimal average delays (average en-route ATFM delay per flight in 2014: 0.14 min/flight) without significant additional costs or increases in number of ATCOs.</p> <p>LPS SR (B4) is constituent entity of B4 Consortium, composed of four ANSPs from Central and Eastern part of Europe and their Linked Third Parties. LPS SR is a Member of the FAB CE and a founding member of the Gate One, a regional platform of Central and Eastern European ANSPs.</p>
Previous experience	Not applicable
Entity Profile matching the task	Not applicable, LPS SR initially will not participate directly in this action.
Contribution	Support to participating members of B4 Consortium if required.

4.1.1.25 ON (B4)

Organisation	25 Valstybes imone "Oro navigacija"	Air Navigation Service Provider
Description	<p>Valstybes imone "Oro navigacija", Air Navigation Service provider in Lithuania, was founded in 1995 as independent, 100% State owned enterprise. It operates under the supervision of the Ministry of Transport and Communications.</p> <p>Valstybes imone "Oro navigacija" provides air navigation services in Lithuanian airspace and in airspace over the part of Baltic Sea offering its users air traffic management services, communication, navigation and surveillance services as well as an aeronautical information services. It operates one combined En-route/TMA control centre at Vilnius, 3 TMA control centres at Lithuania’s international airports, each year providing safe and efficient air traffic control services to almost 230 thousands movements. It continues to maintain 0 min/flight delays level and to meet users expectations while flexibly and in cost effective way accommodating increase of the traffic up to 10%.</p> <p>Valstybes imone "Oro navigacija" is constituent entity of B4 Consortium, composed of four ANSPs from Central and Eastern part of Europe and their Linked Third Parties (further - L3Ps). B4 Consortium is a member of A6+ on SESAR 2020 Programme content.</p> <p>Valstybes imone "Oro navigacija" together with Polish ANSP PANSa forms Baltic FAB, and it is also a member of GATE ONE (joining 11 ANSPs), a regional platform of Central and Eastern European ANSPs.</p>	
Previous experience	Not applicable	
Entity Profile matching the task	Not applicable, Valstybes imone "Oro navigacija" initially will not participate directly in this action.	
Contribution	Support to participating members of B4 Consortium if required.	

4.1.1.26 PANSA (B4)

Organisation	26 POLSKA AGENCJA ZEGLUGI POWIETRZNEJ Air Navigation Service Provider
Description	<p>PANSA (Polish Air Navigation Services Agency) is the national entity acting pursuant to the Act on the Polish Air Navigation Services Agency (2006) to provide air navigation services in Poland. PANSA provides air traffic management services, communication, navigation and surveillance services as well as an aeronautical information services in the Polish airspace and in airspace over the part of Baltic Sea. It operates one combined En-route/TMA control centre at Warsaw, 3 independent TMA control centres (Gdańsk, Kraków, Poznań) and 14 tower units at Polish international airports. Each year PANSA, being one of the biggest ANSPs in the Central and Eastern part of Europe, provides safe, effective and highly efficient air traffic control services to almost 700 thousands movements.</p> <p>PANSA is constituent entity of B4 Consortium, composed of four ANSPs from Central and Eastern part of Europe and their Linked Third Parties. B4 Consortium is a member of A6+ on SESAR 2020 Programme content.</p> <p>PANSA is a Member of the Baltic FAB and Gate One, a regional platform of Central and Eastern European ANSPs.</p>
Previous experience	<p>Previous projects:</p> <ul style="list-style-type: none"> • GIANT (GNSS INTRODUCTION IN THE AVIATION SECTOR) – project researching possibility of usage of EGNOS and Galileo systems for approach procedures. 2005-2011 • HEDGE (Helicopters Deploy GNSS in Europe) – project aimed on deployment of EGNOS system among helicopters and GA. In Poland there was introduced first time LPV approach procedure in Katowice and Mielec airports. Partners: REGA, Aeroclub de Sabadell, Pildo Labs, TAF Helicopters, Capital High Tech, Helileo, Polish Air Navigation Services, Royal Star. 2009-2011 • SHERPA (Support ad-Hoc to Eastern Region Pre-operational Actions in GNSS) – regional project aiming on harmonization and acceleration of GNSS deployment among Central and Eastern Europe. Partners: BULATSA, PLD, ESSP, HCAA, PANSA, SUT (Silesia University of Technology), DHMI. 2009- • MeteoFlight – national R&I program project in cooperation with Polish Institute of Meteorology and Water Management aiming at development of decision supporting tool which with use of meteo data helps to avoid areas of adverse weather in ATM. 2009-
Entity Profile matching the task	<p>Air Navigation Service Provider including the profiles:</p> <ul style="list-style-type: none"> • ATM Operational expertise, • ATC system expertise, • En-Route and Approach Air Traffic Controllers, • human factors expertise • performance expertise <p>PANSA will bring expertise of its Linked Third Party in the area of numerical modelling (also weather modelling) and development and validation of unique solutions targeted at aviation community supported by weather data archive as well as a reliable and secure High Performing Computing and data processing centre.</p> <p>PANSA’s Linked Third Party experience specific to solution PJ.10-05 has been proved during the implementation of a large number of various research and development projects on:</p> <ul style="list-style-type: none"> • development and validation of main Polish control and avionics systems;

	<ul style="list-style-type: none"> • long-term research and training programs as well as effective implementation and commercialization of new technologies aimed at the aerospace industry; • research and development of air transport and control and avionics systems performed in cooperation with national (Polish) industry and European research entities.
Contribution	<p>PANSA supported by its Third Linked Party as the contributor to SESAR Solution 10-02A intends to devise and develop a decision support tool (DST) specially addressing unusual situations generated or influenced by subtle navigational factors affecting separation management. PANSA plans to participate in all validation activities related to aforementioned DST.</p> <p>PANSA supported by its Linked Third Party as the contributor to SESAR Solution PJ.10-05 intends to develop and validate following tasks:</p> <ul style="list-style-type: none"> • Analysis and development of methods and models of trajectory description; • Analysis of existing and proposed ATM procedures, new technologies, approaches and trends dealt with RPAS; • Operational mission and scenario analysis for RPAS; • Initial validation of minimum performance requirements for RPAS IFR/VFR flights and separation criteria; <p>Operational validation of minimum performance requirements for RPAS IFR/VFR flights and separation criteria.</p>

4.1.1.27 HC (FSP)

Organisation	27	HUNGAROCONTROL MAGYAR LEGIFORGALMI SZOLGALAT ZARTKORUEN MUKODO RESZVENYTARSASAG	Industry
Description	<p>HC (FSP). is a state-owned company in Hungary, which provides air navigation services in the Hungarian airspace and (on a NATO assignment) in the upper airspace over Kosovo, trains air control personnel and conducts air navigation research and development.</p> <p>HC (FSP) is member of the Frequentis SESAR Partners consortium together with the companies Atos Belgium and Frequentis AG and was founded in 2014 for the main purpose of joining SESAR2020 activities. Frequentis SESAR Partners is member of the SESAR Joint Undertaking.</p> <p>The consortium is comprised of companies having a variety of complementary capabilities. Having former SESAR1 experience within its framework, an ANSP whose expertise will result in early feedback loops during certain projects, and the wide range IT, data management and security expertise of the consortium forming entities, Frequentis SESAR Partners believes in the high added value of its participation in SESAR2020 efforts.</p>		
Previous experience	<p>HC (FSP) has more than 50 years of experience in ATM and it has implemented several technical and operational updates for the entire Hungarian airspace. Since its foundation, it has a very strong relation with universities and scientific centres.</p> <p>HC (FSP) is active in ATM research, in SESAR 1 demonstration activities (REACT-Plus), won a grant of SESAR JU for a Large Scale Demonstration project (Budapest 2.0).</p>		
Entity Profile matching the task	<p>HC (FSP) will support the project with expert staff and ATCO in methodology questions for operational viability and provides simulation, validation platform.</p>		

Contribution	HC (FSP) will support the project with expert staff and ATCO in methodology questions for operational viability and provides simulation, validation platform.
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4.1.1.28 Atos (FSP)

Organisation	28 ATOS BELGIUM	Industry
Description	<p>Atos Belgium is a company within Atos SE (Societas Europaea) group. Atos is a leader in digital services with 2014 pro forma annual revenue of €10 billion and 86,000 employees in 66 countries. Serving a global client base, the Group provides Consulting & Systems Integration services, Managed Services, Cloud operations, Big Data & Security solutions, as well as transactional services. Throughout Europe, more than 300 Atos ATM experts provide solutions and architecture support to Air Navigation Service Providers, Airports, Airlines and Eurocontrol Network Manager.</p> <p>Atos Belgium is member of the Frequentis SESAR Partners consortium together with the companies HUNGAROCNTRM MAGYAR LEGIFORGALMI SZOLGALAT ZARTKORUEN MUKODO RESZVENYTARSASAG and Frequentis AG and was founded in 2014 for the main purpose of joining SESAR2020 activities. Frequentis SESAR Partners is member of the SESAR Joint Undertaking.</p> <p>The consortium is comprised of companies having a variety of complementary capabilities. Having former SESAR1 experience within its framework, an ANSP whose expertise will result in early feedback loops during certain projects, and the wide range IT, data management and security expertise of the consortium forming entities, Frequentis SESAR Partners believes in the high added value of its participation in SESAR2020 efforts.</p>	
Previous experience	Not applicable	
Entity Profile matching the task	Not applicable, Atos Belgium initially will not participate directly in this action.	
Contribution	Support to participating members of Frequentis SESAR Partners if required.	

4.1.1.29 NLR (AT-One)

Organisation	29 NLR (AT-One)	Reserach
Description	<p>Stichting Nationaal Lucht en Ruimtevaartlaboratorium (Netherlands Aerospace Centre) is participating in the AT-One Consortium, NLR (AT-One). The AT-One consortium is formed by the German Aerospace Center (DLR) and the Netherlands Aerospace Centre (NLR). AT-One combines the strength of DLR and NLR by joining their capabilities with respect to innovative and independent Air Traffic Management research and implementation support.</p> <p>NLR (AT-One) is the Netherlands Aerospace Centre for identifying, developing and applying advanced technological knowledge in the area of aerospace. NLR (AT-ONE) activities are relevant to society. They are market-oriented and carried out on a non-profit basis. NLR (AT-One) strengthens the innovativeness, competitiveness and effectiveness</p>	

	<p>of government and business. The mission of NLR (AT-One) is to increase the sustainability, safety and efficiency of air transport. NLR is renowned for its leading expertise, professional approach and independent consultancy. NLR moreover possesses an impressive array of high quality research facilities. The activities of NLR span the full spectrum of Research Development Test & Evaluation. NLR thereby bridges the gap between research and practical applications, while working for both government and industry. Founded in 1919, and employing some 650 people.</p> <p>NLR (AT-One) is participating with two divisions in SESAR which are shortly introduced in the following:</p> <p>The division Aerospace Operations of NLR (AT-One) supports its customers – worldwide- with the realization of an excellent operation. With our extensive expertise and unique simulation facilities we contribute to the sustainable performance of air traffic: futureproof, safer, more efficient and more environmentally friendly. Through consultancy and R&D our flexible and state-of-the-art activities find their way to customers such as airlines, air traffic control, airports, ATM industry and governments. We find our customers both in The Netherlands and beyond its borders and also contribute to European programmes such as SESAR and CleanSky. From the integration of drones in civil airspace to new airport concepts, with our passion for aerospace and our excellence and extensive knowledge of air traffic we always strive for the best result for the customer.</p> <p>The division Aerospace Systems of NLR (AT-One) is active in several domains: avionics technology, definition and flight testing of aircraft systems, application and testing of military systems, and application of space systems. Experts are active in the recent developments of RPAS technology, their certification and integration into non-segregated airspace. Furthermore the division is active in defining and facilitating experimental flight testing. The division has wide expertise in the certification of civil and military aircraft and systems. In the field of navigation NLR (AT-One) has deep expertise in GNSS.</p>
Previous experience	Not applicable
Entity Profile matching the task	Not applicable
Contribution	None

4.2 Third parties involved in the project (including use of third party resources)

4.2.1 Linked to DFS

Objective	
Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	Y
<p>Analysis and provision of airborne derived data for estimation of wind data should be subcontracted because the expected improvements in trajectory prediction and conflict detection tools. This Know-How is not available among the partners. There is also the need to develop and validate algorithms for ‘No-Fly’-zones depending on the meteorological conditions. This includes also the Human-Machine Interface to the Air Traffic Controller.</p>	

<p>Extended Projected Profile (EPP) data during different flight manoeuvres are to be provided for estimation of the most promising data including technical quality of service parameter. These data are required before (expensive) validations are planned in order to minimize costs and risk for validation campaigns. The subcontract shall ensure the provision of EPP data for defined flight manoeuvres.</p>	
Does the participant envisage that part of its work is performed by linked third parties ⁵	Y
<p>The Deutscher Wetterdienst (DWD) is a public institution with partial legal capacity under the Federal Ministry of Transport and Digital Infrastructure. Germany's National Meteorological Service is responsible for meeting meteorological requirements arising from all areas of economy and society in Germany.</p> <p>The DWD is the main provider for meteorological data for DFS operational units. Service agreements and legal contracts are established between both parties. In this project, airborne data derived from Mode S information, should be used to get instantaneous wind data and improve the short-term forecast. The DWD has long experience with provision of meteorological services for DFS and understands the operational requirements and constraints for this specific application. The DWD shall support DFS with provision of raw data and meteorological Know-How for validation in Real Time Simulations.</p>	
Does the participant envisage the use of contributions in kind provided by third parties (Articles 11 and 12 of the General Model Grant Agreement)	N

4.2.2 Linked to AIRBUS

Objective	
Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	Y
<p>Airbus SAS and Airbus Operations SAS will subcontract part of their contribution. The subcontracted part of the activities is in full consistency with the make or buy policy applicable at Airbus ensuring that core activities and expertise is kept internally and respecting H2020 rules as well as any relevant legislation with regards to subcontracting. The subcontractors will be selected after competitive calls for tender and relevant selection processes ensuring the best value for money or, if appropriate, the lowest price and avoiding any conflict of interests. These subcontracting agreements are not placed only for SESAR tasks although they include specific work packages for SESAR and are renegotiated on a periodic basis. Airbus will however check and ensure the consistency of the existing subcontracting agreement with the H2020 requirements.</p> <p>Airbus confirm that for this project, it is not a core activity.</p>	
Does the participant envisage that part of its work is performed by linked third parties	Y
<p>For the present proposal, Airbus Operations SAS and Airbus Defence and Space SAS are linked third parties of Airbus SAS, as declared in the Airbus Proposal for Membership Accession -REF. SJU/LC/0122-CFP.</p> <p>Airbus Operations SAS</p> <p>Airbus Operations SAS designs and manufactures aircraft, aircraft parts, systems, equipment and derivative products, and provides services in the field of aeronautics. Airbus Operations SAS Engineering is operated</p>	

⁵ A third party that is an affiliated entity or has a legal link to a participant implying a collaboration not limited to the action. (Article 14 of the Model Grant Agreement).

in one major design office in Toulouse. It gathers top-level competencies such as integrator architecture, general design, integration tests and systems, propulsion, structural design and computation.

The Toulouse Design Office has dealt with systems design and development for many years and acquired a large expertise in this area.

Airbus Operations SAS will perform the design work in solutions PJ.10-02a and PJ.10-02b whereas Airbus SAS will concentrate on programme management and transversal ATM engineering contributions.

Airbus Defence and Space SAS

Airbus Defence and Space SAS has different activities in air Traffic Control Centres (ATCC) and Airports Towercab, in particular in Support to ATM Services Providers:

- System Engineering: participation to the Coflight and SESAR programmes
- System Integration, Validation & Deployment: various contracts for DSNA/DTI
- Programme Management: participation to the Coflight and SESAR programmes
- Development of new systems: development of the ERATO and ELISA software (MTCD for France and Italy), and participation to the 4-Flight programme
- Maintenance of operational systems: CAUTRA: En Route system in 4 French ACCs and Approaches (80 sites Airports towercab)

Airbus Defence and Space will contribute to solutions PJ.10-02a and PJ.10-02b with regard to separation management ATC tools.

Does the participant envisage the use of contributions in kind provided by third parties (Articles 11 and 12 of the General Model Grant Agreement)	N
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4.2.3 Linked to Naviair/COOPANS

No third parties or subcontractors involved.

4.2.4 Linked to DSNA

Objective

Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	Y
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DSNA has in house expert engineers for En-Route and TMA traffic management. They have the ability to develop new concepts and define specifications for new ATM tools. But, in order to fulfil its prospective studies, DSNA needs additional expertise. In PJ.10-02, subcontracted activities will encompass: platform maintenance and configuration in preparation of demonstration exercises, data preparation and collect of the data steaming from the validations, support to the analysis of the results through specific tooling.

DSNA Subcontract 2015.002.0000201 allows DSNA/DTI to buy these necessary required studies/services. This subcontract is a framework for placing specific purchase orders and has been attributed in accordance to the French “Code des Marchés Public” to the SOPRA STERIA EGISAVIA & Bertin consortium. The duration of this contract is one year renewable five times (max. six years).

Does the participant envisage that part of its work is performed by linked third parties	Y
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ENAC and SAFRAN will work with DSNA as linked third parties in PJ.10-05.

ENAC

ENAC is a public high school placed under the authority of the French Transport Ministry. ENAC trains engineers in electronics, computer and air transport. It also trains pilots, air traffic controllers and technical experts for maintenance and supervision. ENAC have five departments for research and education: air transport, air traffic control, humanities and social sciences, electronics, mathematics and computer science. The ENAC's laboratories are or have been involved in many research projects at the national and European level (ex. ATM-FUSION / ICONUS and the SESAR JU RPAS demonstrators ODREA and TEMPAERIS).

SAFRAN

SAFRAN, high-tech company is a world leader in solutions and services in optronics, avionics, electronics and critical software for the civilian and military markets. In addition to the development and support of tactical (Sperver) and long endurance (Patroller) RPAS, Sagem is a direct contributor to NATO or EDA projects (e.g MiDCAS) in the domain of insertion of RPA in non-segregated airspace and is a leading member of EUROCAE WG73. SAFRAN participated to the ODREA SESAR JU RPAS demonstrator.

Does the participant envisage the use of contributions in kind provided by third parties (Articles 11 and 12 of the General Model Grant Agreement)	N
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4.2.5 Linked to ENAIRE

Objective

Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	Y
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ENAIRE plans to subcontract the involvement of pseudo-pilots in those validation activities to be executed in ENAIRE premises.

Does the participant envisage that part of its work is performed by linked third parties	Y
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INECO, CRIDA and ISDEFE will support ENAIRE in the operational concept development, definition of system requirements and all tasks related to validation activities.

INECO

Ineco (Ingeniería y Economía del Transporte, S.A.) is an engineering and consulting Public Entity 45,85% owned by ENAIRE, focused on the transport sector in general, and also in the air transport field in particular, including ATM and airport operations and management.

CRIDA

CRIDA is a reference ATM R&D&I centre created by ENAIRE, Ineco and the Universidad Politécnica de Madrid. Its main focus is the performance improvement of the ATM system, developing, validating and implementing ATM solutions.

Isdefe

Isdefe (Ingeniería de Sistemas para la Defensa de España, S.A.) is a State-owned company that offers consulting and engineering services for Spanish public administration and public international agencies, addressing the definition, implementation, operation, evolution and regulation of CNS/ATM aspects.

Isdefe is (and of course has been) providing support to ENAIRE in a wide range of areas and projects. It is here worth to mention its support for more than 25 years now in the development, verification, validation and deployment of the Spanish ATC system.

Does the participant envisage the use of contributions in kind provided by third parties (Articles 11 and 12 of the General Model Grant Agreement)	Y
<p>Several companies have been collaborating by means of third party in kind contribution with ENAIRE for long time, and a close collaboration exists in this sense. This has been the habitual practice in SESAR 1 activities and the results have become optimal in terms of efficiency and mutual collaboration.</p> <p>The use of this in kind contribution is identified as a key factor for the proper development of the activities under this project. The complementarity of the know-how and expertise profile obtained by this form of collaboration is necessary to achieve the targets with the expected level of quality.</p> <p>This contribution corresponds to the one referred to in Art. 11 of the AMGA (in-kind contributions against payment), in turn corresponding to category “A.3- seconded persons” of the Annex 2 of the Grant Agreement , and currently is estimated to amount to around 13.000 € (direct costs) for the work developed on ENAIRE’s premises (since there is no specific place in Annex 2 to indicate these costs).</p>	

4.2.6 Linked to ENAV

Objective	
Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	N
<p>Does the participant envisage that part of its work is performed by linked third parties⁶</p> <p>Y</p> <p>ENAV contribution in the project is complemented by the following LTPs: BULATSA, CIRA, Deep Blue, IDS, MATS, SICTA.</p> <p>BULATSA</p> <p>Bulgarian Air Traffic Services Authority (BULATSA) is a legal entity based in Sofia and performing state functions for the provision of air navigation services in the controlled civil airspace of the Republic of Bulgaria, in line with the international agreements in the field of civil aviation signed and ratified by the Republic of Bulgaria.</p> <p>BULATSA consists of a central headquarter and air traffic control centres – Area Control Centre (ACC) in Sofia and APP/TWR Centres in Varna, Burgas, Plovdiv and Gorna Oryahovitsa. The scope of BULATSA's activities encompasses all aircraft departing from and arriving at civil airports and overflying the controlled civil airspace of the Republic of Bulgaria.</p> <p>BULATSA successfully fulfils the functions delegated by the Bulgarian state, namely the provision of air traffic services, and follows its development strategy. A pro-active stand to the Single European Sky initiative is in place. The new SATCAS ATM System has recently commenced operations, equipped with state-of-the-art hi-tech functionalities anticipating the future needs of air traffic service provision.</p> <p>Bulgaria constantly promotes and boosts the co-operation in the region through their active participation in several regional initiatives and agreements. BULATSA is an active partner in ATM co-operation in South Eastern Europe and is a key partner along with ROMATSA in the DANUBE FAB.</p>	

⁶ A third party that is an affiliated entity or has a legal link to a participant implying a collaboration not limited to the action. (Article 14 of the Model Grant Agreement).

BULATSA will participate as a linked third party to ENAV to the two following Solutions developed with AI DS Space:

PJ.10-02a Improved Performance in the Provision of Separation to contribute to the development of the V2 and V3 maturity level solutions. BULATSA will deploy an industry based platform which will host a prototype provided by AI DF Space which will be used towards the validation of OI steps: (1) CM-0206 and (2) CM-0208-A with focus on enhancing the tactical separation management process, resolution assistance and conformance monitoring. BULATSA will contribute to the development of concept description (OSED/SPR/INTEROP) and validation tasks (VALP and VALR), while Airbus D&S will be involved in the technical specification and the prototype development.

PJ.10-02b Advanced Separation Management to contribute to the development of the V1, V2 and V3 maturity level solutions. In collaboration of Airbus D&S BULATSA will contribute to the validation of OI steps (1) CM-0408, CM 0208-B to provide enhancements to conflict detection and resolution tools intended to be used in TMA operational environment. BULATSA will be involved in OSED/SPR/INTEROP and in VALP and VALR while Airbus D&S will provide the technical specification and the prototype. The activities are interdependent on the outcome of PJ.10-02a and on PJ.18 for the use of EPP data.

CIRA

CIRA was created in 1984 to manage PRORA, the Italian Aerospace Research Program, and uphold Italy's leadership in the fields of Aeronautics and Space. It has both public and private shareholders. CIRA is involved in advanced aeronautical and space research which ranges from the study of revolutionary air and space craft to innovative systems to reduce environmental impact, increase flight safety, make surveillance more effective , developing and verifying in its own labs systems to re-enter the atmosphere from space. CIRA plays its role directly or collaborating with small and large companies at a domestic, European or global level, and with bodies and institutions from NASA to the European Space Agency, from the European Commission to the Chinese Aerospace Academy.

Its contribution to the project will come from different departments belonging to the Environmental Impact of Air Transport division, namely through its Air Transport Sustainability Department, and to the On Board Systems and ATM division, namely through its Air Transport Management Department. The Air Transport Sustainability Department will assume the leading role of the CIRA subcontracting participation in the project, as far as the GA aircraft is concerned, and will maximise the benefits deriving from the involvement of its researchers. The Air Transport Management Department will lead the participation in the project for what concerns the RPAS integration aspects, in which the ATM Department can take relevant previous experiences and also taking benefit for involvement in other SESAR 2020 project on the topic (PJ.13-01-01). CIRA researchers involved in the project have long experience and relevant know-how acquired in projects aimed at developing and validating up to TRL 6 innovative technologies in the field of on board avionics systems for both manned and unmanned vehicles. Specific research activities are devoted to the development of avionics systems technologies tailored for the full integration of the RPAS and GA vehicles within the future civil ATM system (SESAR). In this project, CIRA Air Transport Sustainability Department can make available specific expertise in the field of Traffic Avoidance, Collision Avoidance and Advanced Situational Awareness systems, by providing support in the design of specific applications aimed to implement automatic conflict detection and resolution for Separation Management. The specific know-how has been improved by the participation in international projects like MIDCAS (EDA funded) and RAID (SESAR JU funded).

