



## GRANT AGREEMENT FOR MEMBERS<sup>1</sup>

NUMBER 101017521 — PJ34-W3 AURA

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

**on the one part,**

the **Single European Sky ATM Research Joint Undertaking** ('the JU'), represented for the purposes of signature of this Agreement by the JU Executive Director or his/her representative, Florian GUILLERMET,

**and**

**on the other part,**

1. 'the coordinator':

**INDRA SISTEMAS SA (INDRA)**, established in AVENIDA DE BRUSELAS 35, ALCOBENDAS MADRID 28108, Spain, VAT number: ESA28599033, represented for the purposes of signing the Agreement by Jesús Angel GARCÍA SÁNCHEZ

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

2. **AIRBUS (AIRBUS)**, established in 2 ROND POINT EMILE DEWOITINE, BLAGNAC 31700, France, VAT number: FR89383474814,

3. **DEUTSCHES ZENTRUM FÜR LUFT - UND RAUMFAHRT EV (DLR)**, established in LINDER HOHE, KOLN 51147, Germany, VAT number: DE121965658,

4. **STICHTING NATIONAAL LUCHT- EN RUIMTEVAARTLABORATORIUM (NLR)**, established in Anthony Fokkerweg 2, AMSTERDAM 1059CM, Netherlands, VAT number: NL002760551B01,

5. **RIZENI LETOVEHO PROVOZU CESKE REPUBLIKY STATNI PODNIK (ANS CR (B4))**, established in JENEC NAVIGACNI 787, JENEC 252 61, Czech Republic, VAT number: CZ699004742,

6. **VALSTYBES IMONE ORO NAVIGACIJA (ON (B4))**, established in BALIO KARVELIO G. 25, VILNIUS LT-02184, Lithuania, VAT number: LT100604610,

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<sup>1</sup> '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.

7. **POLSKA AGENCJA ZEGLUGI POWIETRZNEJ (PANS (B4))**, established in UL. WIEZOWA 8, WARSZAWA 02 147, Poland, VAT number: PL5222838321,
8. **AUSTRO CONTROL OSTERREICHISCHE GESELLSCHAFT FUR ZIVILLUFTFAHRT MBH (ACG/COOPANS)**, established in WAGRAMER STRASSE 19, WIEN 1220, Austria, VAT number: ATU37259408,
9. **LUFTFARTSVERKET (LFV/COOPANS)**, established in HOSPITALSGATAN 30, NORRKOPING 602 27, Sweden, VAT number: SE202100079501,
10. **DFS DEUTSCHE FLUGSICHERUNG GMBH (DFS)**, established in AM DFS CAMPUS 10, LANGEN 63225, Germany, VAT number: DE114110232,
11. **DIRECTION DES SERVICES DE LA NAVIGATION AERIENNE (DSNA)**, established in 50 RUE HENRY FARMAN, PARIS 75720, France, VAT number: FR29120064019,
12. **ENAIRES (ENAIRES)**, established in AVENIDA DE ARAGON S/N BLOQUE 330, PORTAL 2 PARQUE EMPRESARIAL LAS MERCEDES, MADRID 28022, Spain, VAT number: ESQ2822001J,
13. **ENAV SPA (ENAV)**, established in VIA SALARIA 716, ROMA 00138, Italy, VAT number: IT02152021008,
14. **EUROCONTROL - EUROPEAN ORGANISATION FOR THE SAFETY OF AIR NAVIGATION (EUROCONTROL)**, established in Rue de la Fusée 96, BRUXELLES 1130, Belgium, VAT number: not applicable, as 'beneficiary not receiving JU funding' (see Article 9),
15. **FREQUENTIS AG (FRQ (FSP))**, established in Innovationsstrasse 1, WIEN 1100, Austria, VAT number: ATU14715600,
16. **HUNGAROCONTROL MAGYAR LEGIFORGALMISZOLGALAT ZARTKORUEN MUKODO RESZVENYTARSASAG (HC (FSP))**, established in IGLO UTCA 33 35, BUDAPEST 1185, Hungary, VAT number: HU13851325,
17. **HONEYWELL AEROSPACE (HONEYWELL SAS)**, established in 4 AVENUE SAINT GRANIER, TOULOUSE 31300, France, VAT number: FR92340797919,
18. **LEONARDO - SOCIETA PER AZIONI (LEONARDO)**, established in PIAZZA MONTE GRAPPA 4, ROMA 00195, Italy, VAT number: IT00881841001,
19. **SINTEF AS (SINTEF)**, established in STRINDVEGEN 4, TRONDHEIM 7034, Norway, VAT number: NO919303808MVA,
20. **NATS (EN ROUTE) PUBLIC LIMITED COMPANY (NATS)**, established in 4000 PARKWAY WHITELEY, FAREHAM PO15 7FL, United Kingdom, VAT number: GB440379456,
21. **THALES LAS FRANCE SAS (THALES AIR SYS)**, established in AVENUE GAY LUSSAC 2, ELANCOURT 78990, France, VAT number: FR15319159877,
22. **THALES AVS FRANCE SAS (THALES AVS)**, established in 75-77 AVENUE MARCEL DASSAULT, MERIGNAC 33700, France, VAT number: FR65612039495,