Specialised support in the development of automatic controller support tools for separation management should be subcontracted, because relevant research activities are ongoing on this topic and they should be capitalised in the project. Research and development advancements are expected with reference to both Conflict Detection and Conflict Resolution functionalities for Advanced Separation Management and with reference to Enhanced Situational Awareness. These innovative functionalities should be used in order to support the controller decision making in the Separation Management task.

The know-how about the above indicated functionalities can be efficiently improved in the consortium by benefiting of the support of a specialised research centre, as linked third party.

Deep Blue

Deep Blue is an Italian research and consultancy SME specialised in safety, human factors, validation and dissemination. The company operates in the domain of transportation dealing with the design, analysis and evaluation of interactive systems, especially in Aviation and Air Traffic Management.

The company's main area of activity is the analysis and evaluation of interactive complex systems, with particular focus on interactions, integration and allocation of functions between humans, procedures and equipment. Deep Blue services range from concept design to system evaluation and validation.

Deep Blue research activity is concentrated on the following main areas:

- Evaluation and validation of air traffic and aviation concepts and systems;
- Evaluation of dependability of interactive systems;
- Methodologies and techniques for design, analysis and validation of air traffic and aviation concepts and systems.

A highly qualified multidisciplinary team skilled in Cognitive Science, Psychology, Safety, Engineering, Interaction Design, Computer Science and Mathematics leads Deep Blue in delivering innovative and highly professional results. Deep Blue's staff is highly qualified and research-oriented and about 70% of the personnel own a PhD and many of them collaborate with or teach in Italian Universities. The research activity is carried out mainly through the participation in cooperation projects both at a national and international level which are co-funded by public organisations and through the involvement in some of the most important Research Networks in the domains of interest.

DeepBlue, as ENAV LTP, has the expertise to validate and assess operators' impact of the New Sector Team Operations, investigating role and responsibilities distribution among operators, operating methods, effective allocation of tasks between operator and machine together with potential changes in operator competences. A similar approach should be adopted to validate the introduction of the assistance tools for conflict detection and resolution allowing more strategic optimisation of controllers' performance. Particularly, workload, situation awareness, need for training, usage and requirements identification of new tools will be the areas of investigation, applying a wide range of both-standard and tailored - methodologies.

The human performance assessment will be performed according to the guidelines of the Human Performance Assessment Process by SESAR and will be further supported by tailored methodologies and dedicated instruments to allow an integrated view of the concepts under investigations.

Finally Deep Blue contribution may support the validation of the integration of the RPAS into the current ATM environment. Particularly, aspects related to procedural means to safely integrate RPAS into ATM, human performance – especially in contingency situations – and training needs may investigated applying dedicated methodologies and expertise.

IDS INGEGNERIA DEI SISTEMI S.p.A.

IDS – INGEGNERIA DEI SISTEMI S.p.A. is based in Pisa (Italy) but also has a branch office in Rome and subsidiaries in four other countries abroad (UK, Brazil, Canada and Australia). It has around 500 employees worldwide with experience and expertise in the most sophisticated technologies. IDS's roots date back to 1980. Today, IDS is a world leading provider of high-tech solutions in selected niche defence and civil market sectors. Its Quality System is certified ISO 9001:2008.

IDS provides unrivalled solutions across defence and civil markets, managed by four different divisions, in the Naval, Aeronautical & Unmanned Systems, Air Navigation and Radar sectors.

The Air Navigation division, involved in this project, works globally with both civil and military aviation agencies and air navigation service providers to address their needs in the aeronautical fields of communication, navigation, surveillance and air traffic management.

Since its creation IDS has been investing more than 20% of its turnover in research and development programmes to guarantee its competitive margin. Nine laboratories are responsible for R&D activities. Serving more than 50 customers in over 20 countries, IDS Air Navigation Division is recognised as a leading solution and service provider in the Air Navigation market.

Since 1992, IDS has been working globally with both civil and military aviation agencies and air navigation service providers to address their needs in the aeronautical fields of communication, navigation, surveillance and air traffic management. IDS provides COTS solutions and highly customisable commercial software products aimed at supporting the transition from Aeronautical Information Services (AIS) to Aeronautical Information Management (AIM) in full compliancy with the ICAO and Eurocontrol mandates for data quality and ready for future challenges in data interoperability domains.

IDS has made available to the project its validation platform, including an Aircraft Cockpit Simulator, a Tower Simulator and the capability to simulate and control RPAS vehicles in the validation scenario.

IDS has demonstrated how to integrate RPAS into non-segregated airspace in a multi-aircraft and manned flight environment, in order to explore the feasibility of integration with the wider aviation community.

Therefore, IDS can contribute to RPAS solution in terms of:

- Operational concept definition;
- Analysis and development of methods/models for trajectory description;
- Operational validation of minimum performance requirements for RPAS IFR/VFR flights and separation criteria;
- Sensitivity of RPAS to severe conditions (e.g. weather) and assessment of contingency situations (e.g. data-link loss);
- RPAS Systems Engineering (Air and Ground Segment) and performances definition;
- Provision of RPAS Operational staff (remote pilots).

Moreover, IDS can contribute to ATC/RPAS simulation campaigns in terms of:

- Definition and design of the validation scenario (including traffic data and models);
- Validation of the model through comparison with real data;
- Simulation activities;
- Post processing and result data analysis/evaluation.

Finally, IDS can contribute to IFR procedures design and development in terms of:

- specific trajectories characterization, not defined in the existing B/MT format;
- flight preparation, requiring information management for flight planning, compatible with the ATM Network.

MATS

Malta Air Traffic Services Ltd (MATS) is the designated Air Navigation Service Provider for Malta. It is a Government-owned company and was established as a separate entity in January 2002. MATS is a certified ISO 9001/2008 entity. It is audited by Bureau Veritas on its Integrated Management System and the Malta Civil Aviation Directorate regarding the provision of air navigation services. Over the years, the Company has developed a high level of safety standards and adopts a policy of just culture.

MATS has one Area Control Centre and one ATC Tower. Its operations section has accumulated considerable experience in integrated civil-military ATC provision and high seas operations. The airspace controlled by MATS occupies a wide area of the central Mediterranean Sea and the Malta FIR has common boundaries with three North African States, besides Italy and Greece.

MATS provides a variety of services including:

- Air Traffic Control at all levels of flight, i.e. En-Route, approach and aerodrome, including ground movement control. MATS also provides air traffic control services to aircraft of the Armed Force;
- Aeronautical Information Service and Management;
- Maintenance and, where applicable, installation of CNS and ATM equipment;

- Partial training of its operational, technical and flight data support personnel.

Besides being a very active member of the Blue Med FAB, more recently, MATS has successfully ventured, jointly with ENAV and other European ANSPs, in TEN-T funded initiatives. It has also participated in other small R&D initiatives with ENAV and other third parties, including universities.

MATS contribution to the project is envisaged mainly to be provided in the solution PJ.10-05.

SICTA

SICTA - Advanced Systems for Air Traffic Control - is the Research Branch of ENAV Group. SICTA is an internal subsidiary company, namely the SICTA Consortium, which is 100% controlled by ENAV Group as of July 2012.

SICTA's staff is made up of highly skilled professionals like Air Traffic Management experts, Systems experts, Systems and software engineers, operational concept and simulation experts (both fast and real time), validation and demonstration experts.

Established in 1993 SICTA boasts a solid tradition of research and applied studies in ATM/CNS. It conducts research, development, validation and demonstration activities related to the Innovation in the Air Traffic Management domain participating in National and European research projects, playing an important role in the European field as the Italian R&D lab for ATM/CNS.

The multi-year experience gained on ATC/ATM topics both in operational as well in innovative contexts makes of SICTA a dynamic company ready to act as a joining link between today operations and future solutions. The daily proximity with ENAV operational staff allows SICTA's resources to full understand key issues in the ATC/ATM domain and to strongly contribute into the investigation of solutions addressing them.

SICTA participation is quite significant from an ENAV perspective considering it brings an important piece of transversal technical, operational and management expertise.

On the basis of the considerations and skills depicted above and taking into account that SICTA, as part of the ENAV Group, is to all effects same as an ENAV department, the ENAV and SICTA in kind contribution is to be considered as a single block.

SICTA contribution to this project is intended to be provided in all activities where ENAV has expressed interest, with special emphasis on the operational validation of the concepts developed within the project solutions.

Specifically, transversal contribution to the tasks for the concept, procedures and requirements definition; for structuring and organising all validation activities; for executing and reporting related to all validation exercises envisaged to be performed within this project as well as for the related analysis of the ATM performances.

The above LTP(s) are Companies which are either bound to ENAV through shared ownership (i.e. our affiliate SICTA) or are linked to ENAV through the sharing of a strategic plan for cooperation in several ATM related domains, as established in the framework of an Agreement for Cooperation (AfC) addressing various areas of development, such as Research & Development, Commercial Activities and Organisational Development (the AfC is attached to Appendix B – Technical Part of the ENAV application to the SJU Call for Final SJU Membership – Ref. SJU/LC/0122-CFP). Such plans may well include joint and coordinated efforts to be injected in SESAR to foster the development of specific key features of the SESAR 2020 Programme.

Does the participant envisage the use of contributions in kind provided by third parties N
(Articles 11 and 12 of the General Model Grant Agreement)

4.2.7 *Linked to Finmeccanica*

Objective	
Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	Y
<p>According to the company outsourcing policy of an average of 20% for external non-core activities, Finmeccanica plans to delegate a set of sub-contractors to perform part of activities for the non-core components of the ATM system. In particular, the activities sub-contracted regard the Technical Specification phase, Low Level design and SW implementation as well as CSCI integration since Finmeccanica could not have internally available resources for this job profile.</p> <p>For this project Finmeccanica plans to subcontract:</p> <ul style="list-style-type: none"> - part of the activities of T04-02-08 - V2 Prototype Development #2 for the Solution PJ10-02a. - part of the activities of T04-03-08 - V3 Prototype Development #2 for the Solution PJ10-02a. - part of the activities of T06-02-02 - V2 Technical Specification for the Solution PJ10-05. 	
Does the participant envisage that part of its work is performed by linked third parties ⁷	Y
<p>Telespazio, a joint venture between Finmeccanica and Thales, is one of the world’s leading players in satellite services. The company relies on an international network of space centres and teleports and operates worldwide through many subsidiaries and joint ventures. Telespazio now covers the whole space market value chain through its four business units: Satellite Systems & Applications, Satellite Operations, Geoinformation, and Networks & Connectivity.</p> <p>Telespazio participates to the SESAR Development Phase, leveraging on a wealth of experience of the highest level, stemming from technological expertise acquired over 50 years of business practice. The Company’s experience is also drawn from the management of space infrastructure - including the Fucino Space Centre, the world’s largest civilian teleport - as well as from its involvement in major space programmes, including: Galileo, EGNOS, Copernicus, COSMO-SkyMed, SICRAL and Göktürk.</p> <p>For EGNOS, Telespazio performs system maintenance, telecommunications and logistics services, also developing new services in various public and private sectors (aviation, road, rail, maritime). For several years, Telespazio has participated in projects in the field of satellite navigation and communication applied to the aviation domain. Among these, the SENECA programme, developed by the ASI and ENAV, to facilitate the dissemination of satellite navigation based on EGNOS in the Italian air traffic sector, the MEDUSA project, a European programme that aims to introduce such services in the countries of the Mediterranean basin, and the DESIRE2, ESA/EDA programme to develop and demonstrate a service based on a Remotely Piloted Aircraft (RPA) flying in Beyond Radio Line of Sight (BRLOS) using space assets (SatCom, SatNav).</p> <p>In the framework of PJ.10-5, Telespazio will leverage on the experience gathered in previous projects (SESAR 1, DeSIRE 2, etc.) in order to contribute as follows for Satellite Communication and Navigation aspects:</p> <ul style="list-style-type: none"> • contribution to the definition of Air Traffic Insertion Requirements for IFR RPAS Integration for satellite aspects • contribute definition of operational mission and scenarios for RPAS based on Service Provider/User perspectives 	

⁷ A third party that is an affiliated entity or has a legal link to a participant implying a collaboration not limited to the action. (Article 14 of the Model Grant Agreement).

<ul style="list-style-type: none"> • provide expertise on Satcom datalink RCP for C2 and ATC Comms • evaluation of the latency introduced by satcom connectivity for C2 and ATC Comms in BRLOS Operations • evaluation of the effects of SatNav underperformances on RPAS operations and procedures, including contingency conditions • contribute to the simulation/validation exercises in the integrated simulation environment for the following aspects: <ul style="list-style-type: none"> ○ Satcom datalink RCP for C2 and ATC Comms ○ Satnav GNSS position and integrity ○ Contingency Procedures definition evaluating the impact of Satcom C2 Link Loss ○ Contingency Procedures definition evaluating the impact of SatNav Underperformances <p>Telespazio is a Finmeccanica joint venture.</p>	
Does the participant envisage the use of contributions in kind provided by third parties (Articles 11 and 12 of the General Model Grant Agreement)	N

4.2.8 Linked to Skyguide

Objective	
Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	N
Does the participant envisage that part of its work is performed by linked third parties	Y
<p>In the framework of PJ.10, Skyguide is willing to entrust to Skysoft-ATM for the provision of the simulation platform. Skysoft-ATM will develop the necessary functionalities (if not already implemented) that will be defined in the PJ.10-01a, PJ.10-02a, PJ.10-02b and potentially PJ.10-06. The simulation platform will also take benefit of other developments coming from PJ.16 and PJ.18.</p> <p>As the platform will be also used for PJ.06, validation exercises planned in the different PJ.10 solutions will include Free Routing airspace, valuable to validate new ATCO support tools functionalities coming from PJ.10 Solutions.</p> <p>Justification</p> <p>SkySoft-ATM was core-member of the FASTI trials as from 2005, at the time already making use of the fully electronic environment. The SkySoft-ATM system is fully equipped with CPDLC capability and make use on a daily basis of 4d Trajectory based ATC Support tools (conflict detection and conflict resolution tools, monitoring aids, inter-sector and inter-centre coordination tools, “what-if” and “what-else” tools). In the context of the changing ATM environment, it would also allow migrating to a multi-sector planner configuration.</p> <p>SkySoft-ATM has a dedicated SESAR platform that is operated jointly with skyguide and that offers 16 positions. The platform is the result of the excellent collaboration between the ATM and ATM solution provider.</p>	

SkySoft-ATM functions similarly to a start-up company and brings flexibility and dynamic solutions into PJ10 that will allow easily to demonstrate the potential future ATM Capabilities to be developed in the Project.	
Does the participant envisage the use of contributions in kind provided by third parties (Articles 11 and 12 of the General Model Grant Agreement)	N

4.2.9 Linked to SAAB (NATMIG)

No third parties or subcontractors involved.

4.2.10 Linked to NATS

No third parties or subcontractors involved.

4.2.11 Linked to Dassault

No third parties or subcontractors involved.

4.2.12 Linked to Thales Air Systems

Objective	
Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	Y
<p>Thales Air Systems has a general policy to outsource a limited proportion of some of its non-critical activities. In accordance with this policy, Thales Air Systems intends to subcontract part of its work in certain non-core activities of this project, typically related to technical specifications, low-level software design & coding, integration or verification tasks. Thales Air Systems is not in a position to name its subcontractors for this project at this stage as, in accordance with the company's subcontracting and procurement policy, the selection of adequate subcontractors will be done in a timely manner through a competitive selection process.</p>	
Does the participant envisage that part of its work is performed by linked third parties	Y
<p>Thales Air Systems plans to involve Linked Third Parties to undertake part of its work in this project:</p> <p>SMATSA LLC</p> <p>Serbia and Montenegro Air Traffic Services (SMATSA LLC) was established in 2003 in order to provide air traffic services within the area of its jurisdiction, as well as to perform other activities in the field of air navigation.</p> <p>The founders of SMATSA LLC are the Governments of the Republic of Serbia and of the State of Montenegro. Upon signing the Contract in 2012 by the Governments of the Republic of Serbia and the State of Montenegro, and after the Agreement on Cooperation in the Air Traffic Domain, concluded between the Republic of Serbia and the State of Montenegro, the continuity of a mutual air traffic control service provider - SMATSA LLC – was confirmed.</p> <p>SMATSA LLC operates fully in accordance with the national and international regulations and international agreements and it participates in the work of the most important international aviation organisations, thus representing the Republic of Serbia and the State of Montenegro in the best possible way.</p>	

The mission of SMATSA LLC is the provision of high quality air navigation services (the services in ATM, CNS, MET and AIS domains) to civil and military aircraft, in order to maintain and enhance safe, orderly, and expeditious air traffic within the airspace of the FIR/UIR Beograd and in the airspace of other countries, as in compliance with the bilateral state agreements. Its mission is also the provision of ANSP personnel training, pilot training, flight calibration services of ground-based navigation aids from the air and system and aircraft maintenance services.

SMATSA LLC is fully capable for the participation in all kind of activities from scientific research; analytical and laboratory studies; system design phase making links between scientific research and applications, systems and architecture; assist in ATM operational concept development, prototyping; testing, Master Test plan development and validation in laboratory environment (SMATSA Llc can offer our own facilities for laboratory) and operational environment, simulation validation, to provision of respectable documentation such as OSED (Operational Service and Environment Description) and OC (Operational Concept).

SMATSA LLC ATM system supports separation tool that is use to assist ATCO in handling more traffic and supports SYSCO and from 2011, verbal coordination between TMA sectors and En-route sectors within ATCC is downsized to a minimum.

SMATSA LLC experts together with airspace users and NSA in order to increase sector capacity have develop and presented project TMA 2017+ (ConOps, simulation, safety argumentation..) regarding Extended TMA Belgrade solution with introducing:

- new vertical and horizontal limits of TMA sectors in order to encompass arriving traffic from point of leaving Air Way till final approach and from point of departure towards exit points of FIR.
- new sector structure with Final Director and implementation of shared planning controller for two tactical controllers in extended TMA.
- new separation standard of 3NM in TMA.
- RNAV1 STAR and SID procedures that encompasses CDA and CCO.

In the scope of solution 10-02a (Improved Performance in the Provision of Separation) and 10-02b (Advanced Separation Management) SMATSA LLC will contribute to the development of concept description (OSED/SPR/INTEROP) and validation tasks (VALP and VALR), and will also participate to the maturation of the OIs validated within these solutions with air traffic controllers supporting the COOPANS validations.

Thales Australia Limited

Thales in Australia is part of a leading international electronics and systems group serving the defence, aerospace and space, security, and transport markets in Australia and throughout the world.

From take-off to landing, Thales offers the most complete range of solutions to address all Communication, Navigation, Surveillance/Air Traffic Management (CNS/ATM) needs to provide dynamic Air traffic Control (ATC) to support today's growing domestic and international travel requirements. In Australia, Thales provide customers with the most adapted CNS/ATM solution, offering them a unique global ATM capability.

In 1994 Airservices Australia, responsible for Australia's sovereign airspace, awarded Thales a contract to develop the Australian Advanced Air Traffic control System (TAAATS). TAAATS was successfully delivered to Airservices Australia in 1997 and has been progressively updated to reflect changing technologies and requirements and as such is one of the world's most advanced Air Traffic Management systems.

The Melbourne Centre of Excellence for Air Traffic Management (ATM) systems exports TopSky systems throughout Asia-Pacific region and beyond to Africa and Middle East. Thales Australia will utilise this experience and knowledge to deliver a harmonised Civil Military Air Traffic Management System (OneSky) in Australia, to Airservices Australia and the RAAF.

Thales Australia ATM offering is a component-based solution ready to integrate the latest technological developments from SESAR & Next Gen, and designed to address all customer needs. TopSky - ATM Solutions are based on a robust product strategy for the next 10 years and beyond, and comply with the

ICAO Aviation system Block Upgrades roadmaps and key standards. As world leading solutions, they are mature, safe and reliable.

TopSky - Simulation is an advanced stimulator for Air Traffic Control (ATC) systems facilitating training-delivery productivity, operational-training fidelity, ATC system software maintenance and trainee-throughput.

Already used in SESAR1 with advanced capabilities developed for i4D validations TopSky-Simulation will be used in different projects of SESAR2020 for Real Time Simulations capabilities within the Thales Air Systems TopSky ATC platform.

Thales UK Limited

Initially, when drafting the proposal, Thales UK contribution was planned for addressing specific functions and ATC tools. It appeared that these features were eventually addressed differently in PJ10. So Thales UK participation has been cancelled and the related activities have been reallocated to Thales Air Systems activities without modifying the general terms of the proposal and without modifying the tasks and budget.

Does the participant envisage the use of contributions in kind provided by third parties (Articles 11 and 12 of the General Model Grant Agreement)	N
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4.2.13 Linked to Indra

No third parties or subcontractors involved.

4.2.14 Linked to EUROCONTROL

Objective

Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	Y
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EUROCONTROL plan to subcontract some tasks which are not part of EUROCONTROL core tasks. It mainly consists of:

- Developing/adapting Real Time and Modelling tools for the purpose of the planned validation
- Performing pilot inputs during real time simulation

EUROCONTROL, as an international organisation, follows strict rules in terms of external assistance selection and procurement. These rules will be applied for the selection of the subcontracting parties in the framework of PJ.10.

Does the participant envisage that part of its work is performed by linked third parties	N
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Does the participant envisage the use of contributions in kind provided by third parties (Articles 11 and 12 of the General Model Grant Agreement)	N
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4.2.15 Linked to ANS CR (B4)

Objective	
Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	N
Does the participant envisage that part of its work is performed by linked third parties	Y
<p>Czech Technical University in Prague (CTU)</p> <p>Czech Technical University in Prague (CTU) is the biggest technical university in Czech Republic with excellent research centres. Artificial Intelligence Centre at Department of Computer Science at Faculty of Electrical Engineering has long term research track related to fast-time, large scale simulation, ATM simulations, aircraft modelling and human behaviour modelling. Research is performed using system AgentFly. CTU cooperates with Czech Air Navigation Services, U.S. Federal Aviation Administration, Air Force, and Drexel University.</p> <p>The CTU has provided ANS CR in the past support in the development of the ATM. Currently the mutual cooperation is covered by Framework Cooperation Agreement (Ref. No.: 013/2016/PS/088) formalizing and extending existing mutual cooperation in the areas of:</p> <ul style="list-style-type: none"> • ATM • Air Navigation Service • Scientific Research • Research and Development <p>and in particular with respect to SESAR2020 the provision of support to PJ.10.</p> <p>CTU will perform basic research related to tasks PJ.10-01b, PJ.10-02a and PJ.10-02b, specifically CTU will study workload reduction in a sectorless environment through intelligent assignment strategies and dynamic airspace configuration, and analyse required performance of CD&R tools to support sectorless operations, and will study workload and flight efficiency analyses related to CD&R and separation tools.</p> <p>AgentFly Technologies (AFT)</p> <p>AgentFly Technologies (AFT) is a spin-off company of the Czech Technical University. AFT focuses on research and development of the AgentFly system to provide complex system usable for both research and industrial purposes. AFT has long term research track related to fast-time, large scale simulation, ATM simulations, aircraft modelling and human behaviour modelling. Research is performed using system AgentFly. AFT cooperates with Czech Air Navigation Services, U.S. Federal Aviation Administration, Air Force, and Drexel University.</p> <p>AFT does a long term ATM research and development of the AgentFly system. It focuses on fast-time large-scale agent-based simulation used for studying, testing and validating of new concepts, approaches, ideas and tools. The AgentFly system is a complex simulation tool simulating airspace environment (geographical data – e.g. surface, fixes, routes, SIDs, STARs, LOAs, procedures, wind, etc.), modelling kinematic model of aircrafts based on BADA performance model, and modelling of cognitive behaviour of air traffic controller that allows to study workload and other metrics. The AgentFly system is flexible to run many different scenarios and configuration and allows to measure various metrics from performance of the overall system to metrics related to each actor in the system.</p> <p>The AgentFly Technologies have provided ANS CR in the past support in the development of the ATM. Currently the mutual cooperation is covered by Framework Cooperation Agreement (Ref. No.: 013/2016/PS/088) formalizing and extending existing mutual cooperation in the areas of:</p>	

- ATM
- Air Navigation Service
- Scientific Research
- Research and Development

and in particular with respect to SESAR2020 the provision of support to PJ.10.

AFT will perform development and some research tasks to cooperate with and support CTU in tasks PJ.10-01b, PJ.10-02a and PJ.10-02b, specifically AFT will work on workload reduction in a sectorless environment through intelligent assignment strategies and dynamic airspace configuration, and analyse required performance of CD&R tools to support sectorless operations, and will work on workload and flight efficiency analyses related to CD&R and separation tools.

Integra A/S

Integra A/S is an independent, privately owned Danish consultancy company established in 1988. Today the company provides a wide range of services within the ATM environment throughout the world including Legal support, management and project services, technical support and safety services. In the context of SESAR 2020, Integra A/S will provide expertise in safety related activities and concept development.

Among other services, Integra developed a manual safety management for air traffic services for ICAO and was responsible for the development of safety assessments for the Network Manager in relation with the validation activities performed within SESAR 1.

Integra A/S has a long track of records related to aviation safety including the development and implementation of Safety Management Systems, development of safety assessments and safety cases, development of safety requirements for new operational concepts or related to the implementation of new CNS/ATM systems, examination and evaluation of SMS and safety documentation, safety culture survey and improvement programmes, safety audits and reviews, safety training or support to the implementation of an ATM Safety regulatory framework.

The Integra A/S has provided ANS CR in the past and on contractual basis consulting services and support in different areas of ATM (organisation and corporate governance, ATM consulting, safety, etc.). Currently the mutual cooperation is covered by Framework Cooperation Agreement (Ref. No.: 014/2016/PS/088) formalizing and extending existing mutual cooperation in the areas of:

- ATM,
- Air Navigation Service and
- Other areas of aviation

and in particular with respect to SESAR2020 the provision of support to selected SESAR2020 projects, PJ.10 being one of them.

Integra A/S will contribute to Solution PJ.10-01b: Flight Centric ATC, PJ.10-02a: Improved Performance in the provision of Separation and PJ.10-02b Advanced Separation Management

For Solution PJ.10-01b, the safety experts will support OI CM-0200-C, contributing to the development of safety assessments based on the V2 concept.

The operational expertise in support of solution PJ.10-01b will be provided by an expert familiar with this concept, which is the model implemented by the military controllers in France.

Additionally, the operational experts will contribute to the review of the concept and analyse its feasibility.

For Solution PJ.10-02a, Integra' safety experts will contribute to the development of safety requirements and safety assessments prior V3 validations scheduled for Release 8. They will contribute to the refinement of safety requirements based on the validation results.

For Solution PJ.10-02b, the safety experts will support in particular OIs CM-0403B, CM0208-B, CM- 0408 and CM-0608. They will contribute to the development of safety requirements and safety assessments prior V2 validation activities. They will also contribute to the refinement of safety requirements based on validation results. They will contribute to the development of SPR V2.

Does the participant envisage the use of contributions in kind provided by third parties (Articles 11 and 12 of the General Model Grant Agreement)	N

4.2.16 Linked to FRQ (FSP)

No third parties or subcontractors involved.

4.2.17 Linked to DLR (AT-One)

No third parties or subcontractors involved.

4.2.18 Linked to ACG/COOPANS

No third parties or subcontractors involved.

4.2.19 Linked to CCL/COOPANS

No third parties or subcontractors involved.

4.2.20 Linked to IAA/COOPANS

No third parties or subcontractors involved.

4.2.21 Linked to LFV/COOPANS

Objective	
Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	N
Not applicable	
Does the participant envisage that part of its work is performed by linked third parties ⁸	N
Not applicable.	
Does the participant envisage the use of contributions in kind provided by third parties (Articles 11 and 12 of the General Model Grant Agreement)	Y
<p>Linköping University (LiU) has been cooperating with COOPANS member LFV since the early 90s. Since 2011 several research and evaluation activities within design and visualization has been started related to COOPANS performance requirements, sample below.</p> <p>-J. Lundberg, A. Svensson, J. Johansson, B. Josefsson (2015) Human-automation Collaboration Strategies. Schaefer, Dirk (Editor) Proceedings of the SESAR Innovation Days (2015) EUROCONTROL. ISSN 0770-1268.</p>	

- Johansson, B. Lundberg, J. (forthcoming). Resilience and the temporal dimension – the chimera of timely response. Theoretical Issues in Ergonomics Science, DOI: 10.1080/1463922X.2016.1154231

Participation is mainly expected within evaluation and reporting in solutions 10.01a and 10.02a/b.

Original anticipation was to include LiU as Linked Third Party, but as stated in the table of changes, this was actually not the correct way to approach this. There are no changes to budget, tasks nor general terms of the proposal.

At the moment it is expected that work will take place on LFV premises, but this is not finally decided yet and might change. This contribution corresponds to the one referred to in Art. 11 of the AMGA (in-kind contributions against payment), in turn corresponding to category “A.3- seconded persons” of the Annex 2 of the Grant Agreement , and currently is estimated to amount to around 25.000 € (direct costs) for the work developed on LFV’s premises (since there is no specific place in Annex 2 to indicate these costs).

4.2.22 Linked to Airtel (NATMIG)

No third parties or subcontractors involved.

4.2.23 Linked to Sintef (NATMIG)

No third parties or subcontractors involved.

4.2.24 Linked to LPS SR (B4)

No third parties or subcontractors involved.

4.2.25 Linked to ON (B4)

No third parties or subcontractors involved.

4.2.26 Linked to PANSAs (B4)

Objective

Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	N
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N/A

Does the participant envisage that part of its work is performed by linked third parties	Y
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UNIWERSYTET WARSZAWSKI (UNIWARSAW)

PANSAs Linked Third Party “Interdisciplinary Centre for Mathematical and Computational Modelling, University of Warsaw” (ICM) is an interdisciplinary unit that is a part to the University of Warsaw. ICM possesses a documented experience in participating in airport centered projects (in collaboration with Polish Airports) as well as working on interface of airport and network planning (in collaboration with polish Ministry of Transportation and Lot Polish Airlines). ICM has expertise in providing solutions and efficiently modelling of high complexity networks as well as processing large datasets of varying nature.

Besides experience and expertise ICM possesses a reliable and secure HPC and big data processing centre. ICM R&D activities are focused on (but not limited to) big data exploitation and processing, algorithms

design and optimization, environmental modelling and weather based applications, applied network modelling and complex process modelling (e.g. in transportation, energy industry, society health management). ICM operational services include: provision of HPC infrastructure, WBN - virtual opensource science library, RepOD - scientific data repository and numerical weather prediction service.

The combining of in-house computational infrastructure and interdisciplinary expertise allows ICM UW to successfully participate in national and international research projects (including EU framework programmes FP4 -HORIZON 2020). Among them are also numerous projects focused on aviation, including:

- Airline operations and analysis DSS System for Polish Airlines LOT.
- Cause-incident safety occurrence drill-down chain concept developed for Polish CAA.
- Evaluation Study project for BOEING "Sonic Cruiser vs Dreamliner".
- Airport Seasonal Wind Rose developed for Polish Air Navigation Service Provider.
- Development strategy for the network of airports and aviation ground nav aids - for Polish Ministry of Infrastructure.
- SID/STAR Flight profiles performance evaluation - for Polish Air Navigation Service Provider.
- Resilience of airport resources operational planning - study dedicated for Warsaw Chopin Airport.
- FP7 DELICAT project focused on clear-air turbulence detection with THALES, DLR, EADS, Meteo France and others

Other:

- PROZA, national project focusing on providing decision support tools based on weather

The Interdisciplinary Centre for Mathematical and Computational Modelling will work alongside PANSA in Solution PJ.10-02A to devise and develop a decision support tool (DST) specially addressing unusual situations generated or influenced by subtle navigational factors affecting separation management. The ICM plans to participate in all validation activities related to forementioned DST.

POLITECHNIKA RZESZOWSKA IM IGNACEGO LUKASIEWICZA PRZ (PRZ)

Rzeszow University of Technology (RUT) is linked third party to PANSA. RUT cooperates with PANSA to projects developing and improving air traffic rules and operational procedures for manned and unmanned aircrafts with the uses of all existing, certified and being developed navigation systems. In the project RUT would like to concentrate on analysis of:

- methods and models of RPAS trajectory description,
- existing and proposed ATM procedures, new technologies, approaches and trends dealt with RPAS,
- operational missions and scenarios for RPAS,
- minimum performance requirements for RPAS IFR/VFR flights and separation criteria,
- RPAS IFR/VFR flights contingency situations.

In order to integrate the human supervised RPAS flights in the same airspace where other manned aircraft flights are performed, new ATM procedures, rules and regulations need to be introduced. All of this requires research of new technological and procedural standards in order to have RPAS flying in the common air space and using the same ATM system. RUT intends to analyse current ATC procedures suitability for RPAS flights together with manned aircraft in the same airspace performing simulation including RPAS characteristics and separation procedures to regulate and control RPAS flights safely and efficiently from the other aircraft, terrain or obstacles including contingency situations. RUT has extensive experience in Domestic and International Cooperation in general, and in Domestic Programmes and European R&D programs in particular FP6 and FP7, such as in EPATS, FUSETRA, GABRIEL and SCARLETT. RUT was also the Coordinator or partner of the several Domestic Programmes related to UAV's.

The most important UAV projects for last years are:

1. Airplane Imitator of Middle Air Assault MJ-7 Shogun, Eurotech Mielec years 2008-2011.
2. Miniature control and navigation system for unmanned flying platform, Rzeszów University of Technology (0089/R/T00/2010/11/U-8057/G/R), 2010-2012.

3. Flying terrain observer, Rzeszów University of Technology (0116/R/T00/2010/11), 2010-2012.
4. Unmanned Strike Force Agent Intended for Destruction Purposes in Zones of Responsibilities of Ground Troops, (O R00 0044 09), Eurotech in Mielec, Military Technical Academy and the Military Institute of Armament Technology, 2009-2011.
5. Smart Autopilot, Technology Agency of the Czech Republic, TA01010678

During last year's RUT has participated in UE ATM research programs e.g.

1. EPATS - European Personal Air Transportation System, under the Sixth Framework Programme of the European Union, 2006-2008.
2. SFORA project submitted for SESAR SJU call - not accepted for founding ERA/AUTARKIA project being prepared in consortium with Airbus Defense (former Cassidian) for EDA

Selected RUT Publications:

- Rogalski T., The Conception of the of the Pilot Friendly Control System for Small Local Communication Aircraft, AIAA PAPER, 2002.
- Rogalski T., The Conception of Control System Allowing to Modify Small Aircraft Properties and Simulate Another Plane's Behavior, AIAA PAPER, 2002.
- Dołęga B., Rogalski T., The new conception of the laboratory testing of the FBW control system for small aircraft, AIRCRAFT ENGINEERING AND AEROSPACE TECHNOLOGY, 2004.
- Rogalski T., Dołęga B., The laboratory stand Intends to Test and Prototype Control System for Small Transportation Aircraft, International Multidisciplinary Conference 5th edition, Baia Mare, 23-24.05, 2003,451-456.
- Kopecki G., Pieniążek J., Rogalski T., Rzucidło P., Tomczyk A., A Proposal of Navigation and Control System for Small UAV, UAV World 2008 Conference, Frankfurt/Main, 11-14 Nov. 2008,
- Tomczyk A., Shaping Indirect Flight Control System Properties for General Aviation Aircraft, JOURNAL OF AEROSPACE ENGINEERING, 2011,1,59-71.
- Dołęga B., Tomczyk A., Pilot-friendly indirect flight control system for general aviation aircraft (2nd European Conference for Aero-Space Sciences, organizator EUCASS) ISBN 978-2-930389-27-3, 2nd European Conference for Aero-Space Sciences, 2007.
- Majka A., Multiple Objective Optimization of the Fleet Sizing Problem for Personal Air Transportation System, 8th International Conference AIRTEC 2013.
- Majka A., The Green Trajectory of an Aircraft Aided During Take-Off by Ground-Based System Using Magnetic Levitation Technology, 8th International Conference AIRTEC 2013.
- Majka A., Take-off aided by magnetic levitation technology, AIRCRAFT ENGINEERING AND AEROSPACE TECHNOLOGY, 2013.
- Majka A., Multiple Objective Optimization of the Power Unit For a Very Light Jet, AIRCRAFT ENGINEERING AND AEROSPACE TECHNOLOGY, 2014.
- Majka A., Optimal Flight Paths in Emergency Situations, 9th International Conference AIRTEC 2014.

RUT will support PANSAs as the contributor to SESAR Solution PJ.10-05 and intends to develop and validate following tasks:

- Analysis and development of methods and models of trajectory description;
- Analysis of existing and proposed ATM procedures, new technologies, approaches and trends dealt with RPAS;
- Operational mission and scenario analysis for RPAS;
- Initial validation of minimum performance requirements for RPAS IFR/VFR flights and separation criteria;
- Operational validation of minimum performance requirements for RPAS IFR/VFR flights and separation criteria

Does the participant envisage the use of contributions in kind provided by third parties (Articles 11 and 12 of the General Model Grant Agreement) N

Not applicable

4.2.27 *Linked to HC (FSP)*

No third parties or subcontractors involved.

4.2.28 *Linked to Atos (FSP)*

No third parties or subcontractors involved.

4.2.29 *Linked to NLR (AT-One)*

No third parties or subcontractors involved.

4.3 **Global budget approach taken by the SJU candidate members**

The SJU Members comprising EUROCONTROL and the 19 Members selected as a result of the Membership Accession Process have actively participated to the SESAR2020 dialogue phase, launched by SESAR JU, considering the 28 Projects (18 IR, 3 Transversal and 7 VLD) as part of a unique Work Programme.

During the dialogue phase the SJU Members, have supported SESAR JU both in DoW preparation and in the estimation of the effort per project.

Then SESAR JU published, in the SESAR2020 Multi-annual Work Programme, an indicative co-financing estimation per Project, per Stakeholder Group (Service Providers, Airborne Manufacturing Industry, Ground Manufacturing Industry) and per Wave (Waves 1 and 2).

In view of the response to be given in a short period, the SJU Members decided to start the preparation activities before the official launch of the call for proposal, using the available documents published by SESARJU (i.e. SESAR2020 Multi-annual Work Programme) in order to have more available time for the proposal preparation.

A deep and comprehensive analysis of the required work was done, bringing to a revision of the estimated effort necessary to perform the activities. In such analysis also the interests to invest from both Service Providers and Manufacturing Industries were taken into account.

The result was a limited different co-financing distribution among the 28 Projects.

The SJU Members have collectively decided to maintain these limited differences because the revised values were more close to the described activities while keeping the overall maximum co-financing for W1 and per Stakeholder group.

The rationale for maximum co-financing deviation is explained at project level.

The following table contains the allocation of co-financing required to support Wave 1 (extracted from the SESAR2020 Multi-annual Work Programme) and the co-financing distribution agreed by the SJU Members for the 28 Projects for Wave 1:

Controller Tools and Team Organisation for the Provision of Separation in Air Traffic Management

Topic	NAME OF PROJECT	Max Co-financing Value Wave 1	Co-financing agreed by Candidate Members
1	PJ.19 Content Integration	€8.320.000	€7.395.141
2	PJ.20 Master plan maintenance	€3.510.000	€3.327.673
3	PJ.22 Validation and Demonstration Engineering	€4.940.000	€2.051.363
TOTAL TRANSVERSAL WAVE 1		€16.770.000	€12.774.177
4	PJ.02 Increased Runway and Airport Throughput	€13.845.000	€15.592.847
5	PJ.03a Integrated Surface Management	€12.220.000	€12.925.438
6	PJ.03b Airport Safety Nets	€8.125.000	€8.228.635
7	PJ.04 Total Airport Management	€10.465.000	€8.909.071
8	PJ.05 Remote Tower for Multiple Airports	€6.630.000	€9.013.622
9	PJ.07 Optimised Airspace Users Operations	€3.640.000	€2.247.337
10	PJ.08 Advanced Airspace Management	€2.730.000	€2.738.354
11	PJ.09 Advanced DCB	€7.020.000	€7.153.377
12	PJ.01 Enhanced arrivals and departures	€17.680.000	€17.521.365
13	PJ.06 Trajectory Based Free Routing	€6.045.000	€6.029.406
14	PJ.10 Separation Management En-Route and TMA	€25.935.000	€26.388.527
15	PJ.11 Enhanced Air and Ground Safety Nets	€5.265.000	€5.478.828
16	PJ.13 Air Vehicle Systems	€10.140.000	€9.251.386
17	PJ.14 CNS	€22.880.000	€23.213.553
18	PJ.15 Common Services	€6.435.000	€5.784.518
19	PJ.16 CWP - HMI	€11.635.000	€12.861.755
20	PJ.17 SWIM Infrastructures	€9.490.000	€9.754.600
21	PJ.18 4D Trajectory Management	€21.125.000	€22.193.942
TOTAL SESAR 2020 PROJECTS WAVE 1		€201.305.000	€205.286.559
TOTAL TRANSVERSAL & PROJECTS WAVE 1		€218.075.000	€218.060.736
22	PJ.28 Integrated Airport Operations (incl. TBS)	€4.300.000	€4.001.243
23	PJ.24 Network Collaborative Management	€3.600.000	€4.759.841
24	PJ.23 Flexible Airspace Management and Free Route	€4.400.000	€1.443.374
25	PJ.25 Arrival Management extended to en-route Airspace	€4.000.000	€3.914.104
26	PJ.26 Enhanced Terminal Airspace using RNP-Based Operations	€2.400.000	€539.333
27	PJ.27 Flight Information Exchange	€6.100.000	€6.079.367
28	PJ.31 Initial Trajectory Information Sharing	€17.200.000	€18.955.119
TOTAL VLD WAVE 1		€42.000.000	€39.692.380
TOTAL SESAR 2020 PPP (TRANSVERSAL, IR & VLDs) WAVE 1		€260.075.000	€257.753.116

5. Ethics and Security

5.1 Ethics

All participants of the PJ.10 project will conform to national and European legislation and regulations. In relation to this project these include:

- The Charter of Fundamental Rights of the EU
- Directive 95/46/EC of the European Parliament and of the Council of 24 October 1995 on the protection of individuals with regard to the processing of personal data and on the free movement of such data.

During the project, WP09 will ensure compliance with ethics by verifying that all documents from the PJ.10 project follow European ethical rules and the ethical rules of the concerned country. Furthermore, WP09 will provide support for all WPs regarding ethical issues.

In the following sub-section, further explanation is given for the self-assessment presented in the Proposal Submission Forms “Ethics issue table”. This is to provide an overview of potential ethical issues and how they will be handled in relation to the activities in the project.

5.1.1 Humans

To achieve the required maturity for all Operational Improvements addressed by Separation Management, the project will conduct validation exercises including Live Trials that involves human participants. During these activities, user-centred experiments, observations, instantaneous self assessments and interviews will be conducted in all PJ.10 solutions.

Recruited Air Traffic Controllers and other operational personnel will be healthy adults (no vulnerable adults) and recruited on a voluntary basis. Recruiting controllers will be at first the task of ANSPs involved in the activities. If difficulties are arising to get a sufficient amount of controllers from their own company, controllers from other companies involved in PJ.10 may be asked. As some major ANSPs in Europe are all members of this project recruiting test persons should not be a challenging issue.

Participants will be recruited through the management of operational divisions of the involved ANSP partners, depending on the requirements for the specific validation exercise (e.g. controller licence for specific sectors or type of airspace).

For all human-in-the-loop trials participants will, before the studies take place, be clearly informed about the project, validation and research goals, the methodology of anonymity and data protection, and possible adverse events in a presentation of the project and in interviews. The project complies with the declaration of Helsinki, stating that subjects are free to leave any test at any time without giving any reason and without raising any disadvantages. To ensure that participants are aware of the study's purpose and their rights, they will be given an informed consent form (refer to Annex 3 in H2020 portal) to sign prior to the study. The informed consent form will include confirmation that the information provided about the project and the study has been read and understood, that participation is voluntary, participants' right to withdraw from the study at any given point in time, and information about anonymity and data protection. All participants will receive a copy of the informed consent form for them to keep.

For the validation threads with Real Time Simulations data will be saved and examined. It is not planned to use this data for any purpose beside Key performance Indicator (KPI) and Key Performance Area (KPA) analysis as outlined in the Validation Plans. The data will not be provided in its raw format to any person outside the project and it will not be used to judge or assess the professional capabilities of the recruited controllers.

Section: Humans	YES	NO	Information to be provided	Documents to be provided
Does your research involve human participants?	X		Confirmation about obtained Informed consent of the participants.	Example of “informed consent form” (refer to H2020 portal Annex 3)
If YES: Are they volunteers for social or human sciences research?		X		
Are they persons unable to give informed consent (including children/minors)?		X		
Are they vulnerable individuals or groups?		X		
Are they children/minors?		X		
Are they patients?		X		
Are they healthy volunteers for medical studies		X	Note: The project will use healthy volunteers, but in the project no medical studies are foreseen.	
Does your research also involve physical interventions on the study participants?		X		

5.1.2 Protection of Personal Data

In advance and during the action execution, personal data will be acquired. This data will be protected regarding article 8 – protection of personal data – of the European Charter of Fundamental Rights and the Treaty on the Functioning of the European Union. These personal data will be collected and processed fully in accordance with the Directive 95/46/EC of the European Parliament on the protection of individuals with regard to the processing of personal data and on the free movement of such data.

Personal data collected and further processed concern mainly all the technical and/or operational experts contributing to the action, either during its whole duration or playing a punctual or temporal role, for the purpose of the needed mutual contact among involved parties, exercises preparation and execution, meeting and logistic arrangements and communication activities. For the latter, personal data collection from the people to which communication is aimed at, is also envisaged.

In the context of this action, collected personal data would comprise information identifying the person designated by its organization. Typically, personal data would relate to the following:

- Name;
- Identification Number (ID);
- Company position / action role;
- Business contact details (e-mail address, business telephone number, mobile telephone number, fax number, postal address, company and department);
- Level of qualification, professional experience.

Under no circumstances these personal data will refer to racial or ethnic origin, political opinions, economical situation, religious or philosophical beliefs, trade-union membership, physical and mental health, sex life, or any other sensitive data.

Section: Protection of Personal Data	YES	NO	Information to be provided	Documents to be provided
Does your research involve personal data collection and/or processing?	X			Free and fully Informed consent sheets (see section 2) of the persons concerned (data subjects) will be obtained
If YES: Does it involve the collection or processing of sensitive personal data (e.g. health, sexual lifestyle, ethnicity, political opinion, religious or philosophical conviction)?		X		
Does it involve processing of genetic information?		X		
Does it involve tracking or observation of participants (e.g. surveillance or localization data, and WAN data such as IP address, cookies, etc.)?		X		
Does your research involve further processing of previously collected personal data (secondary use) (including use of pre-existing data sets or sources, merging existing data sets, sharing data with non-EU member states)?		X		

5.1.3 Misuse

The PJ.10 project is part of the SESAR 2020 program and as such will be supervised by the SESAR Joint Undertaking (SJU) and its members of the Administration Board. Several independent advisors are included in that body: e.g. Staff Representative, Airspace User, Military, and Scientific Community Representative. The SJU has or will expand on the development of a strategy on how to deal with possible risks regarding misuse and related consequences during the project execution inside of SESAR 2020.

In the case that ethical issues arise unexpectedly during the project, the project coordinator will contact the Commission immediately and provide detailed information on the issue and how the project team intends to handle it.

5.1.4 Other Ethics Issues

At this stage of the project proposal, there are no other ethics issues that should be taken into consideration. In the case that other ethical issues arise unexpectedly during the project, the project coordinator will contact the Commission immediately and provide detailed information on the issue and how the project team intends to handle it.

5.2 Security⁹

Section: Security	YES	NO	Information to be provided	to Documents to be provided
Are activities planned or results expected raising security issues?		X		
Are 'EU-classified information' as background or results foreseen?		X		

References

- [1] European Commission: **H2020 CALL: SESAR2020 IR-VLD WAVE1**, <http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/calls/h2020-sesar-2015-2.html#c.topics=callIdentifier/t/H2020-SESAR-2015-2/1/1/1&callStatus/t/Forthcoming/1/1/0&callStatus/t/Open/1/1/0&callStatus/t/Closed/1/1/0&+identifier/ desc>, Brussels, 22 October 2015.
- [2] SESAR Joint Undertaking: **SESAR 2020 Multi Annual Work Program**, Edition 1.0, Brussels, 01 July 2015.
- [3] SESAR Joint Undertaking: **Annual Work Programme* 2015**, Amendment n°1 Edition 00.01.01, Brussels, 20 October 2015.
- [4] SESAR Joint Undertaking: **Introduction to the SESAR 2020 Programme Execution**, Edition 01.00.01, Brussels, 12th October 2015.
- [5] ICAO Doc 9854 AN/458 Global Air Traffic Management Operational Concept, First Edition, 2005
- [6] SESAR Joint Undertaking (2013), Guidelines for Addressing Human Performance Automation Issues. P16.5.1 Deliverable 04
- [7] PRR 2014, Performance Review Report covering the calendar year 2014, Performance Review Commission, May 2015
- [8] Twelfth Air Navigation Conference, ICAO, Montreal, 19 to 30 November 2012, Doc 100007, AN-Conf/12
- [9] E-OCVM Version 3.0, Volume I and II, EUROCONTROL, 2010
- [10] EUROCONTROL Seven-Year IFR Flight Movements and Service Units Forecast: 2015-2021, STATFOR Document 553

⁹ Article 37.1 of the Model Grant Agreement: *Before disclosing results of activities raising security issues to a third party (including affiliated entities), a beneficiary must inform the coordinator — which must request written approval from the Commission/Agency. Article 37.2: Activities related to 'classified deliverables' must comply with the 'security requirements' until they are declassified. Action tasks related to classified deliverables may not be subcontracted without prior explicit written approval from the Commission/Agency. The beneficiaries must inform the coordinator — which must immediately inform the Commission/Agency — of any changes in the security context and — if necessary — request for Annex 1 to be amended (see Article 55).*

- [11] The ATM Target Concept D3, DLM-0612-001-02-00, SESAR Joint Undertaking
- [12] Velasco, G.A.M., M. Mulder, M.M. Paasse, 2010, Analysis of Air Traffic Controller Workload Reduction Based on the Solution Space for the Merging Task, Toronto, AIAA Guidance, Navigation and Control Conference
- [13] MAT Report: Overview for Step 1. Maturity Assessment. *Issue Date 17/12/2015*

Abbreviations

This list extends the list given in [2] and [3].