23. **LETOVE PREVADZKOVE SLUZBY SLOVENSKEJ REPUBLIKY, STATNY PODNIK (LPS SR (B4))**, established in IVANSKA CESTA 93, BRATISLAVA 823 07, Slovakia, VAT number: SK2020244699, as ‘beneficiary not receiving JU funding’ (see Article 9),
24. **CROATIA CONTROL, CROATIAN AIR NAVIGATION SERVICES LTD (CCL/COOPANS)**, established in RUDOLFA FIZIRA 2, VELIKA GORICA 10410, Croatia, VAT number: HR33052761319, as ‘beneficiary not receiving JU funding’ (see Article 9),
25. **UDARAS EITLIOCHTA NA HEIREANN THE IRISH AVIATION AUTHORITY (IAA/COOPANS)**, established in D'OLIER STREET 11-12 THE TIMES BUILDING, DUBLIN D02 T449, Ireland, VAT number: IE8211082B, as ‘beneficiary not receiving JU funding’ (see Article 9),
26. **NAVIAIR (NAVIAIR/COOPANS)**, established in NAVIAIR ALLE 1, KASTRUP 2770, Denmark, VAT number: DK26059763, as ‘beneficiary not receiving JU funding’ (see Article 9),
27. **ATOS BELGIUM (ATOS (FSP))**, established in DA VINCILAAN 5, ZAVENTEM 1930, Belgium, VAT number: BE0401848135, as ‘beneficiary not receiving JU funding’ (see Article 9),
28. **AIRTEL ATN LIMITED (AIRTEL)**, established in 2 HARBOUR SQUARE CROFTON ROAD, DUN LOAGHAIRE DUBLIN A96D6R0, Ireland, VAT number: IE8287698U, as ‘beneficiary not receiving JU funding’ (see Article 9),
29. **SAAB AKTIEBOLAG (SAAB)**, established in ..., LINKOPING 581 88, Sweden, VAT number: SE556036079301, as ‘beneficiary not receiving JU funding’ (see Article 9),

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
  - 2a    Additional information on the estimated budget
- 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 ‘**PJ34-W3 AURA “ATM U-SPACE INTERFACE”**’ — ‘**PJ34-W3 AURA**’ (**‘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-2019-1 (Wave2).

### **ARTICLE 3 — DURATION AND STARTING DATE OF THE ACTION**

The duration of the action will be **24 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 shows 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 — without an amendment (see Article 55) — by transfers of amounts between beneficiaries, budget categories and/or forms of costs set out in Annex 2, 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 7 978 319.51** (seven million nine hundred and seventy eight thousand three hundred and nineteen EURO and fifty one 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 11 397 599.28** (eleven million three hundred and ninety seven thousand five hundred and ninety nine EURO and twenty eight 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 2a (**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**:

- for costs of internally invoiced goods and services: on the basis of an amount per unit calculated by the beneficiary in accordance with its usual cost accounting practices ('**unit costs**');
- for all other 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 substantial errors, irregularities or fraud or serious breach of 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 substantial errors, irregularities or fraud or serious breach of 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 seriousness of the errors, irregularities or fraud or 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 the seriousness of the errors, irregularities or fraud or 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 2a or calculated by the beneficiary in accordance with its usual cost accounting practices (see Article 6.2, Point A and Article 6.2.D.5)

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 entities<sup>2</sup> 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’ means any part of the remuneration which exceeds what the person would be paid for time worked in projects funded by national schemes.

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:

$$\left\{ \begin{array}{l} \text{EUR 8 000} \\ \text{divided by} \\ \text{the number of annual productive hours (see below)}, \\ \text{multiplied by} \\ \text{the number of hours that the person has worked on the action during the year} \end{array} \right\}.$$

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 conditions similar to those of an employee (in particular regarding the way the work is organised, the tasks that are performed and the premises where they are performed);
- (b) the result of the work carried out belongs to the beneficiary (unless exceptionally agreed otherwise), and

<sup>2</sup> 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 2a 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 2a 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 are:

{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** (i.e. budget categories A.1, A.2, A.3): the hourly rate is calculated *per full financial year*, as follows:

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

using the personnel costs and the number of productive hours for each full financial year covered by the reporting period concerned. 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.

As an alternative, beneficiaries may calculate the hourly rate *per month*, as follows:

{actual monthly personnel cost (excluding additional remuneration) for the person

divided by

{number of annual productive hours / 12}}}

using the personnel costs for each month and (one twelfth of) the annual productive hours calculated according to either option (i) or (iii) above, i.e.:

- fixed number of hours or
- standard annual productive hours.



Time spent on **parental leave** may not be deducted when calculating the hourly rate per month. However, beneficiaries may declare personnel costs incurred in periods of parental leave in proportion to the time the person worked on the action in that financial year.

If parts of a basic remuneration are generated over a period longer than a month, the beneficiaries may include only the share which is generated in the month (irrespective of the amount actually paid for that month).

Each beneficiary must use only one option (per full financial year or per month) for each full financial year;

(b) for personnel costs declared on the basis of **unit costs** (i.e. budget categories A.1, A.2, A.4, A.5): 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 2a (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'**<sup>3</sup> 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 infrastructure<sup>4</sup>);
- (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.

<sup>3</sup> '**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.

<sup>4</sup> For the definition, see Article 2(6) of the H2020 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'.

#### D.5 Costs of internally invoiced goods and services directly used for the action are eligible, if:

- (a) they are declared on the basis of a unit cost calculated in accordance with the beneficiary's usual cost accounting practices;
- (b) the cost accounting practices used are applied in a consistent manner, based on objective criteria, regardless of the source of funding;
- (c) the unit cost is calculated using the actual costs for the good or service recorded in the beneficiary's accounts, excluding any ineligible cost or costs included in other budget categories.

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

- (d) the unit cost excludes any costs of items which are not directly linked to the production of the invoiced goods or service.

'Internally invoiced goods and services' means goods or services which are provided by the beneficiary directly for the action and which the beneficiary values on the basis of its usual cost accounting practices.

#### 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.

Beneficiaries receiving an operating grant<sup>5</sup> financed by the EU or Euratom budget cannot declare indirect costs for the period covered by the operating grant, unless they can demonstrate that the operating grant does not cover any costs of the action.

#### F. Specific cost category(ies)

Not applicable

### 6.3 Conditions for costs of linked third parties to be eligible

<sup>5</sup> 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 ('**Financial Regulation No 966/2012**') (OJ L 218, 26.10.2012, p.1): '**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.



**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 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, unless it can demonstrate that the operating grant does not cover any costs of the action.

#### **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);
- call upon international partners to implement action tasks described in Annex 1 (see Article 14a).

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 that are not eligible for JU funding or request zero JU funding (**‘beneficiaries not receiving JU funding’**) must implement the action tasks attributed to them in Annex 1 in accordance with 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, 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.

If a beneficiary requesting zero funding receives funding later on (through an amendment; see Article 55), all obligations will apply retroactively.

## 9.2 Consequences of non-compliance

If a beneficiary not receiving JU funding breaches any of its obligations under this Article, its participation in 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/EC<sup>6</sup> (or 2014/24/EU<sup>7</sup>) or ‘contracting entities’ within the meaning of Directive 2004/17/EC<sup>8</sup> (or 2014/25/EU<sup>9</sup>) must comply with the applicable national law on public procurement.

### 10.2 Consequences of non-compliance

<sup>6</sup> 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).

<sup>7</sup> Directive 2014/24/EU of the European Parliament and of the Council of 26 February 2014 on public procurement and repealing Directive 2004/18/EC. (OJ L 94, 28.03.2014, p. 65).

<sup>8</sup> 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)

<sup>9</sup> Directive 2014/25/EU of the European Parliament and of the Council of 26 February 2014 on procurement by entities operating in the water, energy, transport and postal services sectors and repealing Directive 2004/17/EC (OJ L 94, 28.03.2014, p. 243).

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.

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 2014/24/EU) or ‘contracting entities’ within the meaning of Directive 2004/17/EC (or 2014/25/EU) 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**<sup>11</sup> and **third parties with a legal link to a beneficiary**<sup>12</sup> (**‘linked third parties’**) may implement the action tasks attributed to them in Annex 1:

- INDRA FACTORIA TECNOLOGICA SL (Indra FT), affiliated or linked to INDRA
- UNIVERSIDAD POLITECNICA DE MADRID (UPM), affiliated or linked to INDRA
- AIRBUS OPERATIONS SL (AOSL), affiliated or linked to AIRBUS, if it has accepted joint and several liability with the beneficiary (see Annex 3a)
- INTEGRA CONSULT AS (Integra), affiliated or linked to ANS CR (B4), if it has accepted joint and several liability with the beneficiary (see Annex 3a)
- DRONERADAR SP Z O.O. (DRR), affiliated or linked to PANSA (B4), if it has accepted joint and several liability with the beneficiary (see Annex 3a)
- CENTRO DE REFERENCIA INVESTIGACION DESARROLLO E INNOVACION ATM, A.I.E. (CRIDA), affiliated or linked to ENAIRE, if it has accepted joint and several liability with the beneficiary (see Annex 3a)
- INGENIERIA Y ECONOMIA DEL TRANSPORTE SME MP SA (INECO), affiliated or linked to ENAIRE

<sup>11</sup> For the definition see Article 2.1(2) 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.