ACC	Area Control Centre
ADS-B	Automatic Dependent Surveillance – Broadcast
ADS-C	Automatic Dependent Surveillance – Contract
ANS	Air Navigation Service
ANSP	Air Navigation Service Provider
AOR	Area of Responsibility
ASAS	Airborne Separation Assurance Systems
ASBU	Aviation Systems Block Upgrades
ATC	Air Traffic Control
ATFCM	Air Traffic Flow and Capacity Management
ATM	Air Traffic Management
C2	Command & Control
CANSO	Civil Air Navigation Services Organisation
CBA	Cost Benefit Analysis
CD	Conflict Detection
CD&R	Conflict Detection and Resolution
CNS	Communication-Navigation-Surveillance
COTS	Commercial off-the-shelf
CP	Communication Panel
CTA	Controlled Time of Arrival
CTO	Controlled Time Over
DCB	Demand Capacity Balancing
EAP	Extended ATC Planner
EASA	European Aviation Safety Agency
EC	Executive Controller
ESSP	European Satellite Services Provider
EPMB	Extended Project Management Board
EPP	Extended Projected Profile
EU	European Union
FAB	Functional Airspace Block
FL	Flight Level
FOC	Flight Operation Centre
FOCA	Swiss Confederation and the Federal Office of Civil Aviation
FTS	Fast-time simulation
H2020	HORIZON 2020 (research and innovation program of the EU, 2014-2020)
HMI	Human Machine Interface
IBP	Industry Based Platform
ICAO	International Civil Aviation Organisation
IEEE	Institute of Electrical and Electronics Engineers
IFR	Instrument Flight Rules
IOP	Interoperability
IP	Internet Protocol
IR	Industrial Research project
LoA	Letter of Agreement
KPA	Key Performance Area

Controller Tools and Team Organisation for the Provision of Separation in Air Traffic Management

MAWP	Multi Annual Work Programme [2]
MONA	Monitoring Aids
MSP	Multi Sector Planner
MTCD	Medium Term Based Conflict Detection
NSA	National Supervisory Authority
OI	Operational Improvement
OPDLWG	Operational Datalink Working Group
PBN	Performance Based Navigation
PC	Planning Controller
PCIL	Project Content Integration Lead
PCIT	Project Content Integration Team
PEG	Programme Execution Guidance [4]
PJ.00	Project No. 00 described in [2] corresponds to the Topic of the call
PJ.00-01	Solution No 01 in PJ00
PM	Project Manager (is used as synonym for SGA coordinator [SESAR] as well as for Action Coordinator [H2020; PPP Membership Agreement Appendix E] in this proposal)
PMB	Project Management Board
R&D	Research and Development
RA	Resolution Advisory
RBT	Reference Business Trajectory
RNAV	Area Navigation
RNP	Required Navigation Performance
RPAS	Remotely Piloted Aircraft Systems
RTS	Real-time simulation
SASP	Separation and Airspace Safety Panel
SJU	SESAR Joint Undertaking
SL	Solution Lead
SWIM	System Wide Information Management
SPO	Single Person Operations
TA	Transversal Action
TCT	Tactical Controller Tools
TMA	Terminal Manoeuvring Area
TP	Trajectory Prediction
TRL	Technology Readiness Levels
VFR	Visual Flight Rules
VLD	Very Large Demonstration
WAN	Wide Area Network
WP	Work Package

ESTIMATED BUDGET FOR THE ACTION (page 1 of 4)

Estimated eligible ¹ costs (per budget category)									EU contribution			Additional information		
A. Direct personnel costs		B. Direct costs of subcontracting	C. Direct costs of fin. support	D. Other direct costs	E. Indirect costs ²	Total costs	Reimbursement rate %	Maximum EU contribution ³	Maximum grant amount ⁴	Information for indirect costs	Information for auditors	Other information:		
A.1 Employees (or equivalent) A.2 Natural persons under direct contract A.3 Seconded persons [A.6 Personnel for providing access to research infrastructure]		A.4 SME owners without salary A.5 Beneficiaries that are natural persons without salary		D.1 Travel D.2 Equipment D.3 Other goods and services D.4 Costs of large research infrastructure						Estimated costs of in-kind contributions not used on premises	Declaration of costs under Point D.4	Estimated costs of beneficiaries/ linked third parties not receiving EU funding		
Form of costs ⁶	Actual	Unit ⁷	Unit ⁸		Actual	Actual	Actual	Flat-rate ⁹						
	(a)	Total (b)	No hours	Total (c)	(d)	(e)	(f)	(g)=0,25x ((a)+(b)+(c)+(f)) +[(h1)+(h2)]-(m)	(i)= (a)+(b)+(c)+(d)+(e)+(f)+(g)+(h1)+(h2)+(h3)	(j)	(k)	(l)	(m)	Yes/No
1. DFS	1483893.40	0.00	0	0.00	150000.00	0.00	80000.00	390973.35	2104866.75	70.00	1473406.73	298843.50	0.00	No
- DWD ¹⁴	44607.60	0.00	0	0.00	0.00	0.00	3500.00	12026.90	60134.50	70.00	42094.15	8537.71	0.00	No
Total beneficiary 1	1528501.00	0.00			150000.00	0.00	83500.00	403000.25	2165001.25		1515500.88	307381.21	0.00	
2. AIRBUS	0.00	110759.99	0	0.00	0.00	0.00	162255.00	68253.75	341268.74	70.00	238888.12	48452.47	0.00	No
- AI DS Space ¹⁴	0.00	277380.00	0	0.00	0.00	0.00	16000.00	73345.00	366725.00	70.00	256707.50	52066.69	0.00	No
- AI OPS ¹⁴	0.00	321904.00	0	0.00	436000.00	0.00	84711.00	101653.75	944268.75	70.00	660988.13	134064.88	0.00	No
Total beneficiary 2	0.00	710043.99			436000.00	0.00	262966.00	243252.50	1652262.49		1156583.75	234584.04	0.00	
3. Naviair/ COOPANS	610717.00	0.00	0	0.00	0.00	0.00	91162.00	175469.75	877348.75	70.00	614144.13	124563.75	0.00	No
4. DSNA	649350.00	0.00	0	0.00	400000.00	0.00	44530.00	173470.00	1267350.00	70.00	887145.00	179935.14	0.00	No
- SAFRAN ¹⁴	53760.00	0.00	0	0.00	0.00	0.00	3560.00	14330.00	71650.00	70.00	50155.00	10172.69	0.00	No
- ENAC ¹⁴	95000.00	0.00	0	0.00	0.00	0.00	5000.00	25000.00	125000.00	70.00	87500.00	17747.18	0.00	No
Total beneficiary 4	798110.00	0.00			400000.00	0.00	53090.00	212800.00	1464000.00		1024800.00	207855.01	0.00	
5. ENAIRE	1044159.61	0.00	0	0.00	30000.00	0.00	37946.72	227646.33	1339752.66	70.00	937826.86	190214.69	171521.00	No
- CRIDA ¹⁴	328072.23	0.00	0	0.00	0.00	0.00	12327.77	85100.00	425500.00	70.00	297850.00	60411.41	0.00	No
- ISDEFE ¹⁴	96378.45	0.00	0	0.00	0.00	0.00	3621.55	25000.00	125000.00	70.00	87500.00	17747.18	0.00	No
- INECO ¹⁴	126088.71	0.00	0	0.00	0.00	0.00	4737.96	32706.67	163533.34	70.00	114473.34	23218.05	0.00	No
Total beneficiary 5	1594699.00	0.00			30000.00	0.00	58634.00	370453.00	2053786.00		1437650.20	291591.33	171521.00	
6. ENAV	335669.40	0.00	0	0.00	0.00	0.00	31514.60	91796.00	458980.00	70.00	321286.00	65164.82	0.00	No
- I.D.S. ¹⁴	86400.00	0.00	0	0.00	0.00	0.00	9600.00	24000.00	120000.00	70.00	84000.00	17037.30	0.00	No
- CIRA ¹⁴	172800.00	0.00	0	0.00	0.00	0.00	19200.00	48000.00	240000.00	70.00	168000.00	34074.59	0.00	No
- MATS ¹⁴	7200.00	0.00	0	0.00	0.00	0.00	800.00	2000.00	10000.00	70.00	7000.00	1419.77	0.00	No
- SICTA ¹⁴	330465.60	0.00	0	0.00	0.00	0.00	36718.40	91796.00	458980.00	70.00	321286.00	65164.82	0.00	No
- DEEP BLUE ¹⁴	259200.00	0.00	0	0.00	0.00	0.00	28800.00	72000.00	360000.00	70.00	252000.00	51111.89	0.00	No
- BULATSA ¹⁴	216000.00	0.00	0	0.00	0.00	0.00	24000.00	60000.00	300000.00	70.00	210000.00	42593.24	0.00	No

ESTIMATED BUDGET FOR THE ACTION (page 2 of 4)

Estimated eligible ¹ costs (per budget category)									EU contribution			Additional information		
A. Direct personnel costs		B. Direct costs of subcontracting	C. Direct costs of fin. support	D. Other direct costs	E. Indirect costs ²	Total costs	Reimbursement rate %	Maximum EU contribution ³	Maximum grant amount ⁴	Information for indirect costs	Information for auditors	Other information:		
A.1 Employees (or equivalent) A.2 Natural persons under direct contract A.3 Seconded persons [A.6 Personnel for providing access to research infrastructure]		A.4 SME owners without salary A.5 Beneficiaries that are natural persons without salary		D.1 Travel D.2 Equipment D.3 Other goods and services D.4 Costs of large research infrastructure						Estimated costs of in-kind contributions not used on premises	Declaration of costs under Point D.4	Estimated costs of beneficiaries/ linked third parties not receiving EU funding		
Form of costs ⁶	Actual	Unit ⁷	Unit ⁸		Actual	Actual	Actual	Flat-rate ⁹						
	(a)	Total (b)	No hours	Total (c)	(d)	(e)	(f)	(g)=0,25x ((a)+(b)+ (c)+(f) +[(h1)+(h2)]- (m))	(i)= (a)+(b)+(c)+ (d)+(e)+(f)+ (g)+(h1)+(h2)+(h3)	(j)	(k)	(l)	(m)	Yes/No
Total beneficiary 6	1407735.00	0.00	0.00	0.00	0.00	0.00	150633.00	389592.00	1947960.00		1363572.00	276566.43	0.00	
7. FINMECCANICA	2539556.00	0.00	0	0.00	357000.00	0.00	85934.00	656372.50	3638862.50	70.00	2547203.75	516636.47	0.00	No
- TELESPAZIO ¹⁴	185187.00	0.00	0	0.00	0.00	0.00	11500.00	49171.75	245858.75	70.00	172101.13	34906.40	0.00	No
Total beneficiary 7	2724743.00	0.00			357000.00	0.00	97434.00	705544.25	3884721.25		2719304.88	551542.87	0.00	
8. SKYGUIDE	808405.46	0.00	0	0.00	0.00	0.00	116868.04	231318.37	1156591.87	70.00	809614.31	164209.98	0.00	No
- SKYSOFTATM ¹⁴	298354.54	0.00	0	0.00	0.00	0.00	43131.96	85371.63	426858.13	70.00	298800.69	60604.23	0.00	No
Total beneficiary 8	1106760.00	0.00			0.00	0.00	160000.00	316690.00	1583450.00		1108415.00	224814.21	0.00	
9. SAAB (NATMIG)	97833.00	0.00	0	0.00	0.00	0.00	13371.00	27801.00	139005.00	70.00	97303.50	19735.58	0.00	No
10. NATS	1872528.00	0.00	0	0.00	0.00	0.00	59472.00	483000.00	2415000.00	70.00	1690500.00	342875.58	0.00	No
11. DASSAULT	112731.00	0.00	0	0.00	0.00	0.00	7157.00	29972.00	149860.00	70.00	104902.00	21276.74	0.00	No
12. THALES AIR SYS	4211286.00	0.00	0	0.00	874621.00	0.00	523359.00	1183661.25	6792927.25	70.00	4755049.08	964442.59	0.00	No
- THALES-AUS ¹⁴	507015.00	0.00	0	0.00	0.00	0.00	42171.00	137296.50	686482.50	70.00	480537.75	97465.04	0.00	No
- SMATSA ¹⁴	568700.00	0.00	0	0.00	0.00	0.00	59200.00	156975.00	784875.00	70.00	549412.50	111434.56	0.00	No
Total beneficiary 12	5287001.00	0.00			874621.00	0.00	624730.00	1477932.75	8264284.75		5784999.33	1173342.19	0.00	
13. INDRA	4793917.00	0.00	0	0.00	0.00	0.00	252312.00	1261557.25	6307786.25	70.00	4415450.38	895563.42	0.00	No
14. EUROCONTROL														5550990.00
15. ANS CR (B4)	306300.00	0.00	0	0.00	0.00	0.00	60000.00	91575.00	457875.00	70.00	320512.50	65007.93	0.00	No
- Integra ¹⁴	129150.00	0.00	0	0.00	0.00	0.00	10000.00	34787.50	173937.50	70.00	121756.25	24695.21	0.00	No
- CTU ¹⁴	120240.00	0.00	0	0.00	0.00	0.00	7000.00	31810.00	159050.00	70.00	111335.00	22581.52	0.00	No
- AFT ¹⁴	490435.00	0.00	0	0.00	0.00	0.00	29500.00	129983.75	649918.75	70.00	454943.13	92273.82	0.00	No
Total beneficiary 15	1046125.00	0.00	0.00	0.00	0.00	0.00	106500.00	288156.25	1440781.25		1008546.88	204558.48	0.00	
16. FRQ (FSP)	130241.00	0.00	0	0.00	0.00	0.00	18330.00	37142.75	185713.75	70.00	129999.63	26367.17	0.00	No

ESTIMATED BUDGET FOR THE ACTION (page 3 of 4)

Estimated eligible ¹ costs (per budget category)									EU contribution			Additional information		
A. Direct personnel costs		B. Direct costs of subcontracting	C. Direct costs of fin. support	D. Other direct costs	E. Indirect costs ²	Total costs	Reimbursement rate %	Maximum EU contribution ³	Maximum grant amount ⁴	Information for indirect costs	Information for auditors	Other information:		
A.1 Employees (or equivalent) A.2 Natural persons under direct contract A.3 Seconded persons [A.6 Personnel for providing access to research infrastructure]		A.4 SME owners without salary A.5 Beneficiaries that are natural persons without salary		D.1 Travel D.2 Equipment D.3 Other goods and services D.4 Costs of large research infrastructure						Estimated costs of in-kind contributions not used on premises	Declaration of costs under Point D.4	Estimated costs of beneficiaries/ linked third parties not receiving EU funding		
Form of costs ⁶	Actual	Unit ⁷	Unit ⁸		Actual	Actual	Actual	Flat-rate ⁹						
	(a)	Total (b)	No hours	Total (c)	(d)	(e)	(f)	(g)=0,25x ((a)+(b)+ (c)+(f) +[(h1)+(h2)]- (m))	(i)= (a)+(b)+(c)+ (d)+(e)+(f)+ (g)+(h1)+(h2)+(h3)	(j)	(k)	(l)	(m)	Yes/No
17. DLR (AT-One)	632770.00	0.00	0	0.00	0.00	0.00	87021.00	179947.75	899738.75	70.00	629817.13	127742.63	0.00	No
18. ACG/ COOPANS	132097.00	0.00	0	0.00	0.00	0.00	19743.00	37960.00	189800.00	70.00	132860.00	26947.32	0.00	No
19. CCL/ COOPANS	127599.00	0.00	0	0.00	0.00	0.00	19041.00	36660.00	183300.00	70.00	128310.00	26024.47	0.00	No
20. IAA/ COOPANS	201340.00	0.00	0	0.00	0.00	0.00	30088.00	57857.00	289285.00	70.00	202499.50	41071.95	0.00	No
21. LFV/ COOPANS	258760.00	0.00	0	0.00	0.00	0.00	507417.00	191544.25	957721.25	70.00	670404.88	135974.84	0.00	No
22. AIRTEL (NATMIG)	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	70.00	0.00	0.00	0.00	No
23. SINTEF (NATMIG)	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	70.00	0.00	0.00	0.00	No
24. LPS SR (B4)	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	70.00	0.00	0.00	0.00	No
25. ON (B4)	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	70.00	0.00	0.00	0.00	No
26. PANSA (B4)	74177.00	0.00	0	0.00	0.00	0.00	40900.00	28769.25	143846.25	70.00	100692.38	20422.93	0.00	No
- UNIWARSAW ¹⁴	169301.69	0.00	0	0.00	0.00	0.00	105000.00	68575.42	342877.11	70.00	240013.98	48680.82	0.00	No
- PRZ ¹⁴	25085.31	0.00	0	0.00	0.00	0.00	2915.00	7000.08	35000.39	70.00	24500.27	4969.27	0.00	No
Total beneficiary 26	268564.00	0.00			0.00	0.00	148815.00	104344.75	521723.75		365206.63	74073.02	0.00	
27. HC (FSP)	87286.00	0.00	0	0.00	0.00	0.00	13000.00	25071.50	125357.50	70.00	87750.25	17797.94	0.00	No
28. ATOS (FSP)	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	70.00	0.00	0.00	0.00	No
29. NLR (AT-One)	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	70.00	0.00	0.00	0.00	No
Total consortium	24820057.00	710043.99		0.00	2247621.00	0.00	2864416.00	7055749.00	37697886.99		26388520.95	5352250.18	171521.00	5550990.00

ESTIMATED BUDGET FOR THE ACTION (page 4 of 4)

- (1) See Article 6 for the eligibility conditions
- (2) The indirect costs covered by the operating grant (received under any EU or Euratom funding programme; see Article 6.5.(b)) are ineligible under the GA. Therefore, a beneficiary that receives an operating grant during the action's duration cannot declare indirect costs for the year(s)/reporting period(s) covered by the operating grant (see Article 6.2.E).
- (3) This is the theoretical amount of EU contribution that the system calculates automatically (by multiplying all the budgeted costs by the reimbursement rate). This theoretical amount is capped by the 'maximum grant amount' (that the Commission/Agency decided to grant for the action) (see Article 5.1).
- (4) The 'maximum grant amount' is the maximum grant amount decided by the Commission/Agency. It normally corresponds to the requested grant, but may be lower.
- (5) Depending on its type, this specific cost category will or will not cover indirect costs. Specific unit costs that include indirect costs are: costs for energy efficiency measures in buildings, access costs for providing trans-national access to research infrastructure and costs for clinical studies.
- (6) See Article 5 for the forms of costs
- (7) Unit : hours worked on the action; costs per unit (hourly rate) : calculated according to beneficiary's usual accounting practice
- (8) See Annex 2a 'Additional information on the estimated budget' for the details (costs per hour (hourly rate)).
- (9) Flat rate : 25% of eligible direct costs, from which are excluded: direct costs of subcontracting, costs of in-kind contributions not used on premises, direct costs of financial support, and unit costs declared under budget category F if they include indirect costs
- (10) See Annex 2a 'Additional information on the estimated budget' for the details (units, costs per unit).
- (11) See Annex 2a 'Additional information on the estimated budget' for the details (units, costs per unit, estimated number of units, etc)
- (12) Only specific unit costs that do not include indirect costs
- (13) See Article 9 for beneficiaries not receiving EU funding
- (14) Only for linked third parties that receive EU funding

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

AIRBUS SAS (AIRBUS) SAS, 383474814, established in rd point Maurice Bellonte 1, BLAGNAC 31707, France, VAT number FR89383474814, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('2')

in Grant Agreement No 734143 ('the Agreement')

between DFS DEUTSCHE FLUGSICHERUNG GMBH **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

for the action entitled 'Controller Tools and Team Organisation for the Provision of Separation in Air Traffic Management (PJ10 PROSA)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

NAVIAIR (Naviair/COOPANS) DK18, 26059763, established in NAVIAIR ALLE 1, KASTRUP 2770, Denmark, VAT number DK26059763, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('3')

in Grant Agreement No 734143 ('the Agreement')

between DFS DEUTSCHE FLUGSICHERUNG GMBH **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

for the action entitled 'Controller Tools and Team Organisation for the Provision of Separation in Air Traffic Management (PJ10 PROSA)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

DIRECTION DES SERVICES DE LA NAVIGATION AERIENNE (DSNA), 120064019, established in 50 RUE HENRY FARMAN, PARIS 75720, France, VAT number FR29120064019, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('4')

in Grant Agreement No 734143 ('the Agreement')

between DFS DEUTSCHE FLUGSICHERUNG GMBH **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

for the action entitled 'Controller Tools and Team Organisation for the Provision of Separation in Air Traffic Management (PJ10 PROSA)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

ENTIDAD PUBLICA EMPRESARIAL ENAIRE (ENAIRES), established in CALLE ARTURO SORIA 109, MADRID 28043, Spain, VAT number ESQ2822001J, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('5')

in Grant Agreement No 734143 ('the Agreement')

between DFS DEUTSCHE FLUGSICHERUNG GMBH **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

for the action entitled 'Controller Tools and Team Organisation for the Provision of Separation in Air Traffic Management (PJ10 PROSA)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

ENAV SPA (ENAV) SPA, 965162/CF97016000586, established in VIA SALARIA 716, ROMA 00138, Italy, VAT number IT02152021008, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('6')

in Grant Agreement No 734143 ('the Agreement')

between DFS DEUTSCHE FLUGSICHERUNG GMBH and the Single European Sky ATM Research Joint Undertaking ('the JU'),

for the action entitled 'Controller Tools and Team Organisation for the Provision of Separation in Air Traffic Management (PJ10 PROSA)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

LEONARDO - FINMECCANICA SPA (FINMECCANICA) SPA, 7031/CF00401990585, established in PIAZZA MONTE GRAPPA 4, ROMA 00195, Italy, VAT number IT00881841001, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('7')

in Grant Agreement No 734143 ('the Agreement')

between DFS DEUTSCHE FLUGSICHERUNG GMBH **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

for the action entitled 'Controller Tools and Team Organisation for the Provision of Separation in Air Traffic Management (PJ10 PROSA)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

SKYGUIDE, SA SUISSE POUR LES SERVICES DE LA NAVIGATION AERIENNE CIVILS ET MILITAIRES (SKYGUIDE) SA, CH03530005515, established in ROUTE DE PRE BOIS 15-17, GENEVA 1215, Switzerland, VAT number CH514204, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('8')

in Grant Agreement No 734143 ('the Agreement')

between DFS DEUTSCHE FLUGSICHERUNG GMBH **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

for the action entitled 'Controller Tools and Team Organisation for the Provision of Separation in Air Traffic Management (PJ10 PROSA)'.
'

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

SAAB AKTIEBOLAG (SAAB (NATMIG)) AB, 5560360793, established in ., LINKOPING 58188, Sweden, VAT number SE556036079301, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('9')

in Grant Agreement No 734143 ('the Agreement')

between DFS DEUTSCHE FLUGSICHERUNG GMBH **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

for the action entitled 'Controller Tools and Team Organisation for the Provision of Separation in Air Traffic Management (PJ10 PROSA)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

NATS (EN ROUTE) PUBLIC LIMITED COMPANY (NATS) LTD, 04129273, established in 4000 PARKWAY WHITELEY, FAREHAM PO15 7FL, United Kingdom, VAT number GB440379456, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('10')

in Grant Agreement No 734143 ('the Agreement')

between DFS DEUTSCHE FLUGSICHERUNG GMBH **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

for the action entitled 'Controller Tools and Team Organisation for the Provision of Separation in Air Traffic Management (PJ10 PROSA)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

DASSAULT AVIATION (DASSAULT) FR39, 712042456, established in 9 ROND POINT CHAMPS-ELYSEES-MARCEL DASSAULT, PARIS 75008, France, VAT number FR73712042456, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('11')

in Grant Agreement No 734143 ('the Agreement')

between DFS DEUTSCHE FLUGSICHERUNG GMBH **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

for the action entitled 'Controller Tools and Team Organisation for the Provision of Separation in Air Traffic Management (PJ10 PROSA)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

THALES AIR SYSTEMS SAS (THALES AIR SYS) SAS, 319159877, established in AVENUE CHARLES LINDBERGH 3, RUNGIS 94150, France, VAT number FR15319159877, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('12')

in Grant Agreement No 734143 ('the Agreement')

between DFS DEUTSCHE FLUGSICHERUNG GMBH **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

for the action entitled 'Controller Tools and Team Organisation for the Provision of Separation in Air Traffic Management (PJ10 PROSA)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