<sup>12</sup> **‘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.

- D-FLIGHT SPA (D-FLIGHT), affiliated or linked to ENAV, if it has accepted joint and several liability with the beneficiary (see Annex 3a)
- TECHNO SKY SRL TECHNOLOGIES FOR AIR TRAFFIC MANAGEMENT (TECHNO SKY), affiliated or linked to ENAV
- NEXTANT APPLICATIONS & INNOVATIVE SOLUTION SRL (NAIS), affiliated or linked to ENAV
- FREQUENTIS SOLUTIONS SRO (FSO), affiliated or linked to FRQ (FSP), if it has accepted joint and several liability with the beneficiary (see Annex 3a)
- FREQUENTIS ROMANIA SRL (FRQ RO), affiliated or linked to FRQ (FSP)
- FREQUENTIS COMSOFT GMBH (FCO), affiliated or linked to FRQ (FSP)
- HONEYWELL INTERNATIONAL SRO (HIsro), affiliated or linked to HONEYWELL SAS, if it has accepted joint and several liability with the beneficiary (see Annex 3a)
- LEONARDO GERMANY GMBH (LDO GMBH), affiliated or linked to LEONARDO
- E-GEOS SPA (E-GEOS), affiliated or linked to LEONARDO
- TELESPIAZIO SPA (TPZ), affiliated or linked to LEONARDO

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 14a — IMPLEMENTATION OF ACTION TASKS BY INTERNATIONAL PARTNERS**

Not applicable

## **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 Participant Portal 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 the 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 Article 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 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.

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 12
- RP2: from month 13 to month 24

### 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 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**’.

The report must indicate the communication activities;

- (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 JU and the Horizon 2020 key performance indicators and JU and the Horizon 2020 monitoring requirements;

(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’**, 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’**, 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).

## 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

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, the JU may terminate the Agreement (see Article 50) or apply any of the other measures described in Chapter 6.



## 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 **6 382 655.61** (six million three hundred and eighty two thousand six hundred and fifty five EURO and sixty one 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 **398 915.98** (three hundred and ninety eight thousand nine hundred and fifteen EURO and ninety eight 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 beneficiaries' consent — against any

other amount owed by a 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) 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: BANCO SANTANDER, S.A.  
Full name of the account holder: INDRA SISTEMAS SA  
IBAN code: ES5700491500042710383419

### **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 883/2013<sup>16</sup> and No 2185/96<sup>17</sup> (and in accordance with their provisions and procedures), and Article 110 of the JU Financial Rules<sup>18</sup>, the European Anti-Fraud Office (OLAF) 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 JU Financial Rules, 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

<sup>16</sup> 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).

<sup>17</sup> 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).

<sup>18</sup> The SESAR JU Financial Rules are made publicly available on the SESAR JU official website.

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:

- (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 JU or the Commission may then start a rejection procedure in accordance with Article 42, on the basis of:

- the revised financial statements, if approved;
  - the proposed alternative correction method, if accepted
- or
- the initially notified correction rate for extrapolation, if it 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.

22.5.3.2 If the findings concern **substantial errors, irregularities or fraud or serious breach of obligations**: 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.

The JU or the Commission may then start a reduction procedure in accordance with Article 43, on the basis of:

- the proposed alternative flat-rate, if accepted
- or
- the initially notified flat-rate, if it does not receive any observations or does not accept the observations or the proposed 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**

#### **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 activities<sup>19</sup>.

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**

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<sup>19</sup> 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.

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 entities<sup>20</sup> established in an EU Member State or ‘**associated country**’<sup>21</sup>, 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.

#### 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 complementary beneficiaries<sup>22</sup> (see Article 2).

#### 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

<sup>20</sup> For the definition, see ‘affiliated entity’ footnote (Article 14.1).

<sup>21</sup> 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.

<sup>22</sup> ‘**Complementary beneficiary**’ means a beneficiary of the complementary grant agreement.

## 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.

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 take place 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 JU FUNDING AND SUPPORT FROM JU MEMBERS**

### **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 JU funding and support from JU members**

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 (JU) under grant agreement No 101017521. The JU receives support from the European Union’s Horizon 2020 research and innovation programme and the SESAR JU members other than the Union”.

## **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.

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 JU funding and support from JU members**

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 (JU) under grant agreement No 101017521. The JU receives support from the European Union’s Horizon 2020 research and innovation programme and the SESAR JU members other than the Union”.

### **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 JU FUNDING AND SUPPORT FROM JU MEMBERS**

### **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).

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 JU funding and support from JU members — 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 and
- (b) display the EU emblem and
- (c) include the following text:

“This project has received funding from the SESAR Joint Undertaking (JU) under grant agreement No 101017521. The JU receives support from the European Union’s Horizon 2020 research and innovation programme and the SESAR JU members other than the Union”.

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 and 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 access rights under Article 31 and
- (b) not applicable.

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, the EU institutions, other EU bodies, offices or agencies and EU Member States**

The beneficiaries must give access to their results — on a royalty-free basis — to the JU and to EU institutions, other EU 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 — access to their results to complementary beneficiaries<sup>22</sup> (see Article 2).

### **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**

### **ARTICLE 32 — RECRUITMENT AND WORKING CONDITIONS FOR RESEARCHERS**

<sup>22</sup> ‘Complementary beneficiary’ means a beneficiary of a complementary grant agreement.

### **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 Researchers<sup>23</sup>, 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 AND RESEARCH INTEGRITY**

### **34.1 Obligation to comply with ethical and research integrity principles**

The beneficiaries must carry out the action in compliance with:

- (a) ethical principles (including the highest standards of research integrity)
- and
- (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 or for activities which destroy human embryos (for example, for obtaining stem cells).

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<sup>23</sup> 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).

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.

In addition, the beneficiaries must respect the fundamental principle of research integrity — as set out, for instance, in the European Code of Conduct for Research Integrity<sup>24</sup>.

This implies compliance with the following fundamental principles:

- **reliability** in ensuring the quality of research reflected in the design, the methodology, the analysis and the use of resources;
- **honesty** in developing, undertaking, reviewing, reporting and communicating research in a transparent, fair and unbiased way;
- **respect** for colleagues, research participants, society, ecosystems, cultural heritage and the environment;
- **accountability** for the research from idea to publication, for its management and organisation, for training, supervision and mentoring, and for its wider impacts

and means that beneficiaries must ensure that persons carrying out research tasks follow the good research practices and refrain from the research integrity violations described in this Code.

This does not change the other obligations under this Agreement or obligations under applicable international, EU or national law, all of which still apply.

### 34.2 Activities raising ethical issues

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

Before the beginning of an activity raising an ethical issue, each beneficiary must have obtained:

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

needed for implementing the action tasks in question.

<sup>24</sup> European Code of Conduct for Research Integrity of ALLEA (All European Academies)  
[http://ec.europa.eu/research/participants/data/ref/h2020/other/hi/h2020-ethics\\_code-of-conduct\\_en.pdf](http://ec.europa.eu/research/participants/data/ref/h2020/other/hi/h2020-ethics_code-of-conduct_en.pdf)

The documents must be kept on file and be submitted upon request by the coordinator to the JU (see Article 52). If they are not in English, they must be submitted together with an English summary, which shows that the action tasks in question are covered and includes the conclusions of the committee or authority concerned (if available).

### **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, in addition to Article 34.1, 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. It may disclose confidential information to 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 information**

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 JU FUNDING AND SUPPORT FROM JU MEMBERS****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 JU funding and support from JU members — 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 and
- (b) display the EU emblem and
- (c) include the following text:

For communication activities:

“This project has received funding from the SESAR Joint Undertaking (JU) under grant agreement No 101017521. The JU receives support from the European Union’s Horizon 2020 research and innovation programme and the SESAR JU members other than the Union”.

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 (JU) under grant agreement No 101017521. The JU receives support from the European Union’s Horizon 2020 research and innovation programme and the SESAR JU members other than the Union”.





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 and 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 received 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.

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 1049/2001<sup>27</sup>, 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.

## 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 45/2001<sup>28</sup> 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).

<sup>27</sup> 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.

<sup>28</sup> 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).

### **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(s) (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.

## **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 responsibility 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 Article 44.

#### **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 Participant Portal 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 or subcontract the above-mentioned tasks to any other beneficiary or third party (including linked third parties).

### 41.3 Internal arrangements between beneficiaries — Consortium agreement

Not applicable

### 41.4 Relationship with complementary beneficiaries — Collaboration agreement

The beneficiaries must conclude a written ‘collaboration agreement’ with the complementary

beneficiaries to coordinate the work under the Agreement and the complementary grant agreement(s) (see Article 2), covering for instance:

- efficient decision making processes and
- settlement of disputes.

The collaboration agreement must not contain any provision contrary to the Agreement.

The beneficiaries and complementary beneficiaries must create and participate in common boards and advisory structures to decide on collaboration and synchronisation of activities, including on management of outcomes, common approaches towards standardisation, SME involvement, links with regulatory and policy activities, and commonly shared dissemination and awareness raising activities.

The beneficiaries must give access to their results to the complementary beneficiaries, for the purposes of the complementary grant agreement(s) (see Article 31.6).

The beneficiaries must share the technical reports (see Article 20.3 and 20.4). The confidentiality obligations in Article 36 apply.