INDRA SISTEMAS SA (INDRA) SA, M11339, established in AVENIDA DE BRUSELAS 35, ALCOBENDAS MADRID 28108, Spain, VAT number ESA28599033, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('13')

in Grant Agreement No 734143 ('the Agreement')

between DFS DEUTSCHE FLUGSICHERUNG GMBH **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

for the action entitled 'Controller Tools and Team Organisation for the Provision of Separation in Air Traffic Management (PJ10 PROSA)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

EUROCONTROL - EUROPEAN ORGANISATION FOR THE SAFETY OF AIR NAVIGATION (EUROCONTROL), N/A, established in Rue de la Fusée 96, BRUXELLES 1130, Belgium, VAT number not applicable, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('14')

in Grant Agreement No 734143 ('the Agreement')

between DFS DEUTSCHE FLUGSICHERUNG GMBH **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

for the action entitled 'Controller Tools and Team Organisation for the Provision of Separation in Air Traffic Management (PJ10 PROSA)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

RIZENI LETOVEHO PROVOZU CESKE REPUBLIKY STATNI PODNIK (ANS CR (B4)) SP, 49710371, established in Navigacni 787, Jenec 25261, Czech Republic, VAT number CZ49710371, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('15')

in Grant Agreement No 734143 ('the Agreement')

between DFS DEUTSCHE FLUGSICHERUNG GMBH **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

for the action entitled 'Controller Tools and Team Organisation for the Provision of Separation in Air Traffic Management (PJ10 PROSA)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

FREQUENTIS AG (FRQ (FSP)) AG, FN72115B, established in Innovationsstrasse 1, WIEN 1100, Austria, VAT number ATU14715600, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('16')

in Grant Agreement No 734143 ('the Agreement')

between DFS DEUTSCHE FLUGSICHERUNG GMBH **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

for the action entitled 'Controller Tools and Team Organisation for the Provision of Separation in Air Traffic Management (PJ10 PROSA)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

DEUTSCHES ZENTRUM FUER LUFT - UND RAUMFAHRT EV (DLR (AT-One)) EV, VR2780, established in Linder Hoehe, KOELN 51147, Germany, VAT number DE121965658, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('17')

in Grant Agreement No 734143 ('the Agreement')

between DFS DEUTSCHE FLUGSICHERUNG GMBH **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

for the action entitled 'Controller Tools and Team Organisation for the Provision of Separation in Air Traffic Management (PJ10 PROSA)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

AUSTRO CONTROL OSTERREICHISCHE GESELLSCHAFT FUR ZIVILLUFTFAHRT MBH (ACG/COOPANS) GMBH, FN71000M, established in WAGRAMER STRASSE 19, WIEN 1220, Austria, VAT number ATU37259408, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('18')

in Grant Agreement No 734143 ('the Agreement')

between DFS DEUTSCHE FLUGSICHERUNG GMBH **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

for the action entitled 'Controller Tools and Team Organisation for the Provision of Separation in Air Traffic Management (PJ10 PROSA)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

CROATIA CONTROL, CROATIAN AIR NAVIGATION SERVICES LTD (CCL/COOPANS) DOO, 080328617, established in RUDOLFA FIZIRA 2, VELIKA GORICA 10410, Croatia, VAT number HR33052761319, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('19')

in Grant Agreement No 734143 ('the Agreement')

between DFS DEUTSCHE FLUGSICHERUNG GMBH **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

for the action entitled 'Controller Tools and Team Organisation for the Provision of Separation in Air Traffic Management (PJ10 PROSA)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

UDARAS EITLIOCHTA NA HEIREANN THE IRISH AVIATION AUTHORITY (IAA/ COOPANS) LTD, 211082, established in D'OLIER STREET 11-12 THE TIMES BUILDING, DUBLIN D02 T449, Ireland, VAT number IE8211082B, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('20')

in Grant Agreement No 734143 ('the Agreement')

between DFS DEUTSCHE FLUGSICHERUNG GMBH **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

for the action entitled 'Controller Tools and Team Organisation for the Provision of Separation in Air Traffic Management (PJ10 PROSA)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

LUFTFARTSVERKET (LFV/COOPANS), 2021000795, established in HOSPITALSGATAN 30, NORRKOPING 602 27, Sweden, VAT number SE202100079501, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('21')

in Grant Agreement No 734143 ('the Agreement')

between DFS DEUTSCHE FLUGSICHERUNG GMBH **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

for the action entitled 'Controller Tools and Team Organisation for the Provision of Separation in Air Traffic Management (PJ10 PROSA)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

AIRTEL ATN LIMITED (AIRTEL (NATMIG)) LTD, 287698, established in 2 HARBOUR SQUARE CROFTON ROAD, DUN LOAGHAIRE DUBLIN A96D6R0, Ireland, VAT number IE8287698U, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('22')

in Grant Agreement No 734143 ('the Agreement')

between DFS DEUTSCHE FLUGSICHERUNG GMBH **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

for the action entitled 'Controller Tools and Team Organisation for the Provision of Separation in Air Traffic Management (PJ10 PROSA)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

STIFTELSEN SINTEF (SINTEF (NATMIG)) NO1, 948007029, established in STRINDVEIEN 4, TRONDHEIM 7034, Norway, VAT number NO948007029MVA, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('23')

in Grant Agreement No 734143 ('the Agreement')

between DFS DEUTSCHE FLUGSICHERUNG GMBH **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

for the action entitled 'Controller Tools and Team Organisation for the Provision of Separation in Air Traffic Management (PJ10 PROSA)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

LETOVE PREVADZKOVE SLUZBY SLOVENSKEJ REPUBLIKY, STATNY PODNIK (LPS SR (B4)) SK9, 35778458, established in IVANSKA CESTA 93, BRATISLAVA 823 07, Slovakia, VAT number SK2020244699, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('24')

in Grant Agreement No 734143 ('the Agreement')

between DFS DEUTSCHE FLUGSICHERUNG GMBH **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

for the action entitled 'Controller Tools and Team Organisation for the Provision of Separation in Air Traffic Management (PJ10 PROSA)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

VALSTYBES IMONE ORO NAVIGACIJA (ON (B4)) LT7, 210060460, established in RODUNIOS KEL 2, VILNIAUS 02188, Lithuania, VAT number LT100604610, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('25')

in Grant Agreement No 734143 ('the Agreement')

between DFS DEUTSCHE FLUGSICHERUNG GMBH **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

for the action entitled 'Controller Tools and Team Organisation for the Provision of Separation in Air Traffic Management (PJ10 PROSA)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

POLSKA AGENCJA ZEGLUGI POWIETRZNEJ (PANSA (B4)), 140886771, established in UL. WIEZOWA 8, WARSZAWA 02 147, Poland, VAT number PL5222838321, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('26')

in Grant Agreement No 734143 ('the Agreement')

between DFS DEUTSCHE FLUGSICHERUNG GMBH **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

for the action entitled 'Controller Tools and Team Organisation for the Provision of Separation in Air Traffic Management (PJ10 PROSA)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

HUNGAROCONTROL MAGYAR LEGIFORGALMI SZOLGALAT ZARTKORUEN MUKODO RESZVENYTARSASAG (HC (FSP)) RT, 0110045570, established in IGLO UTCA 33 35, BUDAPEST 1185, Hungary, VAT number HU13851325, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('27')

in Grant Agreement No 734143 ('the Agreement')

between DFS DEUTSCHE FLUGSICHERUNG GMBH **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

for the action entitled 'Controller Tools and Team Organisation for the Provision of Separation in Air Traffic Management (PJ10 PROSA)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

ATOS BELGIUM (ATOS (FSP)) NV, 401848135, established in DA VINCILAAN 5, ZAVENTEM 1930, Belgium, VAT number BE0401848135, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('28')

in Grant Agreement No 734143 ('the Agreement')

between DFS DEUTSCHE FLUGSICHERUNG GMBH **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

for the action entitled 'Controller Tools and Team Organisation for the Provision of Separation in Air Traffic Management (PJ10 PROSA)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

STICHTING NATIONAAL LUCHT- EN RUIMTEVAARTLABORATORIUM (NLR (AT-One)) NL6, 41150373, established in Anthony Fokkerweg 2, AMSTERDAM 1059CM, Netherlands, VAT number NL002760551B01, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('29')

in Grant Agreement No 734143 ('the Agreement')

between DFS DEUTSCHE FLUGSICHERUNG GMBH **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

for the action entitled 'Controller Tools and Team Organisation for the Provision of Separation in Air Traffic Management (PJ10 PROSA)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3a

DECLARATION ON JOINT AND SEVERAL LIABILITY OF LINKED THIRD PARTIES

AIRBUS DEFENCE AND SPACE SAS (AI DS Space) SAS, 393341516, established in 51-61 Route de Verneuil, LES MUREAUX 78130, France, VAT number FR63393341516, ('the linked third party'), represented for the purpose of signing this Declaration on joint and several liability by its legal representative(s) [forename and surname, function of the legal representative(s) of the linked third party],

linked to beneficiary No 2 **AIRBUS SAS (AIRBUS) SAS**, 383474814, established in rd point Maurice Bellonte 1, BLAGNAC 31707, France, VAT number FR89383474814, ('the beneficiary'),

hereby accepts joint and several liability with the beneficiary

for any amount owed to the Commission by the beneficiary under Grant Agreement No 734143 (PJ10 PROSA), up to the maximum EU contribution indicated, for the linked third party, in the estimated budget (see Annex 2).

The linked third party irrevocably and unconditionally agrees to pay amounts requested under this Declaration to the Commission, immediately and at first demand.

For the linked third party
[forename/surname/function]

Done in English at [place], on [date]

ANNEX 3a

DECLARATION ON JOINT AND SEVERAL LIABILITY OF LINKED THIRD PARTIES

AIRBUS OPERATIONS SAS (AI OPS) SAS, 420916918, established in ROUTE DE BAYONNE 316, TOULOUSE 31060, France, VAT number FR13420916918, ('the linked third party'), represented for the purpose of signing this Declaration on joint and several liability by its legal representative(s) [forename and surname, function of the legal representative(s) of the linked third party],

linked to beneficiary No 2 **AIRBUS SAS (AIRBUS) SAS**, 383474814, established in rd point Maurice Bellonte 1, BLAGNAC 31707, France, VAT number FR89383474814, ('the beneficiary'),

hereby accepts joint and several liability with the beneficiary

for any amount owed to the Commission by the beneficiary under Grant Agreement No 734143 (PJ10 PROSA), up to the maximum EU contribution indicated, for the linked third party, in the estimated budget (see Annex 2).

The linked third party irrevocably and unconditionally agrees to pay amounts requested under this Declaration to the Commission, immediately and at first demand.

For the linked third party
[forename/surname/function]

Done in English at [place], on [date]

ANNEX 3a

DECLARATION ON JOINT AND SEVERAL LIABILITY OF LINKED THIRD PARTIES

CONSORZIO SICTA SISTEMI INNOVATIVIPER IL CONTROLLO DELTRAFFICO AEREO (SICTA) IT4, 516936/CF02790511212, established in VIA FULCO RUFFO DI CALABRIA, NAPOLI 80144, Italy, VAT number IT02790511212, ('the linked third party'), represented for the purpose of signing this Declaration on joint and several liability by its legal representative(s) [forename and surname, function of the legal representative(s) of the linked third party],

linked to beneficiary No 6 **ENAV SPA (ENAV)** SPA, 965162/CF97016000586, established in VIA SALARIA 716, ROMA 00138, Italy, VAT number IT02152021008, ('the beneficiary'),

hereby accepts joint and several liability with the beneficiary

for any amount owed to the Commission by the beneficiary under Grant Agreement No 734143 (PJ10 PROSA), up to the maximum EU contribution indicated, for the linked third party, in the estimated budget (see Annex 2).

The linked third party irrevocably and unconditionally agrees to pay amounts requested under this Declaration to the Commission, immediately and at first demand.

For the linked third party
[forename/surname/function]

Done in English at [place], on [date]

ANNEX 3a

DECLARATION ON JOINT AND SEVERAL LIABILITY OF LINKED THIRD PARTIES

AGENTFLY TECHNOLOGIES SRO (AFT) SRO, 24727679, established in KARLOVO NAMESTI 290/16, NOVE MESTO PRAHA 120 00, Czech Republic, VAT number CZ24727679, ('the linked third party'), represented for the purpose of signing this Declaration on joint and several liability by its legal representative(s) [forename and surname, function of the legal representative(s) of the linked third party],

linked to beneficiary No 15 **RIZENI LETOVEHO PROVOZU CESKE REPUBLIKY STATNI PODNIK (ANS CR (B4)) SP**, 49710371, established in Navigacni 787, Jenec 25261, Czech Republic, VAT number CZ49710371, ('the beneficiary'),

hereby accepts joint and several liability with the beneficiary

for any amount owed to the Commission by the beneficiary under Grant Agreement No 734143 (PJ10 PROSA), up to the maximum EU contribution indicated, for the linked third party, in the estimated budget (see Annex 2).

The linked third party irrevocably and unconditionally agrees to pay amounts requested under this Declaration to the Commission, immediately and at first demand.

For the linked third party
[forename/surname/function]

Done in English at [place], on [date]

ANNEX 3a

DECLARATION ON JOINT AND SEVERAL LIABILITY OF LINKED THIRD PARTIES

UNIwersytet Warszawski (UniWarsaw), 000001258, established in KRAKOWSKIE PRZEDMIESCIE 26/28, WARSZAWA 00 927, Poland, VAT number PL5250011266, ('the linked third party'), represented for the purpose of signing this Declaration on joint and several liability by its legal representative(s) [forename and surname, function of the legal representative(s) of the linked third party],

linked to beneficiary No 26 **Polska Agencja Żeglugi Powietrznej (Pansa (B4))**, 140886771, established in UL. WIEZOWA 8, WARSZAWA 02 147, Poland, VAT number PL5222838321, ('the beneficiary'),

hereby accepts joint and several liability with the beneficiary

for any amount owed to the Commission by the beneficiary under Grant Agreement No 734143 (PJ10 PROSA), up to the maximum EU contribution indicated, for the linked third party, in the estimated budget (see Annex 2).

The linked third party irrevocably and unconditionally agrees to pay amounts requested under this Declaration to the Commission, immediately and at first demand.

For the linked third party
[forename/surname/function]

Done in English at [place], on [date]

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MODEL ANNEX 4 FOR H2020 GENERAL MGA — MULTI

FINANCIAL STATEMENT FOR [BENEFICIARY [name]/ LINKED THIRD PARTY [name]] FOR REPORTING PERIOD [reporting period]

Eligible ¹ costs (per budget category)											Receipts	EU contribution			Additional information			
A. Direct personnel costs				B. Direct costs of subcontracting	[C. Direct costs of fin. support]	D. Other direct costs		E. Indirect costs ²	[F. Costs of ...]		Total costs	Receipts	Reimbursement rate %	Maximum EU contribution ³	Requested EU contribution	Information for indirect costs :		
A.1 Employees (or equivalent)		A.4 SME owners without salary				D.1 Travel	[D.4 Costs of large research infrastructure]		[F.1 Costs of ...]			Receipts of the action, to be reported in the last reporting period, according to Article 5.3.3				Costs of in-kind contributions not used on premises		
A.2 Natural persons under direct contract		A.5 Beneficiaries that are natural persons without salary				D.2 Equipment												
A.3 Seconded persons						D.3 Other goods and services												
[A.6 Personnel for providing access to research infrastructure]																		
Form of costs ⁴	Actual	Unit	Unit		Actual	Actual	Actual	Actual	Flat-rate ⁵	Unit	Unit							
									25%									
	a	Total b	No hours	Total c	d	[e]	f	[g]	h=0,25 x (a+b+c+f+[g] + [i1] ⁶ + [i2] ⁶ - o)	No units	Total [i1]	Total [i2]	j = a+b+c+d+[e] + f + [g] + h + [i1] + [i2]	k	l	m	n	o
[short name beneficiary/linked third party]																		

The beneficiary/linked third party hereby confirms that:
 The information provided is complete, reliable and true.
 The costs declared are eligible (see Article 6).
 The costs can be substantiated by adequate records and supporting documentation that will be produced upon request or in the context of checks, reviews, audits and investigations (see Articles 17, 18 and 22).
 For the last reporting period: that all the receipts have been declared (see Article 5.3.3).

Please declare all eligible costs, even if they exceed the amounts indicated in the estimated budget (see Annex 2). Only amounts that were declared in your individual financial statements can be taken into account lateron, in order to replace other costs that are found to be ineligible.

¹ See Article 6 for the eligibility conditions
² The indirect costs claimed must be free of any amounts covered by an operating grant (received under any EU or Euratom funding programme; see Article 6.2.E). If you have received an operating grant during this reporting period, you cannot claim any indirect costs.
³ This is the *theoretical* amount of EU contribution that the system calculates automatically (by multiplying the reimbursement rate by the total costs declared). The amount you request (in the column 'requested EU contribution') may have to be less (e.g. if you and the other beneficiaries are above budget, if the 90% limit (see Article 21) is reached, etc).
⁴ See Article 5 for the form of costs
⁵ Flat rate : 25% of eligible direct costs, from which are excluded: direct costs of subcontracting, costs of in-kind contributions not used on premises, direct costs of financial support, and unit costs declared under budget category F if they include indirect costs (see Article 6.2.E)
⁶ Only specific unit costs that do not include indirect costs

ANNEX 5

MODEL FOR THE CERTIFICATE ON THE FINANCIAL STATEMENTS

- For options [*in italics in square brackets*]: choose the applicable option. Options not chosen should be deleted.
- For fields in [grey in square brackets]: enter the appropriate data

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Terms of Reference for an Independent Report of Factual Findings on costs declared under a Grant Agreement financed by the [BBI][Clean Sky 2][ECSEL][FCH][IMI2] Joint Undertaking under the Horizon 2020 Research and Innovation Framework Programme

This document sets out the ‘**Terms of Reference (ToR)**’ under which

[OPTION 1: [insert name of the beneficiary] (*‘the Beneficiary’*)] [OPTION 2: [insert name of the linked third party] (*‘the Linked Third Party’*), third party linked to the Beneficiary [insert name of the beneficiary] (*‘the Beneficiary’*)]

agrees to engage

[insert legal name of the auditor] (*‘the Auditor’*)

to produce an independent report of factual findings (*‘the Report’*) concerning the Financial Statement(s)¹ drawn up by the [Beneficiary] [Linked Third Party] for the Horizon 2020 grant agreement [insert number of the grant agreement, title of the action, acronym and duration from/to] (*‘the Agreement’*), and

to issue a Certificate on the Financial Statements’ (*‘CFS’*) referred to in Article 20.4 of the Agreement based on the compulsory reporting template stipulated by the Commission.

The Agreement has been concluded under the Horizon 2020 Research and Innovation Framework Programme (H2020) between the Beneficiary and [the [Bio Based Industries][Clean Sky 2][ECSEL][Fuel Cells and Hydrogen 2][Innovative Medicines Initiative 2] Joint Undertaking (*‘the JU’*)], which receives funding under the Horizon 2020 Research and Innovation Framework Programme (H2020)].

The JU is mentioned as a signatory of the Agreement with the Beneficiary only. The JU is not a party to this engagement.

1.1 Subject of the engagement

The coordinator must submit to the JU the final report within 60 days following the end of the last reporting period which should include, amongst other documents, a CFS for each beneficiary and for each linked third party that requests a total contribution of EUR 325 000 or more, as reimbursement of actual costs and unit costs calculated on the basis of its usual cost accounting practices (see Article 20.4 of the Agreement). The CFS must cover all reporting periods of the beneficiary or linked third party indicated above.

The Beneficiary must submit to the coordinator the CFS for itself and for its linked third party(ies), if the CFS must be included in the final report according to Article 20.4 of the Agreement..

The CFS is composed of two separate documents:

- The Terms of Reference (*‘the ToR’*) to be signed by the [Beneficiary] [Linked Third Party] and the Auditor;
- The Auditor’s Independent Report of Factual Findings (*‘the Report’*) to be issued on the Auditor’s letterhead, dated, stamped and signed by the Auditor (or the competent public officer) which includes the agreed-upon procedures (*‘the Procedures’*) to be performed by the Auditor, and the standard factual findings (*‘the Findings’*) to be confirmed by the Auditor.

¹ By which costs under the Agreement are declared (see template ‘Model Financial Statements’ in Annex 4 to the Grant Agreement).

If the CFS must be included in the final report according to Article 20.4 of the Agreement, the request for payment of the balance relating to the Agreement cannot be made without the CFS. However, the payment for reimbursement of costs covered by the CFS does not preclude the JU, the Commission, the European Anti-Fraud Office and the European Court of Auditors from carrying out checks, reviews, audits and investigations in accordance with Article 22 of the Agreement.

1.2 Responsibilities

The *[Beneficiary]* *[Linked Third Party]*:

- must draw up the Financial Statement(s) for the action financed by the Agreement in compliance with the obligations under the Agreement. The Financial Statement(s) must be drawn up according to the *[Beneficiary's]* *[Linked Third Party's]* accounting and book-keeping system and the underlying accounts and records;
- must send the Financial Statement(s) to the Auditor;
- is responsible and liable for the accuracy of the Financial Statement(s);
- is responsible for the completeness and accuracy of the information provided to enable the Auditor to carry out the Procedures. It must provide the Auditor with a written representation letter supporting these statements. The written representation letter must state the period covered by the statements and must be dated;
- accepts that the Auditor cannot carry out the Procedures unless it is given full access to the *[Beneficiary's]* *[Linked Third Party's]* staff and accounting as well as any other relevant records and documentation.

The Auditor:

- *[Option 1 by default:* is qualified to carry out statutory audits of accounting documents in accordance with Directive 2006/43/EC of the European Parliament and of the Council of 17 May 2006 on statutory audits of annual accounts and consolidated accounts, amending Council Directives 78/660/EEC and 83/349/EEC and repealing Council Directive 84/253/EEC or similar national regulations].
- *[Option 2 if the Beneficiary or Linked Third Party has an independent Public Officer:* is a competent and independent Public Officer for which the relevant national authorities have established the legal capacity to audit the Beneficiary].
- *[Option 3 if the Beneficiary or Linked Third Party is an international organisation:* is an [internal] [external] auditor in accordance with the internal financial regulations and procedures of the international organisation].

The Auditor:

- must be independent from the Beneficiary *[and the Linked Third Party]*, in particular, it must not have been involved in preparing the *[Beneficiary's]* *[Linked Third Party's]* Financial Statement(s);
- must plan work so that the Procedures may be carried out and the Findings may be assessed;
- must adhere to the Procedures laid down and the compulsory report format;
- must carry out the engagement in accordance with this ToR;
- must document matters which are important to support the Report;
- must base its Report on the evidence gathered;
- must submit the Report to the *[Beneficiary]* *[Linked Third Party]*.

The Commission sets out the Procedures to be carried out by the Auditor. The Auditor is not responsible for their suitability or pertinence. As this engagement is not an assurance engagement, the Auditor does not provide an audit opinion or a statement of assurance.

1.3 Applicable Standards

The Auditor must comply with these Terms of Reference and with²:

- the International Standard on Related Services ('ISRS') 4400 *Engagements to perform Agreed-upon Procedures regarding Financial Information* as issued by the International Auditing and Assurance Standards Board (IAASB);
- the *Code of Ethics for Professional Accountants* issued by the International Ethics Standards Board for Accountants (IESBA). Although ISRS 4400 states that independence is not a requirement for engagements to carry out agreed-upon procedures, the JU requires that the Auditor also complies with the Code's independence requirements.

The Auditor's Report must state that there is no conflict of interests in establishing this Report between the Auditor and the Beneficiary *[and the Linked Third Party]*, and must specify - if the service is invoiced - the total fee paid to the Auditor for providing the Report.

1.4 Reporting

The Report must be written in the language of the Agreement (see Article 20.7).

Under Article 22 of the Agreement, the JU, the Commission, the European Anti-Fraud Office and the Court of Auditors have the right to audit any work that is carried out under the action and for which costs are declared from the European Union budget. This includes work related to this engagement. The Auditor must provide access to all working papers (e.g. recalculation of hourly rates, verification of the time declared for the action) related to this assignment if the JU, the Commission, the European Anti-Fraud Office or the European Court of Auditors requests them.

1.5 Timing

The Report must be provided by [dd Month yyyy].

1.6 Other terms

[The [Beneficiary] [Linked Third Party] and the Auditor can use this section to agree other specific terms, such as the Auditor's fees, liability, applicable law, etc. Those specific terms must not contradict the terms specified above.]

[legal name of the Auditor]	[legal name of the [Beneficiary][Linked Third Party]]
[name & function of authorised representative]	[name & function of authorised representative]
[dd Month yyyy]	[dd Month yyyy]
Signature of the Auditor	Signature of the [Beneficiary][Linked Third Party]

² Supreme Audit Institutions applying INTOSAI-standards may carry out the Procedures according to the corresponding International Standards of Supreme Audit Institutions and code of ethics issued by INTOSAI instead of the International Standard on Related Services ('ISRS') 4400 and the Code of Ethics for Professional Accountants issued by the IAASB and the IESBA.

Independent Report of Factual Findings on costs declared under a Grant Agreement financed by the [BBI][Clean Sky 2][ECSEL][FCH][IMI2] JU under the Horizon 2020 Research and Innovation Framework Programme

(To be printed on the Auditor's letterhead)

To

[name of contact person(s)], [Position]
[[Beneficiary's] [Linked Third Party's] name]
[Address]
[dd Month yyyy]

Dear [Name of contact person(s)],

As agreed under the terms of reference dated [dd Month yyyy]

with [OPTION 1: [insert name of the beneficiary] ('the Beneficiary')] [OPTION 2: [insert name of the linked third party] ('the Linked Third Party'), third party linked to the Beneficiary [insert name of the beneficiary] ('the Beneficiary')],

we

[name of the auditor] ('the Auditor'),
established at
[full address/city/state/province/country],
represented by
[name and function of an authorised representative],

have carried out the procedures agreed with you regarding the costs declared in the Financial Statement(s)³ of the [Beneficiary] [Linked Third Party] concerning the grant agreement [insert grant agreement reference: number, title of the action and acronym] ('the Agreement'),

with a total cost declared of
[total amount] EUR,

and a total of actual costs and 'direct personnel costs declared as unit costs calculated in accordance with the [Beneficiary's] [Linked Third Party's] usual cost accounting practices' declared of

[sum of total actual costs and total direct personnel costs declared as unit costs calculated in accordance with the [Beneficiary's] [Linked Third Party's] usual cost accounting practices] EUR

and **hereby provide our Independent Report of Factual Findings ('the Report')** using the compulsory report format agreed with you.

The Report

Our engagement was carried out in accordance with the terms of reference ('the ToR') appended to this Report. The Report includes the agreed-upon procedures ('the Procedures') carried out and the standard factual findings ('the Findings') examined.

³ By which the Beneficiary declares costs under the Agreement (see template 'Model Financial Statement' in Annex 4 to the Agreement).

[BBI][Clean Sky 2][ECSEL][FCH][IMI2] JU Multi-Beneficiary Model Grant Agreement [Clean Sky 2: [for Partners]][for Members]] - April 2015

The Procedures were carried out solely to assist the JU in evaluating whether the [Beneficiary's] [Linked Third Party's] costs in the accompanying Financial Statement(s) were declared in accordance with the Agreement. The JU draws its own conclusions from the Report and any additional information it may require.

The scope of the Procedures was defined by the Commission. Therefore, the Auditor is not responsible for their suitability or pertinence. Since the Procedures carried out constitute neither an audit nor a review made in accordance with International Standards on Auditing or International Standards on Review Engagements, the Auditor does not give a statement of assurance on the Financial Statements.

Had the Auditor carried out additional procedures or an audit of the [Beneficiary's] [Linked Third Party's] Financial Statements in accordance with International Standards on Auditing or International Standards on Review Engagements, other matters might have come to its attention and would have been included in the Report.

Not applicable Findings

We examined the Financial Statement(s) stated above and considered the following Findings not applicable:

Explanation (to be removed from the Report):

If a Finding was not applicable, it must be marked as 'N.A.' ('Not applicable') in the corresponding row on the right-hand column of the table and means that the Finding did not have to be corroborated by the Auditor and the related Procedure(s) did not have to be carried out.

The reasons of the non-application of a certain Finding must be obvious i.e.

- i) if no cost was declared under a certain category then the related Finding(s) and Procedure(s) are not applicable;*
- ii) if the condition set to apply certain Procedure(s) are not met the related Finding(s) and those Procedure(s) are not applicable. For instance, for 'beneficiaries with accounts established in a currency other than euro' the Procedure and Finding related to 'beneficiaries with accounts established in euro' are not applicable. Similarly, if no additional remuneration is paid, the related Finding(s) and Procedure(s) for additional remuneration are not applicable.*

List here all Findings considered not applicable for the present engagement and explain the reasons of the non-applicability.

....

Exceptions

Apart from the exceptions listed below, the [Beneficiary] [Linked Third Party] provided the Auditor all the documentation and accounting information needed by the Auditor to carry out the requested Procedures and evaluate the Findings.

Explanation (to be removed from the Report):

- If the Auditor was not able to successfully complete a procedure requested, it must be marked as 'E' ('Exception') in the corresponding row on the right-hand column of the table. The reason such as the inability to reconcile key information or the unavailability of data that prevents the Auditor from carrying out the Procedure must be indicated below.*
- If the Auditor cannot corroborate a standard finding after having carried out the corresponding procedure, it must also be marked as 'E' ('Exception') and, where possible, the reasons why the Finding was not fulfilled and its possible impact must be explained here below.*

List here any exceptions and add any information on the cause and possible consequences of each exception, if known. If the exception is quantifiable, include the corresponding amount.

....

Example (to be removed from the Report):

1. *The Beneficiary was unable to substantiate the Finding number 1 on ... because ...*
2. *Finding number 30 was not fulfilled because the methodology used by the Beneficiary to calculate unit costs was different from the one approved by the Commission. The differences were as follows: ...*
3. *After carrying out the agreed procedures to confirm the Finding number 31, the Auditor found a difference of _____ EUR. The difference can be explained by ...*

Further Remarks

In addition to reporting on the results of the specific procedures carried out, the Auditor would like to make the following general remarks:

Example (to be removed from the Report):

1. *Regarding Finding number 8 the conditions for additional remuneration were considered as fulfilled because ...*
2. *In order to be able to confirm the Finding number 15 we carried out the following additional procedures:*

Use of this Report

This Report may be used only for the purpose described in the above objective. It was prepared solely for the confidential use of the [Beneficiary] [Linked Third Party], the JU and the Commission, and only to be submitted to the JU in connection with the requirements set out in Article 20.4 of the Agreement. The Report may not be used by the [Beneficiary] [Linked Third Party] or by the JU or the Commission for any other purpose, nor may it be distributed to any other parties. The JU or the Commission may only disclose the Report to authorised parties, in particular to the European Anti-Fraud Office (OLAF) and the European Court of Auditors.

This Report relates only to the Financial Statement(s) submitted to the JU by the [Beneficiary] [Linked Third Party] for the Agreement. Therefore, it does not extend to any other of the [Beneficiary's] [Linked Third Party's] Financial Statement(s).

There was no conflict of interest⁴ between the Auditor and the Beneficiary [and Linked Third Party] in establishing this Report. The total fee paid to the Auditor for providing the Report was EUR [] (including EUR [] of deductible VAT).

We look forward to discussing our Report with you and would be pleased to provide any further information or assistance.

[legal name of the Auditor]

[name and function of an authorised representative]

[dd Month yyyy]

Signature of the Auditor

⁴ A conflict of interest arises when the Auditor's objectivity to establish the certificate is compromised in fact or in appearance when the Auditor for instance:

- was involved in the preparation of the Financial Statements;
- stands to benefit directly should the certificate be accepted;
- has a close relationship with any person representing the beneficiary;
- is a director, trustee or partner of the beneficiary; or
- is in any other situation that compromises his or her independence or ability to establish the certificate impartially.

Agreed-upon procedures to be performed and standard factual findings to be confirmed by the Auditor

The Commission reserves the right to i) provide the auditor with additional guidance regarding the procedures to be followed or the facts to be ascertained and the way in which to present them (this may include sample coverage and findings) or to ii) change the procedures, by notifying the Beneficiary in writing. The procedures carried out by the auditor to confirm the standard factual finding are listed in the table below.

If this certificate relates to a Linked Third Party, any reference here below to ‘the Beneficiary’ is to be considered as a reference to ‘the Linked Third Party’.

The ‘result’ column has three different options: ‘C’, ‘E’ and ‘N.A.’:

- ‘C’ stands for ‘confirmed’ and means that the auditor can confirm the ‘standard factual finding’ and, therefore, there is no exception to be reported.
- ‘E’ stands for ‘exception’ and means that the Auditor carried out the procedures but cannot confirm the ‘standard factual finding’, or that the Auditor was not able to carry out a specific procedure (e.g. because it was impossible to reconcile key information or data were unavailable),
- ‘N.A.’ stands for ‘not applicable’ and means that the Finding did not have to be examined by the Auditor and the related Procedure(s) did not have to be carried out. The reasons of the non-application of a certain Finding must be obvious i.e. i) if no cost was declared under a certain category then the related Finding(s) and Procedure(s) are not applicable; ii) if the condition set to apply certain Procedure(s) are not met then the related Finding(s) and Procedure(s) are not applicable. For instance, for ‘beneficiaries with accounts established in a currency other than the euro’ the Procedure related to ‘beneficiaries with accounts established in euro’ is not applicable. Similarly, if no additional remuneration is paid, the related Finding(s) and Procedure(s) for additional remuneration are not applicable.

Ref	Procedures	Standard factual finding	Result (C / E / N.A.)
A	ACTUAL PERSONNEL COSTS AND UNIT COSTS CALCULATED BY THE BENEFICIARY IN ACCORDANCE WITH ITS USUAL COST ACCOUNTING PRACTICE		
	<p>The Auditor draws a sample of persons whose costs were declared in the Financial Statement(s) to carry out the procedures indicated in the consecutive points of this section A.</p> <p><i>(The sample should be selected randomly so that it is representative. Full coverage is required if there are fewer than 10 people (including employees, natural persons working under a direct contract and personnel seconded by a third party), otherwise the sample should have a minimum of 10 people, or 10% of the total, whichever number is the highest)</i></p> <p>The Auditor sampled [] people out of the total of [] people.</p>		

Ref	Procedures	Standard factual finding	Result (C / E / N.A.)
A.1	<p>PERSONNEL COSTS</p> <p><u>For the persons included in the sample and working under an employment contract or equivalent act (general procedures for individual actual personnel costs and personnel costs declared as unit costs)</u></p> <p>To confirm standard factual findings 1-5 listed in the next column, the Auditor reviewed following information/documents provided by the Beneficiary:</p> <ul style="list-style-type: none"> ○ a list of the persons included in the sample indicating the period(s) during which they worked for the action, their position (classification or category) and type of contract; ○ the payslips of the employees included in the sample; ○ reconciliation of the personnel costs declared in the Financial Statement(s) with the accounting system (project accounting and general ledger) and payroll system; ○ information concerning the employment status and employment conditions of personnel included in the sample, in particular their employment contracts or equivalent; ○ the Beneficiary's usual policy regarding payroll matters (e.g. salary policy, overtime policy, variable pay); ○ applicable national law on taxes, labour and social security and ○ any other document that supports the personnel costs declared. <p>The Auditor also verified the eligibility of all components of the retribution (see Article 6 GA) and recalculated the personnel costs for employees included in the sample.</p>	<p>1) The employees were i) directly hired by the Beneficiary in accordance with its national legislation, ii) under the Beneficiary's sole technical supervision and responsibility and iii) remunerated in accordance with the Beneficiary's usual practices.</p> <p>2) Personnel costs were recorded in the Beneficiary's accounts/payroll system.</p> <p>3) Costs were adequately supported and reconciled with the accounts and payroll records.</p> <p>4) Personnel costs did not contain any ineligible elements.</p> <p>5) There were no discrepancies between the personnel costs charged to the action and the costs recalculated by the Auditor.</p>	
	<p><i>Further procedures if 'additional remuneration' is paid</i></p> <p>To confirm standard factual findings 6-9 listed in the next column, the Auditor:</p> <ul style="list-style-type: none"> ○ reviewed relevant documents provided by the Beneficiary (legal form, legal/statutory 	<p>6) The Beneficiary paying "additional remuneration" was a non-profit legal entity.</p>	

Ref	Procedures	Standard factual finding	Result (C / E / N.A.)
	<p>obligations, the Beneficiary’s usual policy on additional remuneration, criteria used for its calculation...);</p> <ul style="list-style-type: none"> ○ recalculated the amount of additional remuneration eligible for the action based on the supporting documents received (full-time or part-time work, exclusive or non-exclusive dedication to the action, etc.) to arrive at the applicable FTE/year and pro-rata rate (see data collected in the course of carrying out the procedures under A.2 ‘Productive hours’ and A.4 ‘Time recording system’). <p><i>IF ANY PART OF THE REMUNERATION PAID TO THE EMPLOYEE IS NOT MANDATORY ACCORDING TO THE NATIONAL LAW OR THE EMPLOYMENT CONTRACT ("ADDITIONAL REMUNERATION") AND IS ELIGIBLE UNDER THE PROVISIONS OF ARTICLE 6.2.A.1, THIS CAN BE CHARGED AS ELIGIBLE COST TO THE ACTION UP TO THE FOLLOWING AMOUNT:</i></p> <p>(A) <i>IF THE PERSON WORKS FULL TIME AND EXCLUSIVELY ON THE ACTION DURING THE FULL YEAR: UP TO EUR 8 000/YEAR;</i></p> <p>(B) <i>IF THE PERSON WORKS EXCLUSIVELY ON THE ACTION BUT NOT FULL-TIME OR NOT FOR THE FULL YEAR: UP TO THE CORRESPONDING PRO-RATA AMOUNT OF EUR 8 000, OR</i></p> <p>(C) <i>IF THE PERSON DOES NOT WORK EXCLUSIVELY ON THE ACTION: UP TO A PRO-RATA AMOUNT CALCULATED IN ACCORDANCE TO ARTICLE 6.2.A.1.</i></p>	<p>7) The amount of additional remuneration paid corresponded to the Beneficiary’s usual remuneration practices and was consistently paid whenever the same kind of work or expertise was required.</p>	
		<p>8) The criteria used to calculate the additional remuneration were objective and generally applied by the Beneficiary regardless of the source of funding used.</p>	
		<p>9) The amount of additional remuneration included in the personnel costs charged to the action was capped at EUR 8,000 per FTE/year (up to the equivalent pro-rata amount if the person did not work on the action full-time during the year or did not work exclusively on the action).</p>	
	<p><i>Additional procedures in case “unit costs calculated by the Beneficiary in accordance with its usual cost accounting practices” is applied:</i></p> <p>Apart from carrying out the procedures indicated above to confirm standard factual findings 1-5 and, if applicable, also 6-9, the Auditor carried out following procedures to confirm standard</p>	<p>10) The personnel costs included in the Financial Statement were calculated in accordance with the Beneficiary's usual cost accounting practice. This methodology was consistently</p>	

Ref	Procedures	Standard factual finding	Result (C / E / N.A.)
	<p>factual findings 10-13 listed in the next column:</p> <ul style="list-style-type: none"> ○ obtained a description of the Beneficiary's usual cost accounting practice to calculate unit costs; ○ reviewed whether the Beneficiary's usual cost accounting practice was applied for the Financial Statements subject of the present CFS; ○ verified the employees included in the sample were charged under the correct category (in accordance with the criteria used by the Beneficiary to establish personnel categories) by reviewing the contract/HR-record or analytical accounting records; ○ verified that there is no difference between the total amount of personnel costs used in calculating the cost per unit and the total amount of personnel costs recorded in the statutory accounts; ○ verified whether actual personnel costs were adjusted on the basis of budgeted or estimated elements and, if so, verified whether those elements used are actually relevant for the calculation, objective and supported by documents. 	<p>used in all H2020 actions.</p> <p>11) The employees were charged under the correct category.</p> <p>12) Total personnel costs used in calculating the unit costs were consistent with the expenses recorded in the statutory accounts.</p> <p>13) Any estimated or budgeted element used by the Beneficiary in its unit-cost calculation were relevant for calculating personnel costs and corresponded to objective and verifiable information.</p>	
	<p><u>For natural persons included in the sample and working with the Beneficiary under a direct contract other than an employment contract, such as consultants (no subcontractors).</u></p> <p>To confirm standard factual findings 14-18 listed in the next column the Auditor reviewed following information/documents provided by the Beneficiary:</p> <ul style="list-style-type: none"> ○ the contracts, especially the cost, contract duration, work description, place of work, ownership of the results and reporting obligations to the Beneficiary; ○ the employment conditions of staff in the same category to compare costs and; ○ any other document that supports the costs declared and its registration (e.g. invoices, 	<p>14) The natural persons reported to the Beneficiary (worked under the Beneficiary's instructions).</p> <p>15) They worked on the Beneficiary's premises (unless otherwise agreed with the Beneficiary).</p> <p>16) The results of work carried out belong to the Beneficiary.</p>	

Ref	Procedures	Standard factual finding	Result (C / E / N.A.)
	accounting records, etc.).	17) Their costs were not significantly different from those for staff who performed similar tasks under an employment contract with the Beneficiary.	
		18) The costs were supported by audit evidence and registered in the accounts.	
	<p><u>For personnel seconded by a third party and included in the sample (not subcontractors)</u></p> <p>To confirm standard factual findings 19-22 listed in the next column, the Auditor reviewed following information/documents provided by the Beneficiary:</p> <ul style="list-style-type: none"> ○ their secondment contract(s) notably regarding costs, duration, work description, place of work and ownership of the results; ○ if there is reimbursement by the Beneficiary to the third party for the resource made available (in-kind contribution against payment): any documentation that supports the costs declared (e.g. contract, invoice, bank payment, and proof of registration in its accounting/payroll, etc.) and reconciliation of the Financial Statement(s) with the accounting system (project accounting and general ledger) as well as any proof that the amount invoiced by the third party did not include any profit; ○ if there is no reimbursement by the Beneficiary to the third party for the resource made available (in-kind contribution free of charge): a proof of the actual cost borne by the Third Party for the resource made available free of charge to the Beneficiary such as a statement of costs incurred by the Third Party and proof of the registration in the Third Party's accounting/payroll; ○ any other document that supports the costs declared (e.g. invoices, etc.). 	19) Seconded personnel reported to the Beneficiary and worked on the Beneficiary's premises (unless otherwise agreed with the Beneficiary).	
		20) The results of work carried out belong to the Beneficiary.	
		<i>If personnel is seconded against payment:</i> 21) The costs declared were supported with documentation and recorded in the Beneficiary's accounts. The third party did not include any profit.	
		<i>If personnel is seconded free of charge:</i> 22) The costs declared did not exceed the third party's cost as	

Ref	Procedures	Standard factual finding	Result (C / E / N.A.)
		recorded in the accounts of the third party and were supported with documentation.	
A.2	<p>PRODUCTIVE HOURS</p> <p>To confirm standard factual findings 23-28 listed in the next column, the Auditor reviewed relevant documents, especially national legislation, labour agreements and contracts and time records of the persons included in the sample, to verify that:</p> <ul style="list-style-type: none"> ○ the annual productive hours applied were calculated in accordance with one of the methods described below, ○ the full-time equivalent (FTEs) ratios for employees not working full-time were correctly calculated. <p>If the Beneficiary applied method B, the auditor verified that the correctness in which the total number of hours worked was calculated and that the contracts specified the annual workable hours.</p> <p>If the Beneficiary applied method C, the auditor verified that the ‘annual productive hours’ applied when calculating the hourly rate were equivalent to at least 90 % of the ‘standard annual workable hours’. The Auditor can only do this if the calculation of the standard annual workable hours can be supported by records, such as national legislation, labour agreements, and contracts.</p> <p><i>BENEFICIARY'S PRODUCTIVE HOURS' FOR PERSONS WORKING FULL TIME SHALL BE ONE OF THE FOLLOWING METHODS:</i></p> <p><i>A. 1720 ANNUAL PRODUCTIVE HOURS (PRO-RATA FOR PERSONS NOT WORKING FULL-TIME)</i></p> <p><i>B. THE TOTAL NUMBER OF HOURS WORKED BY THE PERSON FOR THE BENEFICIARY IN THE YEAR (THIS METHOD IS ALSO REFERRED TO AS ‘TOTAL NUMBER OF HOURS WORKED’ IN THE NEXT COLUMN). THE CALCULATION OF THE TOTAL NUMBER OF HOURS WORKED WAS DONE AS</i></p>	<p>23) The Beneficiary applied method [choose one option and delete the others]</p> <p>[A: 1720 hours]</p> <p>[B: the ‘total number of hours worked’]</p> <p>[C: ‘annual productive hours’ used correspond to usual accounting practices]</p> <p>24) Productive hours were calculated annually.</p> <p>25) For employees not working full-time the full-time equivalent (FTE) ratio was correctly applied.</p> <p><i>If the Beneficiary applied method B.</i></p> <p>26) The calculation of the number of ‘annual workable hours’, overtime and absences was verifiable based on the documents provided by the Beneficiary.</p>	

Ref	Procedures	Standard factual finding	Result (C / E / N.A.)
	<p><i>FOLLOWS: ANNUAL WORKABLE HOURS OF THE PERSON ACCORDING TO THE EMPLOYMENT CONTRACT, APPLICABLE LABOUR AGREEMENT OR NATIONAL LAW PLUS OVERTIME WORKED MINUS ABSENCES (SUCH AS SICK LEAVE OR SPECIAL LEAVE).</i></p> <p><i>C. THE STANDARD NUMBER OF ANNUAL HOURS GENERALLY APPLIED BY THE BENEFICIARY FOR ITS PERSONNEL IN ACCORDANCE WITH ITS USUAL COST ACCOUNTING PRACTICES (THIS METHOD IS ALSO REFERRED TO AS 'TOTAL ANNUAL PRODUCTIVE HOURS' IN THE NEXT COLUMN). THIS NUMBER MUST BE AT LEAST 90% OF THE STANDARD ANNUAL WORKABLE HOURS.</i></p> <p><i>'ANNUAL WORKABLE HOURS' MEANS THE PERIOD DURING WHICH THE PERSONNEL MUST BE WORKING, AT THE EMPLOYER'S DISPOSAL AND CARRYING OUT HIS/HER ACTIVITY OR DUTIES UNDER THE EMPLOYMENT CONTRACT, APPLICABLE COLLECTIVE LABOUR AGREEMENT OR NATIONAL WORKING TIME LEGISLATION.</i></p>	<p><i>If the Beneficiary applied method C.</i></p> <p>27) The calculation of the number of 'standard annual workable hours' was verifiable based on the documents provided by the Beneficiary.</p> <p>28) The 'annual productive hours' used for calculating the hourly rate were consistent with the usual cost accounting practices of the Beneficiary and were equivalent to at least 90 % of the 'annual workable hours'.</p>	
A.3	<p>HOURLY PERSONNEL RATES</p> <p><u>D) For unit costs calculated in accordance to the Beneficiary's usual cost accounting practice (unit costs):</u></p> <p>If the Beneficiary has a "Certificate on Methodology to calculate unit costs " (CoMUC) approved by the Commission, the Beneficiary provides the Auditor with a description of the approved methodology and the Commission's letter of acceptance. The Auditor verified that the Beneficiary has indeed used the methodology approved. If so, no further verification is necessary.</p> <p>If the Beneficiary does not have a "Certificate on Methodology" (CoMUC) approved by the Commission, or if the methodology approved was not applied, then the Auditor:</p>	<p>29) The Beneficiary applied [choose one option and delete the other]:</p> <p>[Option I: "Unit costs (hourly rates) were calculated in accordance with the Beneficiary's usual cost accounting practices"]</p> <p>[Option II: Individual hourly rates were applied]</p>	

Ref	Procedures	Standard factual finding	Result (C / E / N.A.)
	<ul style="list-style-type: none"> ○ reviewed the documentation provided by the Beneficiary, including manuals and internal guidelines that explain how to calculate hourly rates; ○ recalculated the unit costs (hourly rates) of staff included in the sample following the results of the procedures carried out in A.1 and A.2. <p><u>II) For individual hourly rates:</u></p> <p>The Auditor:</p> <ul style="list-style-type: none"> ○ reviewed the documentation provided by the Beneficiary, including manuals and internal guidelines that explain how to calculate hourly rates; ○ recalculated the hourly rates of staff included in the sample following the results of the procedures carried out in A.1 and A.2. <p><i>“UNIT COSTS CALCULATED BY THE BENEFICIARY IN ACCORDANCE WITH ITS USUAL COST ACCOUNTING PRACTICES”:</i> <i>IT IS CALCULATED BY DIVIDING THE TOTAL AMOUNT OF PERSONNEL COSTS OF THE CATEGORY TO WHICH THE EMPLOYEE BELONGS VERIFIED IN LINE WITH PROCEDURE A.1 BY THE NUMBER OF FTE AND THE ANNUAL TOTAL PRODUCTIVE HOURS OF THE SAME CATEGORY CALCULATED BY THE BENEFICIARY IN ACCORDANCE WITH PROCEDURE A.2.</i></p> <p><i>HOURLY RATE FOR INDIVIDUAL ACTUAL PERSONAL COSTS:</i> <i>IT IS CALCULATED BY DIVIDING THE TOTAL AMOUNT OF PERSONNEL COSTS OF AN EMPLOYEE VERIFIED IN LINE WITH PROCEDURE A.1 BY THE NUMBER OF ANNUAL PRODUCTIVE HOURS VERIFIED IN LINE WITH PROCEDURE A.2.</i></p>	<p><i>For option I concerning unit costs and if the Beneficiary applies the methodology approved by the Commission (CoMUC):</i></p> <p>30) The Beneficiary used the Commission-approved methodology to calculate hourly rates. It corresponded to the organisation's usual cost accounting practices and was applied consistently for all activities irrespective of the source of funding.</p> <p><i>For option I concerning unit costs and if the Beneficiary applies a methodology not approved by the Commission:</i></p> <p>31) The unit costs re-calculated by the Auditor were the same as the rates applied by the Beneficiary.</p> <p><i>For option II concerning individual hourly rates:</i></p> <p>32) The individual rates re-calculated by the Auditor were the same as the rates applied by the Beneficiary.</p>	

Ref	Procedures	Standard factual finding	Result (C / E / N.A.)
A.4	<p>TIME RECORDING SYSTEM</p> <p>To verify that the time recording system ensures the fulfilment of all minimum requirements and that the hours declared for the action were correct, accurate and properly authorised and supported by documentation, the Auditor made the following checks for the persons included in the sample that declare time as worked for the action on the basis of time records:</p> <ul style="list-style-type: none"> ○ description of the time recording system provided by the Beneficiary (registration, authorisation, processing in the HR-system); ○ its actual implementation; ○ time records were signed at least monthly by the employees (on paper or electronically) and authorised by the project manager or another manager; ○ the hours declared were worked within the project period; ○ there were no hours declared as worked for the action if HR-records showed absence due to holidays or sickness (further cross-checks with travels are carried out in B.1 below) ; ○ the hours charged to the action matched those in the time recording system. <p><i>ONLY THE HOURS WORKED ON THE ACTION CAN BE CHARGED. ALL WORKING TIME TO BE CHARGED SHOULD BE RECORDED THROUGHOUT THE DURATION OF THE PROJECT, ADEQUATELY SUPPORTED BY EVIDENCE OF THEIR REALITY AND RELIABILITY (SEE SPECIFIC PROVISIONS BELOW FOR PERSONS WORKING EXCLUSIVELY FOR THE ACTION WITHOUT TIME RECORDS).</i></p>	33) All persons recorded their time dedicated to the action on a daily/ weekly/ monthly basis using a paper/computer-based system. <i>(delete the answers that are not applicable)</i>	
		34) Their time-records were authorised at least monthly by the project manager or other superior.	
		35) Hours declared were worked within the project period and were consistent with the presences/absences recorded in HR-records.	
		36) There were no discrepancies between the number of hours charged to the action and the number of hours recorded.	
	<p><u>If the persons are working exclusively for the action and without time records</u></p> <p>For the persons selected that worked exclusively for the action without time records, the Auditor verified evidence available demonstrating that they were in reality exclusively dedicated to the action and that the Beneficiary signed a declaration confirming that they have worked exclusively for the action.</p>	37) The exclusive dedication is supported by a declaration signed by the Beneficiary's and by any other evidence gathered.	