#### **41.5 Relationship with partners of a joint action — Coordination agreement**

Not applicable

### **CHAPTER 6 REJECTION OF COSTS — REDUCTION OF THE GRANT — RECOVERY — SANCTIONS — DAMAGES — SUSPENSION — TERMINATION — FORCE MAJEURE**

#### **SECTION 1 REJECTION OF COSTS — REDUCTION OF THE GRANT — RECOVERY — SANCTIONS**

#### **ARTICLE 42 — REJECTION OF INELIGIBLE COSTS**

##### **42.1 Conditions**

The JU will — after **termination of the participation of a beneficiary**, 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).

The rejection may also be based on the **extension of findings from other grants to this grant** (see Article 22.5.2).

##### **42.2 Ineligible costs to be rejected — Calculation — Procedure**

Ineligible costs will be rejected in full.

If the rejection of costs does not lead to a recovery (see Article 44), the JU will formally notify the coordinator or beneficiary concerned of 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 rejection of costs leads to a recovery, the JU will follow the contradictory procedure with pre-information letter set out in Article 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 rejects costs **after termination of the participation of a beneficiary**, it will deduct them from the costs declared by the beneficiary in the termination report and include the rejection in the calculation after termination (see Article 50.2 and 50.3).

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

The JU may — **after termination of the participation of a beneficiary, at the payment of the balance or afterwards** — reduce the grant amount (see Article 5.1), if :

- (a) a beneficiary (or a natural person who has the power to represent or take decisions on its behalf) has committed:
  - (i) substantial errors, irregularities or fraud or
  - (ii) serious breach of obligations under the Agreement or during the award procedure (including improper implementation of the action, submission of false information, failure to provide required information, breach of ethical principles) or
- (b) a beneficiary (or a natural person who has the power to represent or take decision on its behalf) has committed — in other 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).

### 43.2 Amount to be reduced — Calculation — Procedure

The amount of the reduction will be proportionate to the seriousness of the errors, irregularities or fraud or breach of obligations.

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 **after termination of the participation of a beneficiary**, it will calculate the reduced grant amount for that beneficiary and then determine the amount due to that beneficiary (see Article 50.2 and 50.3).

If the JU reduces the grant **at 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/EC<sup>29</sup> 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

<sup>29</sup> 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).



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:

$\{ \{ \{ \text{beneficiary's costs declared in the final summary financial statement and approved by the JU} \}$   
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)},

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:

$\{ \{ \text{amount calculated according to point (a) for the beneficiary concerned} \}$

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 SANCTIONS

In addition to contractual measures, the JU may also adopt administrative sanctions under Articles 84 and 89 of the JU Financial Rules read in conjunction with Articles 106 and 131(4) of the Financial Regulation No 966/2012 (i.e. exclusion from future procurement contracts, grants, prizes and expert contracts and/or financial penalties).

## 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

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.

## 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 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 payments, in whole or in part and for one or more beneficiaries, if:

- (a) a beneficiary (or a natural person who has the power to represent or take decision on its behalf) has committed or is suspected of having committed:
  - (i) substantial errors, irregularities or fraud or
  - (ii) serious breach of obligations under the Agreement or during the award procedure (including improper implementation of the action, submission of false information, failure to provide required information, breach of ethical principles) or
- (b) a beneficiary (or a natural person who has the power to represent or take decision on its behalf) 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).

If payments are suspended for one or more beneficiaries, the JU will make partial payment(s) for the part(s) not suspended. If suspension concerns the payment of the balance, — once suspension is lifted

— the payment or the recovery of the amount(s) concerned will be considered the payment of the balance that closes the action.

## 48.2 Procedure

Before suspending payments, the JU will formally notify the coordinator or beneficiary concerned:

- 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 or beneficiary concerned.

During the suspension, the periodic report(s) for all reporting periods except the last one (see Article 20.3), must not contain any individual financial statements from the beneficiary concerned and its linked third parties. The coordinator must include them in the next periodic report after the suspension is lifted or — if suspension is not lifted before the end of the action — in the last 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, if:

- (a) a beneficiary (or a natural person who has the power to represent or take decisions on its behalf) has committed or is suspected of having committed:
  - (i) substantial errors, irregularities or fraud or
  - (ii) serious breach of obligations under the Agreement or during the award procedure (including improper implementation of the action, submission of false information, failure to provide required information, breach of ethical principles);
- (b) a beneficiary (or a natural person who has the power to represent or take decisions on its behalf) 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) 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 or beneficiary concerned:

- 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 (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 or beneficiary concerned 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, 40, 42, 43 and 44) 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 — on the basis of the periodic reports, the termination report and the report on the distribution of payments — **calculate** the amount which is due to the beneficiary and if the (pre-financing and interim) payments received by the beneficiary exceed this amount.

The **amount which is due** is calculated in the following steps:

Step 1 — Application of the reimbursement rate to the eligible costs

The grant amount for the beneficiary is calculated by applying the reimbursement rate(s) to the total eligible costs declared by the beneficiary and its linked third parties in the termination report 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.

Step 2 — Reduction due to substantial errors, irregularities or fraud or serious breach of obligations

In case of a reduction (see Article 43), the JU will calculate the reduced grant amount for the beneficiary by deducting the amount of the reduction (calculated in proportion to the seriousness of the errors, irregularities or fraud or breach of obligations, in accordance with Article 43.2) from the grant amount for the beneficiary.

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 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.

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, 40, 42, 43 and 44) 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;
- (l) a beneficiary (or a natural person who has the power to represent or take decisions on its behalf) has committed:
  - (i) substantial errors, irregularities or fraud or
  - (ii) serious breach of obligations under the Agreement or during the award procedure (including improper implementation of the action, submission of false information, failure to provide required information, breach of ethical principles);
- (m) a beneficiary (or a natural person who has the power to represent or take decisions on its behalf) 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);
- (n) despite a specific request by the JU, a beneficiary does not request — through the coordinator — an amendment to the Agreement to end the participation of one of its linked third parties or international partners that is in one of the situations under points (e), (f), (g), (k), (l) or (m) and to reallocate its tasks.

### 50.3.2 Procedure

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

- 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 or beneficiary concerned **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), (l.ii) and (n) 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.

### 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 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 sanctions (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, 40, 42, 43 and 44) 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 — on the basis of the periodic reports, the termination report and the report on the distribution of payments — **calculate** the amount which is due to the beneficiary and if the (pre-financing and interim) payments received by the beneficiary exceed this amount.

The **amount which is due** is calculated in the following steps:

Step 1 — Application of the reimbursement rate to the eligible costs

The grant amount for the beneficiary is calculated by applying the reimbursement rate(s) to the total eligible costs declared by the beneficiary and its linked third parties in the termination report 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.

Step 2 — Reduction due to substantial errors, irregularities or fraud or serious breach of obligations

In case of a reduction (see Article 43), the JU will calculate the reduced grant amount for the beneficiary by deducting the amount of the reduction (calculated in proportion to the seriousness of the errors, irregularities or fraud or breach of obligations, in accordance with Article 43.2) from the grant amount for the beneficiary.

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 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, 40, 42, 43 and 44) 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.

All communication must be made through the Participant Portal **electronic** exchange system and using the forms and templates provided there.

If — after the payment of the balance — the JU finds that a formal notification was not accessed, a second formal notification will be made by registered post with proof of delivery (‘formal notification on **paper**’). Deadlines will be calculated from the moment of the second notification.

Communications in the electronic exchange system must be made by persons authorised according to the Participant Portal Terms & Conditions. 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 Participant Portal Terms & Conditions).

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/info/funding-tenders/opportunities/portal/screen/myarea/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 official mailing address indicated on the JU's website.

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 Participant Portal 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 1182/71<sup>30</sup>, 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.

<sup>30</sup> 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).



## 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, and
- 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 which must be a Leader or a Core Partner<sup>1</sup> of the JU.

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.

As an exception, the Agreement is governed by a different applicable law for the following beneficiaries:

- EUROCONTROL - EUROPEAN ORGANISATION FOR THE SAFETY OF AIR NAVIGATION: by the general principles governing the law of international organisations and the rules of general international law

### **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 SINTEF AS, 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. Each party must formally notify to the other party its intention of resorting to arbitration and the identity of the arbitrator. 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.

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<sup>1</sup> As defined under Article 1 of the Statutes, Annex I to Council Regulation (EU) No 558/2014 of 6 May 2014 (OJ L 169/77).

If a dispute concerns administrative sanctions 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 — 101017521 — PJ34-W3 AURA**

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# 1.1. The project summary

Project Number <sup>1</sup>	101017521	Project Acronym <sup>2</sup>	PJ34-W3 AURA
One form per project			
General information			
Project title <sup>3</sup>	PJ34-W3 AURA "ATM U-SPACE INTERFACE"		
Starting date <sup>4</sup>	The first day of the month after the signature by the JU		
Duration in months <sup>5</sup>	24		
Call (part) identifier <sup>6</sup>	H2020-SESAR-2020-2		
Topic	SESAR-WAVE3-03-2020 Collaborative U-space-ATM interface		
Fixed EC Keywords			
Free keywords	U-space, ATM, SWIM, collaborative interface		
Abstract <sup>7</sup>			
<p>The global objective of AURA is to lay the foundations for the integration of the new entrants in current and future air traffic environment, developing the required concept of operations and validating U-space services information exchanges with ATM systems. In order to achieve this objective, all relevant stakeholders (drone operators, U-space service providers, data services providers, ATM providers and authorities) will be included during the project development and throughout its lifetime.</p> <p>AURA project will identify the requirements for U-space information exchange with ATM through SWIM and will validate a set of selected U-space services, developing the service definition for the SWIM candidate services. Secondly, it will define a novel Collaborative ATM-U-space Concept of Operations (ConOps) for drones in a fully collaborative environment with ATM that go beyond the existing concepts developed for a U-space and will validate these new concepts.</p> <p>AURA project will contribute to enable the development of Very Low Level (VLL) markets, allowing the introduction of new actors in a safe, harmonized, sustainable and efficient way and compatible with current ATM environment. Also, the project will contribute to avoid the segregation of the airspace and increase the interoperability. AURA will provide inputs for the current regulatory and standardization initiatives regarding U-space with a high involvement of external stakeholders through an Advisory Board.</p>			