Ref	Procedures	Standard factual finding	Result (C / E / N.A.)
B	COSTS OF SUBCONTRACTING		
B.1	<p>The Auditor obtained the detail/breakdown of subcontracting costs and sampled [redacted] cost items selected randomly (full coverage is required if there are fewer than 10 items, otherwise the sample should have a minimum of 10 item, or 10% of the total, whichever number is highest).</p> <p>To confirm standard factual findings 38-42 listed in the next column, the Auditor reviewed the following for the items included in the sample:</p> <ul style="list-style-type: none"> ○ the use of subcontractors was foreseen in Annex 1; ○ subcontracting costs were declared in the subcontracting category of the Financial Statement; ○ supporting documents on the selection and award procedure were followed; ○ the Beneficiary ensured best value for money (key elements to appreciate the respect of this principle are the award of the subcontract to the bid offering best price-quality ratio, under conditions of transparency and equal treatment. In case an existing framework contract was used the Beneficiary ensured it was established on the basis of the principle of best value for money under conditions of transparency and equal treatment). <p>In particular,</p> <ol style="list-style-type: none"> i. if the Beneficiary acted as a contracting authority within the meaning of Directive 2004/18/EC or of Directive 2004/17/EC, the Auditor verified that the applicable national law on public procurement was followed and that the subcontracting complied with the Terms and Conditions of the Agreement. ii. if the Beneficiary did not fall under the above-mentioned category the Auditor verified that the Beneficiary followed their usual procurement rules and respected the Terms and Conditions of the Agreement.. 	<p>38) The use of claimed subcontracting costs was foreseen in Annex I and costs were declared in the Financial Statements under the subcontracting category.</p> <p>39) There were documents of requests to different providers, different offers and assessment of the offers before selection of the provider in line with internal procedures and procurement rules. Subcontracts were awarded in accordance with the principle of best value for money.</p> <p><i>(When different offers were not collected the Auditor explains the reasons provided by the Beneficiary under the caption "Exceptions" of the Report. The JU will analyse this information to evaluate whether these costs might be accepted as eligible)</i></p> <p>40) The subcontracts were not awarded to other Beneficiaries</p>	

Ref	Procedures	Standard factual finding	Result (C / E / N.A.)
	<p>For the items included in the sample the Auditor also verified that:</p> <ul style="list-style-type: none"> ○ the subcontracts were not awarded to other Beneficiaries in the consortium; ○ there were signed agreements between the Beneficiary and the subcontractor; ○ there was evidence that the services were provided by subcontractor; 	<p>of the consortium.</p> <p>41) All subcontracts were supported by signed agreements between the Beneficiary and the subcontractor.</p> <p>42) There was evidence that the services were provided by the subcontractors.</p>	
C	COSTS OF PROVIDING FINANCIAL SUPPORT TO THIRD PARTIES		
C.1	<p>The Auditor obtained the detail/breakdown of the costs of providing financial support to third parties and sampled [redacted] cost items selected randomly (<i>full coverage is required if there are fewer than 10 items, otherwise the sample should have a minimum of 10 item, or 10% of the total, whichever number is highest</i>).</p> <p>The Auditor verified that the following minimum conditions were met:</p> <ul style="list-style-type: none"> a) the maximum amount of financial support for each third party did not exceed EUR 60 000, unless explicitly mentioned in Annex 1; b) the financial support to third parties was agreed in Annex 1 of the Agreement and the other provisions on financial support to third parties included in Annex 1 were respected. 	<p>43) All minimum conditions were met</p>	

D	OTHER ACTUAL DIRECT COSTS		
D.1	<p>COSTS OF TRAVEL AND RELATED SUBSISTENCE ALLOWANCES</p> <p>The Auditor sampled [] cost items selected randomly (<i>full coverage is required if there are fewer than 10 items, otherwise the sample should have a minimum of 10 item, or 10% of the total, whichever number is the highest</i>).</p> <p>The Auditor inspected the sample and verified that:</p> <ul style="list-style-type: none"> ○ travel and subsistence costs were consistent with the Beneficiary's usual policy for travel. In this context, the Beneficiary provided evidence of its normal policy for travel costs (e.g. use of first class tickets, reimbursement by the Beneficiary on the basis of actual costs, a lump sum or per diem) to enable the Auditor to compare the travel costs charged with this policy; ○ travel costs are correctly identified and allocated to the action (e.g. trips are directly linked to the action) by reviewing relevant supporting documents such as minutes of meetings, workshops or conferences, their registration in the correct project account, their consistency with time records or with the dates/duration of the workshop/conference; ○ no ineligible costs or excessive or reckless expenditure was declared. 	44) Costs were incurred, approved and reimbursed in line with the Beneficiary's usual policy for travels.	
		45) There was a link between the trip and the action.	
		46) The supporting documents were consistent with each other regarding subject of the trip, dates, duration and reconciled with time records and accounting.	
		47) No ineligible costs or excessive or reckless expenditure was declared.	
D.2	<p>DEPRECIATION COSTS FOR EQUIPMENT, INFRASTRUCTURE OR OTHER ASSETS</p> <p>The Auditor sampled [] cost items selected randomly (<i>full coverage is required if there are fewer than 10 items, otherwise the sample should have a minimum of 10 item, or 10% of the total, whichever number is the highest</i>).</p> <p>For “equipment, infrastructure or other assets” [from now on called “asset(s)”] selected in the sample the Auditor verified that:</p> <ul style="list-style-type: none"> ○ the assets were acquired in conformity with the Beneficiary's internal guidelines and procedures; ○ they were correctly allocated to the action (with supporting documents such as delivery 	48) Procurement rules, principles and guides were followed.	
		49) There was a link between the grant agreement and the asset charged to the action.	
		50) The asset charged to the action was traceable to the accounting records and the underlying documents.	

	<p>note invoice or any other proof demonstrating the link to the action)</p> <ul style="list-style-type: none"> ○ they were entered in the accounting system; ○ the extent to which the assets were used for the action (as a percentage) was supported by reliable documentation (e.g. usage overview table); <p>The Auditor recalculated the depreciation costs and verified that they were in line with the applicable rules in the Beneficiary's country and with the Beneficiary's usual accounting policy (e.g. depreciation calculated on the acquisition value).</p> <p>The Auditor verified that no ineligible costs such as deductible VAT, exchange rate losses, excessive or reckless expenditure were declared (see Article 6.5 GA).</p>	51) The depreciation method used to charge the asset to the action was in line with the applicable rules of the Beneficiary's country and the Beneficiary's usual accounting policy.	
		52) The amount charged corresponded to the actual usage for the action.	
		53) No ineligible costs or excessive or reckless expenditure were declared.	
D.3	<p>COSTS OF OTHER GOODS AND SERVICES</p> <p>The Auditor sampled [redacted] cost items selected randomly (<i>full coverage is required if there are fewer than 10 items, otherwise the sample should have a minimum of 10 item, or 10% of the total, whichever number is highest</i>).</p> <p>For the purchase of goods, works or services included in the sample the Auditor verified that:</p> <ul style="list-style-type: none"> ○ the contracts did not cover tasks described in Annex 1; ○ they were correctly identified, allocated to the proper action, entered in the accounting system (traceable to underlying documents such as purchase orders, invoices and accounting); ○ the goods were not placed in the inventory of durable equipment; ○ the costs charged to the action were accounted in line with the Beneficiary's usual accounting practices; ○ no ineligible costs or excessive or reckless expenditure were declared (see Article 6 GA). <p>In addition, the Auditor verified that these goods and services were acquired in conformity with the Beneficiary's internal guidelines and procedures, in particular:</p> <ul style="list-style-type: none"> ○ if Beneficiary acted as a contracting authority within the meaning of Directive 	54) Contracts for works or services did not cover tasks described in Annex 1.	
		55) Costs were allocated to the correct action and the goods were not placed in the inventory of durable equipment.	
		56) The costs were charged in line with the Beneficiary's accounting policy and were adequately supported.	
		57) No ineligible costs or excessive or reckless expenditure were declared. For internal invoices/charges only the cost element was charged, without any mark-ups.	

	<p>2004/18/EC or of Directive 2004/17/EC, the Auditor verified that the applicable national law on public procurement was followed and that the procurement contract complied with the Terms and Conditions of the Agreement.</p> <ul style="list-style-type: none"> ○ if the Beneficiary did not fall into the category above, the Auditor verified that the Beneficiary followed their usual procurement rules and respected the Terms and Conditions of the Agreement. <p>For the items included in the sample the Auditor also verified that:</p> <ul style="list-style-type: none"> ○ the Beneficiary ensured best value for money (key elements to appreciate the respect of this principle are the award of the contract to the bid offering best price-quality ratio, under conditions of transparency and equal treatment. In case an existing framework contract was used the Auditor also verified that the Beneficiary ensured it was established on the basis of the principle of best value for money under conditions of transparency and equal treatment); <p><i>SUCH GOODS AND SERVICES INCLUDE, FOR INSTANCE, CONSUMABLES AND SUPPLIES, DISSEMINATION (INCLUDING OPEN ACCESS), PROTECTION OF RESULTS, SPECIFIC EVALUATION OF THE ACTION IF IT IS REQUIRED BY THE AGREEMENT, CERTIFICATES ON THE FINANCIAL STATEMENTS IF THEY ARE REQUIRED BY THE AGREEMENT AND CERTIFICATES ON THE METHODOLOGY, TRANSLATIONS, REPRODUCTION.</i></p>	<p>58) Procurement rules, principles and guides were followed. There were documents of requests to different providers, different offers and assessment of the offers before selection of the provider in line with internal procedures and procurement rules. The purchases were made in accordance with the principle of best value for money.</p> <p><i>(When different offers were not collected the Auditor explains the reasons provided by the Beneficiary under the caption “Exceptions” of the Report. The JU will analyse this information to evaluate whether these costs might be accepted as eligible)</i></p>	
<p>D.4</p>	<p>AGGREGATED CAPITALISED AND OPERATING COSTS OF RESEARCH INFRASTRUCTURE</p> <p>The Auditor ensured the existence of a positive ex-ante assessment (issued by the EC Services) of the cost accounting methodology of the Beneficiary allowing it to apply the guidelines on direct costing for large research infrastructures in Horizon 2020.</p> <p><i>In the cases that a positive ex-ante assessment has been issued (see the standard factual findings 59-60 on the next column),</i></p>	<p>59) The costs declared as direct costs for Large Research Infrastructures (in the appropriate line of the Financial Statement) comply with the methodology described in the positive ex-ante assessment report.</p>	

	<p>The Auditor ensured that the beneficiary has applied consistently the methodology that is explained and approved in the positive ex ante assessment;</p> <p><i>In the cases that a positive ex-ante assessment has NOT been issued (see the standard factual findings 61 on the next column),</i></p> <p>The Auditor verified that no costs of Large Research Infrastructure have been charged as direct costs in any costs category;</p> <p><i>In the cases that a draft ex-ante assessment report has been issued with recommendation for further changes (see the standard factual findings 61 on the next column),</i></p> <ul style="list-style-type: none"> The Auditor followed the same procedure as above (when a positive ex-ante assessment has NOT yet been issued) and paid particular attention (testing reinforced) to the cost items for which the draft ex-ante assessment either rejected the inclusion as direct costs for Large Research Infrastructures or issued recommendations. 	60) Any difference between the methodology applied and the one positively assessed was extensively described and adjusted accordingly.	
		61) The direct costs declared were free from any indirect costs items related to the Large Research Infrastructure.	
E	USE OF EXCHANGE RATES		
E.1	<p>a) For Beneficiaries with accounts established in a currency other than euros</p> <p>The Auditor sampled [] cost items selected randomly and verified that the exchange rates used for converting other currencies into euros were in accordance with the following rules established in the Agreement (full coverage is required if there are fewer than 10 items, otherwise the sample should have a minimum of 10 item, or 10% of the total, whichever number is highest):</p> <p><i>COSTS INCURRED IN ANOTHER CURRENCY SHALL BE CONVERTED INTO EURO AT THE AVERAGE OF THE DAILY EXCHANGE RATES PUBLISHED IN THE C SERIES OF OFFICIAL JOURNAL OF THE EUROPEAN UNION (https://www.ecb.int/stats/exchange/eurofxref/html/index.en.html), DETERMINED OVER THE CORRESPONDING REPORTING PERIOD.</i></p> <p><i>IF NO DAILY EURO EXCHANGE RATE IS PUBLISHED IN THE OFFICIAL JOURNAL OF THE EUROPEAN UNION FOR THE CURRENCY IN QUESTION, CONVERSION SHALL BE MADE AT THE AVERAGE OF THE MONTHLY ACCOUNTING RATES ESTABLISHED BY THE COMMISSION AND PUBLISHED ON ITS WEBSITE (http://ec.europa.eu/budget/contracts_grants/info_contracts/inforeuro/inforeuro_en.cfm), DETERMINED OVER THE CORRESPONDING REPORTING PERIOD.</i></p>	62) The exchange rates used to convert other currencies into Euros were in accordance with the rules established of the Grant Agreement and there was no difference in the final figures.	

	<p>b) <u>For Beneficiaries with accounts established in euros</u></p> <p>The Auditor sampled [] cost items selected randomly and verified that the exchange rates used for converting other currencies into euros were in accordance with the following rules established in the Agreement (<i>full coverage is required if there are fewer than 10 items, otherwise the sample should have a minimum of 10 item, or 10% of the total, whichever number is highest</i>):</p> <p><i>COSTS INCURRED IN ANOTHER CURRENCY SHALL BE CONVERTED INTO EURO BY APPLYING THE BENEFICIARY'S USUAL ACCOUNTING PRACTICES.</i></p>	<p>63) The Beneficiary applied its usual accounting practices.</p>	
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[legal name of the audit firm]

[name and function of an authorised representative]

[dd Month yyyy]

<Signature of the Auditor>

ANNEX 6

MODEL FOR THE CERTIFICATE ON THE METHODOLOGY

- For options [*in italics in square brackets*]: choose the applicable option. Options not chosen should be deleted.
- For fields in [grey in square brackets]: enter the appropriate data.

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Terms of reference for an audit engagement for a methodology certificate in connection with one or more grant agreements financed by [BBI][Clean Sky 2][ECSEL][FCH][IM2] JU under the Horizon 2020 Research and Innovation Framework Programme

This document sets out the ‘**Terms of Reference (ToR)**’ under which

[OPTION 1: [insert name of the beneficiary] (*‘the Beneficiary’*)] [OPTION 2: [insert name of the linked third party] (*‘the Linked Third Party’*), third party linked to the Beneficiary [insert name of the beneficiary] (*‘the Beneficiary’*)]

agrees to engage

[insert legal name of the auditor] (*‘the Auditor’*)

to produce an independent report of factual findings (*‘the Report’*) concerning the [Beneficiary’s] [Linked Third Party’s] usual accounting practices for calculating and claiming direct personnel costs declared as unit costs (*‘the Methodology’*) in connection with grant agreements financed under the Horizon 2020 Research and Innovation Framework Programme.

The procedures to be carried out for the assessment of the methodology will be based on the grant agreement(s) detailed below:

[title and number of the grant agreement(s)] (*‘the Agreement(s)’*)

The Agreement(s) has(have) been concluded between the Beneficiary and the [Bio Based Industries][Clean Sky 2][ECSEL][Fuel Cells and Hydrogen 2][Innovative Medicines Initiative 2] Joint Undertaking (*‘the JU’*)

The JU is mentioned as a signatory of the Agreement with the Beneficiary only. The JU is not a party to this engagement.

1.1 Subject of the engagement

According to Article 18.1.2 of the Agreement, beneficiaries [*and linked third parties*] that declare direct personnel costs as unit costs calculated in accordance with their usual cost accounting practices may submit to the JU for approval by the Commission, a certificate on the methodology (*‘CoMUC’*) stating that there are adequate records and documentation to prove that their cost accounting practices used comply with the conditions set out in Point A of Article 6.2.

The subject of this engagement is the CoMUC which is composed of two separate documents:

- the Terms of Reference (*‘the ToR’*) to be signed by the [Beneficiary] [Linked Third Party] and the Auditor;
- the Auditor’s Independent Report of Factual Findings (*‘the Report’*) issued on the Auditor’s letterhead, dated, stamped and signed by the Auditor which includes; the standard statements (*‘the Statements’*) evaluated and signed by the [Beneficiary] [Linked Third Party], the agreed-upon procedures (*‘the Procedures’*) performed by the Auditor and the standard factual findings (*‘the Findings’*) assessed by the Auditor. The Statements, Procedures and Findings are summarised in the table that forms part of the Report.

The information provided through the Statements, the Procedures and the Findings will enable the Commission to draw conclusions regarding the existence of the [Beneficiary’s] [Linked Third Party’s] usual cost accounting practice and its suitability to ensure that direct personnel costs claimed on that

basis comply with the provisions of the Agreement. The Commission draws its own conclusions from the Report and any additional information it may require.

1.2 Responsibilities

The parties to this agreement are the *[Beneficiary]* *[Linked Third Party]* and the Auditor.

The *[Beneficiary]* *[Linked Third Party]*:

- is responsible for preparing financial statements for the Agreement(s) ('the Financial Statements') in compliance with those Agreements;
- is responsible for providing the Financial Statement(s) to the Auditor and enabling the Auditor to reconcile them with the *[Beneficiary's]* *[Linked Third Party's]* accounting and bookkeeping system and the underlying accounts and records. The Financial Statement(s) will be used as a basis for the procedures which the Auditor will carry out under this ToR;
- is responsible for its Methodology and liable for the accuracy of the Financial Statement(s);
- is responsible for endorsing or refuting the Statements indicated under the heading 'Statements to be made by the Beneficiary/ Linked Third Party' in the first column of the table that forms part of the Report;
- must provide the Auditor with a signed and dated representation letter;
- accepts that the ability of the Auditor to carry out the Procedures effectively depends upon the *[Beneficiary]* *[Linked Third Party]* providing full and free access to the *[Beneficiary's]* *[Linked Third Party's]* staff and to its accounting and other relevant records.

The Auditor:

- *[Option 1 by default: is qualified to carry out statutory audits of accounting documents in accordance with Directive 2006/43/EC of the European Parliament and of the Council of 17 May 2006 on statutory audits of annual accounts and consolidated accounts, amending Council Directives 78/660/EEC and 83/349/EEC and repealing Council Directive 84/253/EEC or similar national regulations].*
- *[Option 2 if the Beneficiary or Linked Third Party has an independent Public Officer: is a competent and independent Public Officer for which the relevant national authorities have established the legal capacity to audit the Beneficiary].*
- *[Option 3 if the Beneficiary or Linked Third Party is an international organisation: is an [internal] [external] auditor in accordance with the internal financial regulations and procedures of the international organisation].*

The Auditor:

- must be independent from the Beneficiary *[and the Linked Third Party]*, in particular, it must not have been involved in preparing the Beneficiary's *[and Linked Third Party's]* Financial Statement(s);
- must plan work so that the Procedures may be carried out and the Findings may be assessed;
- must adhere to the Procedures laid down and the compulsory report format;
- must carry out the engagement in accordance with these ToR;
- must document matters which are important to support the Report;
- must base its Report on the evidence gathered;
- must submit the Report to the *[Beneficiary]* *[Linked Third Party]*.

The Commission sets out the Procedures to be carried out and the Findings to be endorsed by the Auditor. The Auditor is not responsible for their suitability or pertinence. As this engagement is not an assurance engagement the Auditor does not provide an audit opinion or a statement of assurance.

1.3 Applicable Standards

The Auditor must comply with these Terms of Reference and with¹:

- the International Standard on Related Services ('ISRS') 4400 *Engagements to perform Agreed-upon Procedures regarding Financial Information* as issued by the International Auditing and Assurance Standards Board (IAASB);
- the *Code of Ethics for Professional Accountants* issued by the International Ethics Standards Board for Accountants (IESBA). Although ISRS 4400 states that independence is not a requirement for engagements to carry out agreed-upon procedures, the Commission requires that the Auditor also complies with the Code's independence requirements.

The Auditor's Report must state that there was no conflict of interests in establishing this Report between the Auditor and the Beneficiary *[and the Linked Third Party]* that could have a bearing on the Report, and must specify – if the service is invoiced - the total fee paid to the Auditor for providing the Report.

1.4 Reporting

The Report must be written in the language of the Agreement (see Article 20.7 of the Agreement).

Under Article 22 of the Agreement, the JU, the Commission, the European Anti-Fraud Office and the Court of Auditors have the right to audit any work that is carried out under the action and for which costs are claimed from the European Union budget. This includes work related to this engagement. The Auditor must provide access to all working papers related to this assignment if the JU, the Commission, the European Anti-Fraud Office or the European Court of Auditors requests them.

1.5 Timing

The Report must be provided by [dd Month yyyy].

1.6 Other Terms

[The [Beneficiary] [Linked Third Party] and the Auditor can use this section to agree other specific terms, such as the Auditor's fees, liability, applicable law, etc. Those specific terms must not contradict the terms specified above.]

[legal name of the Auditor]
[name & title of authorised representative]
[dd Month yyyy]
Signature of the Auditor Signature

[legal name of the [Beneficiary] [Linked Third Party]]
[name & title of authorised representative]
[dd Month yyyy]
Signature of the [Beneficiary] [Linked Third Party]

¹ Supreme Audit Institutions applying INTOSAI-standards may carry out the Procedures according to the corresponding International Standards of Supreme Audit Institutions and code of ethics issued by INTOSAI instead of the International Standard on Related Services ('ISRS') 4400 and the Code of Ethics for Professional Accountants issued by the IAASB and the IESBA.

Independent report of factual findings on the methodology concerning grant agreements financed by the [BBI][Clean Sky 2][ECSEL][FCH][IMI2] JU under the Horizon 2020 Research and Innovation Framework Programme

(To be printed on letterhead paper of the auditor)

To

[name of contact person(s)], [Position]
[[Beneficiary's] [Linked Third Party's] name]
[Address]
[dd Month yyyy]

Dear [Name of contact person(s)],

As agreed under the terms of reference dated [dd Month yyyy]

with [OPTION 1: [insert name of the beneficiary] ('the Beneficiary')] [OPTION 2: [insert name of the linked third party] ('the Linked Third Party'), third party linked to the Beneficiary [insert name of the beneficiary] ('the Beneficiary')],

we

[name of the auditor] ('the Auditor'),

established at

[full address/city/state/province/country],

represented by

[name and function of an authorised representative],

have carried out the agreed-upon procedures ('the Procedures') and provide hereby our Independent Report of Factual Findings ('the Report'), concerning the [Beneficiary's] [Linked Third Party's] usual accounting practices for calculating and declaring direct personnel costs declared as unit costs ('the Methodology').

You requested certain procedures to be carried out in connection with the grant(s)

[title and number of the grant agreement(s)] ('the Agreement(s)').

The Report

Our engagement was carried out in accordance with the terms of reference ('the ToR') appended to this Report. The Report includes: the standard statements ('the Statements') made by the [Beneficiary] [Linked Third Party], the agreed-upon procedures ('the Procedures') carried out and the standard factual findings ('the Findings') confirmed by us.

The engagement involved carrying out the Procedures and assessing the Findings and the documentation requested appended to this Report, the results of which the Commission uses to draw conclusions regarding the acceptability of the Methodology applied by the [Beneficiary] [Linked Third Party].

The Report covers the methodology used from [dd Month yyyy]. In the event that the [Beneficiary] [Linked Third Party] changes this methodology, the Report will not be applicable to any Financial Statement² submitted thereafter.

The scope of the Procedures and the definition of the standard statements and findings were determined solely by the Commission. Therefore, the Auditor is not responsible for their suitability or pertinence.

Since the Procedures carried out constitute neither an audit nor a review made in accordance with International Standards on Auditing or International Standards on Review Engagements, we do not give a statement of assurance on the costs declared on the basis of the [Beneficiary's] [Linked Third Party's] Methodology. Had we carried out additional procedures or had we performed an audit or review in accordance with these standards, other matters might have come to its attention and would have been included in the Report.

Exceptions

Apart from the exceptions listed below, the [Beneficiary] [Linked Third Party] agreed with the standard Statements and provided the Auditor all the documentation and accounting information needed by the Auditor to carry out the requested Procedures and corroborate the standard Findings.

List here any exception and add any information on the cause and possible consequences of each exception, if known. If the exception is quantifiable, also indicate the corresponding amount.

.....

Explanation of possible exceptions in the form of examples (to be removed from the Report):

- i. the [Beneficiary] [Linked Third Party] did not agree with the standard Statement number ... because...;*
- ii. the Auditor could not carry out the procedure ... established because (e.g. due to the inability to reconcile key information or the unavailability or inconsistency of data);*
- iii. the Auditor could not confirm or corroborate the standard Finding number ... because*

Remarks

We would like to add the following remarks relevant for the proper understanding of the Methodology applied by the [Beneficiary] [Linked Third Party] or the results reported:

Example (to be removed from the Report):

Regarding the methodology applied to calculate hourly rates ...

Regarding standard Finding 15 it has to be noted that ...

The [Beneficiary] [Linked Third Party] explained the deviation from the benchmark statement XXIV concerning time recording for personnel with no exclusive dedication to the action in the following manner:

....

Annexes

Please provide the following documents to the auditor and annex them to the report when submitting this CoMUC to the JU:

1. Brief description of the methodology for calculating personnel costs, productive hours and hourly rates;

² Financial Statement in this context refers solely to Annex 4 of the Agreement by which the Beneficiary declares costs under the Agreement.

2. Brief description of the time recording system in place;
3. An example of the time records used by the [Beneficiary] [Linked Third Party];
4. Description of any budgeted or estimated elements applied, together with an explanation as to why they are relevant for calculating the personnel costs and how they are based on objective and verifiable information;
5. A summary sheet with the hourly rate for direct personnel declared by the [Beneficiary] [Linked Third Party] and recalculated by the Auditor for each staff member included in the sample (the names do not need to be reported);
6. A comparative table summarising for each person selected in the sample a) the time claimed by the [Beneficiary] [Linked Third Party] in the Financial Statement(s) and b) the time according to the time record verified by the Auditor;
7. A copy of the letter of representation provided to the Auditor.

Use of this Report

This Report has been drawn up solely for the purpose given under Point 1.1 Reasons for the engagement.

The Report:

- is confidential and is intended to be submitted to the JU by the [Beneficiary] [Linked Third Party] in connection with Article 18.1.2 of the Agreement;
- may not be used by the [Beneficiary] [Linked Third Party], by the JU or by the Commission for any other purpose, nor distributed to any other parties;
- may be disclosed by the JU or the Commission only to authorised parties, in particular the European Anti-Fraud Office (OLAF) and the European Court of Auditors.
- relates only to the usual cost accounting practices specified above and does not constitute a report on the Financial Statements of the [Beneficiary] [Linked Third Party].

No conflict of interest³ exists between the Auditor and the Beneficiary [and the Linked Third Party] that could have a bearing on the Report. The total fee paid to the Auditor for producing the Report was EUR [] (including EUR [] of deductible VAT).

We look forward to discussing our Report with you and would be pleased to provide any further information or assistance which may be required.

Yours sincerely

[legal name of the Auditor]
[name and title of the authorised representative]
[dd Month yyyy]
Signature of the Auditor

³ A conflict of interest arises when the Auditor's objectivity to establish the certificate is compromised in fact or in appearance when the Auditor for instance:

- was involved in the preparation of the Financial Statements;
- stands to benefit directly should the certificate be accepted;
- has a close relationship with any person representing the beneficiary;
- is a director, trustee or partner of the beneficiary; or
- is in any other situation that compromises his or her independence or ability to establish the certificate impartially.

Statements to be made by the Beneficiary/Linked Third Party ('the Statements') and Procedures to be carried out by the Auditor ('the Procedures') and standard factual findings ('the Findings') to be confirmed by the Auditor

The Commission reserves the right to provide the auditor with guidance regarding the Statements to be made, the Procedures to be carried out or the Findings to be ascertained and the way in which to present them. The Commission reserves the right to vary the Statements, Procedures or Findings by written notification to the Beneficiary/Linked Third Party to adapt the procedures to changes in the grant agreement(s) or to any other circumstances.

If this methodology certificate relates to the Linked Third Party's usual accounting practices for calculating and claiming direct personnel costs declared as unit costs any reference here below to 'the Beneficiary' is to be considered as a reference to 'the Linked Third Party'.

<i>Please explain any discrepancies in the body of the Report.</i>	
Statements to be made by Beneficiary	Procedures to be carried out and Findings to be confirmed by the Auditor
<p>A. Use of the Methodology</p> <p>I. The cost accounting practice described below has been in use since [dd Month yyyy].</p> <p>II. The next planned alteration to the methodology used by the Beneficiary will be from [dd Month yyyy].</p>	<p>Procedure:</p> <p>✓ The Auditor checked these dates against the documentation the Beneficiary has provided.</p> <p>Factual finding:</p> <p>1. The dates provided by the Beneficiary were consistent with the documentation.</p>
<p>B. Description of the Methodology</p> <p>III. The methodology to calculate unit costs is being used in a consistent manner and is reflected in the relevant procedures.</p> <p><i>[Please describe the methodology your entity uses to calculate <u>personnel costs</u>, productive hours and hourly rates, present your description to the Auditor and annex it to this certificate]</i></p> <p><i>[If the statement of section "B. Description of the methodology" cannot be endorsed by the Beneficiary or there is no written methodology to calculate unit costs it should be listed here below and reported as exception by the Auditor in the main Report of Factual Findings:</i> - ...]</p>	<p>Procedure:</p> <p>✓ The Auditor reviewed the description, the relevant manuals and/or internal guidance documents describing the methodology.</p> <p>Factual finding:</p> <p>2. The brief description was consistent with the relevant manuals, internal guidance and/or other documentary evidence the Auditor has reviewed.</p> <p>3. The methodology was generally applied by the Beneficiary as part of its usual costs accounting practices.</p>
<p>C. Personnel costs</p> <p><u>General</u></p>	<p>Procedure:</p> <p><i>The Auditor draws a sample of employees to carry out the procedures indicated in</i></p>

Please explain any discrepancies in the body of the Report.	
Statements to be made by Beneficiary	Procedures to be carried out and Findings to be confirmed by the Auditor
<p>IV. The unit costs (hourly rates) are limited to salaries including during parental leave, social security contributions, taxes and other costs included in the remuneration required under national law and the employment contract or equivalent appointing act;</p> <p>V. Employees are hired directly by the Beneficiary in accordance with national law, and work under its sole supervision and responsibility;</p> <p>VI. The Beneficiary remunerates its employees in accordance with its usual practices. This means that personnel costs are charged in line with the Beneficiary's usual payroll policy (e.g. salary policy, overtime policy, variable pay) and no special conditions exist for employees assigned to tasks relating to the European Union or Euratom, unless explicitly provided for in the grant agreement(s);</p> <p>VII. The Beneficiary allocates its employees to the relevant group/category/cost centre for the purpose of the unit cost calculation in line with the usual cost accounting practice;</p> <p>VIII. Personnel costs are based on the payroll system and accounting system.</p> <p>IX. Any exceptional adjustments of actual personnel costs resulted from relevant budgeted or estimated elements and were based on objective and verifiable information. <i>[Please describe the 'budgeted or estimated elements' and their relevance to personnel costs, and explain how they were reasonable and based on objective and verifiable information, present your explanation to the Auditor and annex it to this certificate].</i></p> <p>X. Personnel costs claimed do not contain any of the following ineligible costs: costs related to return on capital; debt and debt service charges; provisions for future losses or debts; interest owed; doubtful debts; currency exchange losses; bank costs charged by the Beneficiary's bank for transfers from the JU; excessive or reckless expenditure; deductible VAT or costs incurred during suspension of the implementation of the action.</p> <p>XI. Personnel costs were not declared under another EU or Euratom grant (including grants awarded by a Member State and financed by the EU budget and grants awarded by bodies other than the JU for the purpose of implementing the EU budget).</p> <p><u>If additional remuneration as referred to in the grant agreement(s) is paid</u></p>	<p><i>this section C and the following sections D to F.</i></p> <p><i>[The Auditor has drawn a random sample of 10 full-time equivalents made up of employees assigned to the action(s). If fewer than 10 full-time equivalents are assigned to the action(s), the Auditor has selected a sample of 10 full-time equivalents consisting of all employees assigned to the action(s), complemented by other employees irrespective of their assignments.].</i> For this sample:</p> <ul style="list-style-type: none"> ✓ the Auditor reviewed all documents relating to personnel costs such as employment contracts, payslips, payroll policy (e.g. salary policy, overtime policy, variable pay policy), accounting and payroll records, applicable national tax, labour and social security law and any other documents corroborating the personnel costs claimed; ✓ in particular, the Auditor reviewed the employment contracts of the employees in the sample to verify that: <ul style="list-style-type: none"> i. they were employed directly by the Beneficiary in accordance with applicable national legislation; ii. they were working under the sole technical supervision and responsibility of the latter; iii. they were remunerated in accordance with the Beneficiary's usual practices; iv. they were allocated to the correct group/category/cost centre for the purposes of calculating the unit cost in line with the Beneficiary's usual cost accounting practices; ✓ the Auditor verified that any ineligible items or any costs claimed under other costs categories or costs covered by other types of grant or by other grants financed from the European Union budget have not been taken into account when calculating the personnel costs; ✓ the Auditor numerically reconciled the total amount of personnel costs used to calculate the unit cost with the total amount of personnel costs recorded in the statutory accounts and the payroll system. ✓ to the extent that actual personnel costs were adjusted on the basis of budgeted or estimated elements, the Auditor carefully examined those elements and checked the information source to confirm that they correspond to objective and verifiable information;

<i>Please explain any discrepancies in the body of the Report.</i>	
Statements to be made by Beneficiary	Procedures to be carried out and Findings to be confirmed by the Auditor
<p>XII. The Beneficiary is a non-profit legal entity;</p> <p>XIII. The additional remuneration is part of the beneficiary's usual remuneration practices and paid consistently whenever the relevant work or expertise is required;</p> <p>XIV. The criteria used to calculate the additional remuneration are objective and generally applied regardless of the source of funding;</p> <p>XV. The additional remuneration included in the personnel costs used to calculate the hourly rates for the grant agreement(s) is capped at EUR 8 000 per full-time equivalent (reduced proportionately if the employee is not assigned exclusively to the action).</p> <p><i>[If certain statement(s) of section "C. Personnel costs" cannot be endorsed by the Beneficiary they should be listed here below and reported as exception by the Auditor in the main Report of Factual Findings: - ...]</i></p>	<p>✓ if additional remuneration has been claimed, the Auditor verified that the Beneficiary was a non-profit legal entity, that the amount was capped at EUR 8 000 per full-time equivalent and that it was reduced proportionately for employees not assigned exclusively to the action(s).</p> <p>✓ the Auditor recalculated the personnel costs for the employees in the sample.</p> <p>Factual finding:</p> <ol style="list-style-type: none"> 4. All the components of the remuneration that have been claimed as personnel costs are supported by underlying documentation. 5. The employees in the sample were employed directly by the Beneficiary in accordance with applicable national law and were working under its sole supervision and responsibility. 6. Their employment contracts were in line with the Beneficiary's usual policy; 7. Personnel costs were duly documented and consisted solely of salaries, social security contributions (pension contributions, health insurance, unemployment fund contributions, etc.), taxes and other statutory costs included in the remuneration (holiday pay, thirteenth month's pay, etc.); 8. The totals used to calculate the personnel unit costs are consistent with those registered in the payroll and accounting records; 9. To the extent that actual personnel costs were adjusted on the basis of budgeted or estimated elements, those elements were relevant for calculating the personnel costs and correspond to objective and verifiable information. The budgeted or estimated elements used are: — (indicate the elements and their values). 10. Personnel costs contained no ineligible elements; 11. Specific conditions for eligibility were fulfilled when additional remuneration was paid: a) the Beneficiary is registered in the grant agreements as a non-profit legal entity; b) it was paid according to objective criteria generally applied regardless of the source of funding used and c) remuneration was capped at EUR 8 000 per full-time equivalent (or up to up to the equivalent pro-rata amount if the person did not work on the

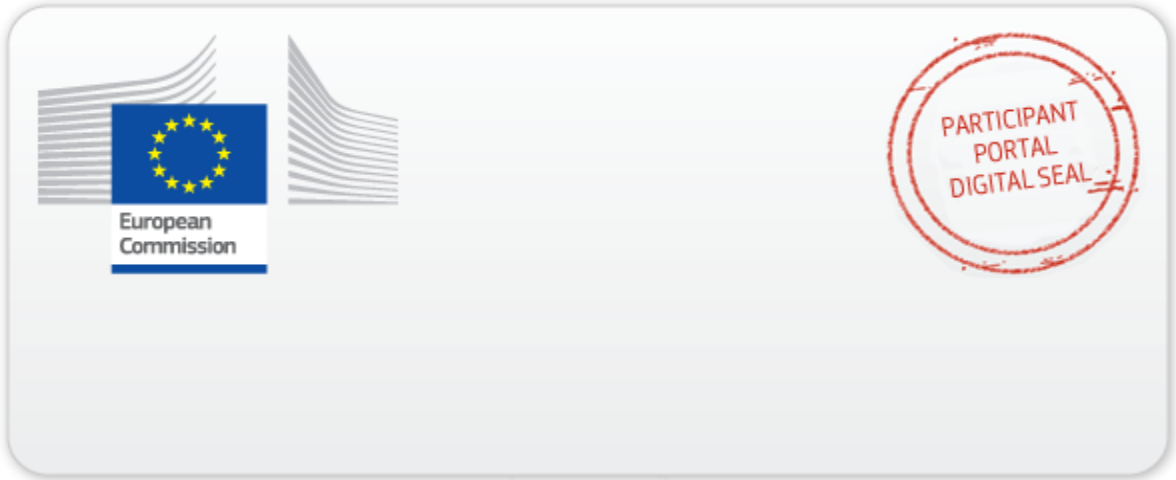
<i>Please explain any discrepancies in the body of the Report.</i>	
Statements to be made by Beneficiary	Procedures to be carried out and Findings to be confirmed by the Auditor
	action full-time during the year or did not work exclusively on the action).
<p>D. Productive hours</p> <p>XVI. The number of productive hours per full-time employee applied is <i>[delete as appropriate]</i>:</p> <p>A. 1720 productive hours per year for a person working full-time (corresponding pro-rata for persons not working full time).</p> <p>B. the total number of hours worked in the year by a person for the Beneficiary</p> <p>C. the standard number of annual hours generally applied by the beneficiary for its personnel in accordance with its usual cost accounting practices. This number must be at least 90% of the standard annual workable hours.</p> <p><u>If method B is applied</u></p> <p>XVII. The calculation of the total number of hours worked was done as follows: annual workable hours of the person according to the employment contract, applicable labour agreement or national law plus overtime worked minus absences (such as sick leave and special leave).</p> <p>XVIII. ‘Annual workable hours’ are hours during which the personnel must be working, at the employer’s disposal and carrying out his/her activity or duties under the employment contract, applicable collective labour agreement or national working time legislation.</p> <p>XIX. The contract (applicable collective labour agreement or national working time legislation) do specify the working time enabling to calculate the annual workable hours.</p> <p><u>If method C is applied</u></p> <p>XX. The standard number of productive hours per year is that of a full-time equivalent; for employees not assigned exclusively to the action(s) this number is reduced proportionately.</p> <p>XXI. The number of productive hours per year on which the hourly rate is based i) corresponds to the Beneficiary’s usual accounting practices; ii) is at least 90% of the standard number of workable (working) hours per year.</p>	<p>Procedure (same sample basis as for Section C: Personnel costs):</p> <ul style="list-style-type: none"> ✓ The Auditor verified that the number of productive hours applied is in accordance with method A, B or C. ✓ The Auditor checked that the number of productive hours per full-time employee is correct and that it is reduced proportionately for employees not exclusively assigned to the action(s). ✓ If method B is applied the Auditor verified i) the manner in which the total number of hours worked was done and ii) that the contract specified the annual workable hours by inspecting all the relevant documents, national legislation, labour agreements and contracts. ✓ If method C is applied the Auditor reviewed the manner in which the standard number of working hours per year has been calculated by inspecting all the relevant documents, national legislation, labour agreements and contracts and verified that the number of productive hours per year used for these calculations was at least 90% of the standard number of working hours per year. <p>Factual finding:</p> <p><u>General</u></p> <p>12. The Beneficiary applied a number of productive hours consistent with method A, B or C detailed in the left-hand column.</p> <p>13. The number of productive hours per year per full-time employee was accurate and was proportionately reduced for employees not working full-time or exclusively for the action.</p> <p><u>If method B is applied</u></p> <p>14. The number of ‘annual workable hours’, overtime and absences was verifiable based on the documents provided by the Beneficiary and the calculation of the total number of hours worked was accurate.</p> <p>15. The contract specified the working time enabling to calculate the annual workable hours.</p>

Please explain any discrepancies in the body of the Report.	
Statements to be made by Beneficiary	Procedures to be carried out and Findings to be confirmed by the Auditor
<p>XXII. Standard workable (working) hours are hours during which personnel are at the Beneficiary’s disposal performing the duties described in the relevant employment contract, collective labour agreement or national labour legislation. The number of standard annual workable (working) hours that the Beneficiary claims is supported by labour contracts, national legislation and other documentary evidence.</p> <p><i>[If certain statement(s) of section “D. Productive hours” cannot be endorsed by the Beneficiary they should be listed here below and reported as exception by the Auditor: - ...]</i></p>	<p><u>If method C is applied</u></p> <p>16. The calculation of the number of productive hours per year corresponded to the usual costs accounting practice of the Beneficiary.</p> <p>17. The calculation of the standard number of workable (working) hours per year was corroborated by the documents presented by the Beneficiary.</p> <p>18. The number of productive hours per year used for the calculation of the hourly rate was at least 90% of the number of workable (working) hours per year.</p>
<p>E. Hourly rates</p> <p>The hourly rates are correct because:</p> <p>XXIII. Hourly rates are correctly calculated since they result from dividing annual personnel costs by the productive hours of a given year and group (e.g. staff category or department or cost centre depending on the methodology applied) and they are in line with the statements made in section C. and D. above.</p> <p><i>[If the statement of section ‘E. Hourly rates’ cannot be endorsed by the Beneficiary they should be listed here below and reported as exception by the Auditor: - ...]</i></p>	<p>Procedure</p> <ul style="list-style-type: none"> ✓ The Auditor has obtained a list of all personnel rates calculated by the Beneficiary in accordance with the methodology used. ✓ The Auditor has obtained a list of all the relevant employees, based on which the personnel rate(s) are calculated. <p>For 10 full-time equivalent employees selected at random (same sample basis as Section C: Personnel costs):</p> <ul style="list-style-type: none"> ✓ The Auditor recalculated the hourly rates. ✓ The Auditor verified that the methodology applied corresponds to the usual accounting practices of the organisation and is applied consistently for all activities of the organisation on the basis of objective criteria irrespective of the source of funding. <p>Factual finding:</p> <p>19. No differences arose from the recalculation of the hourly rate for the employees included in the sample.</p>
<p>F. Time recording</p> <p>XXIV. Time recording is in place for all persons with no exclusive dedication to one Horizon 2020 action. At least all hours worked in connection with the grant agreement(s) are registered on a daily/weekly/monthly basis <i>[delete as appropriate]</i> using a paper/computer-based system <i>[delete as appropriate]</i>;</p> <p>XXV. For persons exclusively assigned to one Horizon 2020 activity the Beneficiary has either signed a declaration to that effect or has put arrangements in place</p>	<p>Procedure</p> <ul style="list-style-type: none"> ✓ The Auditor reviewed the brief description, all relevant manuals and/or internal guidance describing the methodology used to record time. <p>The Auditor reviewed the time records of the random sample of 10 full-time equivalents referred to under Section C: Personnel costs, and verified in particular:</p>

Please explain any discrepancies in the body of the Report.	
Statements to be made by Beneficiary	Procedures to be carried out and Findings to be confirmed by the Auditor
<p>to record their working time;</p> <p>XXVI. Records of time worked have been signed by the person concerned (on paper or electronically) and approved by the action manager or line manager at least monthly;</p> <p>XXVII. Measures are in place to prevent staff from:</p> <ul style="list-style-type: none"> i. recording the same hours twice, ii. recording working hours during absence periods (e.g. holidays, sick leave), iii. recording more than the number of productive hours per year used to calculate the hourly rates, and iv. recording hours worked outside the action period. <p>XXVIII. No working time was recorded outside the action period;</p> <p>XXIX. No more hours were claimed than the productive hours used to calculate the hourly personnel rates.</p> <p><i>[Please provide a brief description of the <u>time recording system</u> in place together with the measures applied to ensure its reliability to the Auditor and annex it to the present certificate⁴].</i></p> <p><i>[If certain statement(s) of section “F. Time recording” cannot be endorsed by the Beneficiary they should be listed here below and reported as exception by the Auditor: - ...]</i></p>	<ul style="list-style-type: none"> ✓ that time records were available for all persons with not exclusive assignment to the action; ✓ that time records were available for persons working exclusively for a Horizon 2020 action, or, alternatively, that a declaration signed by the Beneficiary was available for them certifying that they were working exclusively for a Horizon 2020 action; ✓ that time records were signed and approved in due time and that all minimum requirements were fulfilled; ✓ that the persons worked for the action in the periods claimed; ✓ that no more hours were claimed than the productive hours used to calculate the hourly personnel rates; ✓ that internal controls were in place to prevent that time is recorded twice, during absences for holidays or sick leave; that more hours are claimed per person per year for Horizon 2020 actions than the number of productive hours per year used to calculate the hourly rates; that working time is recorded outside the action period; ✓ the Auditor cross-checked the information with human-resources records to verify consistency and to ensure that the internal controls have been effective. In addition, the Auditor has verified that no more hours were charged to Horizon 2020 actions per person per year than the number of productive hours per year used to calculate the hourly rates, and verified that no time worked outside the action period was charged to the action. <p>Factual finding:</p> <p>20. The brief description, manuals and/or internal guidance on time recording provided by the Beneficiary were consistent with management</p>

⁴ The description of the time recording system must state among others information on the content of the time records, its coverage (full or action time-recording, for all personnel or only for personnel involved in H2020 actions), its degree of detail (whether there is a reference to the particular tasks accomplished), its form, periodicity of the time registration and authorisation (paper or a computer-based system; on a daily, weekly or monthly basis; signed and countersigned by whom), controls applied to prevent double-charging of time or ensure consistency with HR-records such as absences and travels as well as its information flow up to its use for the preparation of the Financial Statements.

<i>Please explain any discrepancies in the body of the Report.</i>	
Statements to be made by Beneficiary	Procedures to be carried out and Findings to be confirmed by the Auditor
	<p>reports/records and other documents reviewed and were generally applied by the Beneficiary to produce the financial statements.</p> <p>21. For the random sample time was recorded or, in the case of employees working exclusively for the action, either a signed declaration or time records were available;</p> <p>22. For the random sample the time records were signed by the employee and the action manager/line manager, at least monthly.</p> <p>23. Working time claimed for the action occurred in the periods claimed;</p> <p>24. No more hours were claimed than the number productive hours used to calculate the hourly personnel rates;</p> <p>25. There is proof that the Beneficiary has checked that working time has not been claimed twice, that it is consistent with absence records and the number of productive hours per year, and that no working time has been claimed outside the action period.</p> <p>26. Working time claimed is consistent with that on record at the human-resources department.</p>
<i>[official name of the [Beneficiary] [Linked Third Party]]</i>	<i>[official name of the Auditor]</i>
<i>[name and title of authorised representative]</i>	<i>[name and title of authorised representative]</i>
<i>[dd Month yyyy]</i>	<i>[dd Month yyyy]</i>
<i><Signature of the [Beneficiary] [Linked Third Party]></i>	<i><Signature of the Auditor></i>



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