## 1.2. List of Beneficiaries

Project Number <sup>1</sup>	101017521	Project Acronym <sup>2</sup>	PJ34-W3 AURA
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### List of Beneficiaries

No	Name	Short name	Country	Project entry month <sup>8</sup>	Project exit month
1	INDRA SISTEMAS SA	INDRA	Spain	1	24
2	AIRBUS	AIRBUS	France	1	24
3	DEUTSCHES ZENTRUM FUR LUFT - UND RAUMFAHRT EV	DLR	Germany	1	24
4	STICHTING NATIONAAL LUCHT- EN RUIMTEVAARTLABORATORIUM	NLR	Netherlands	1	24
5	RIZENI LETOVEHO PROVOZU CESKE REPUBLIKY STATNI PODNIK	ANS CR (B4)	Czech Republic	1	24
6	VALSTYBES IMONE ORO NAVIGACIJA	ON (B4)	Lithuania	1	24
7	POLSKA AGENCJA ZEGLUGI POWIETRZNEJ	PANSA (B4)	Poland	1	24
8	AUSTRO CONTROL OSTERREICHISCHE GESELLSCHAFT FUR ZIVILLUFTFAHRT MBH	ACG/COOPANS	Austria	1	24
9	LUFTFARTSVERKET	LFV/COOPANS	Sweden	1	24
10	DFS DEUTSCHE FLUGSICHERUNG GMBH	DFS	Germany	1	24
11	DIRECTION DES SERVICES DE LA NAVIGATION AERIENNE	DSNA	France	1	24
12	ENAIRES	ENAIRES	Spain	1	24
13	ENAV SPA	ENAV	Italy	1	24
14	EUROCONTROL - EUROPEAN ORGANISATION FOR THE SAFETY OF AIR NAVIGATION	EUROCONTROL	Belgium	1	24
15	FREQUENTIS AG	FRQ (FSP)	Austria	1	24
16	HUNGAROCONTROL MAGYAR LEGIFORGALMISZOLGALAT ZARTKORUEN MUKODO RESZVENYTARSASAG	HC (FSP)	Hungary	1	24
17	HONEYWELL AEROSPACE	HONEYWELL SAS	France	1	24
18	LEONARDO - SOCIETA PER AZIONI	LEONARDO	Italy	1	24
19	SINTEF AS	SINTEF	Norway	1	24
20	NATS (EN ROUTE) PUBLIC LIMITED COMPANY	NATS	United Kingdom	1	24
21	THALES LAS FRANCE SAS	THALES AIR SYS	France	1	24
22	THALES AVS FRANCE SAS	THALES AVS	France	1	24

## 1.2. List of Beneficiaries

No	Name	Short name	Country	Project entry month <sup>8</sup>	Project exit month
23	LETOVE PREVADZKOVE SLUZBY SLOVENSKEJ REPUBLIKY, STATNY PODNIK	LPS SR (B4)	Slovakia	1	24
24	CROATIA CONTROL, CROATIAN AIR NAVIGATION SERVICES LTD	CCL/COOPANS	Croatia	1	24
25	UDARAS EITLIOCHTA NA HEIREANN THE IRISH AVIATION AUTHORITY	IAA/COOPANS	Ireland	1	24
26	NAVIAIR	NAVIAIR/COOPANS	Denmark	1	24
27	ATOS BELGIUM	ATOS (FSP)	Belgium	1	24
28	AIRTEL ATN LIMITED	AIRTEL	Ireland	1	24
29	SAAB AKTIEBOLAG	SAAB	Sweden	1	24



## 1.3. Workplan Tables - Detailed Implementation

Associated with document Ref. Ares(2020)7606929 - 15/12/2020

### 1.3.1. WT1 List of work packages

WP Number <sup>9</sup>	WP Title	Lead beneficiary <sup>10</sup>	Person-months <sup>11</sup>	Start month <sup>12</sup>	End month <sup>13</sup>
WP1	Project Management	1 - INDRA	60.00	1	24
WP2	PJ.34-W3-01 Collaborative U-space-ATM interface	1 - INDRA	928.47	1	24
WP3	PJ.34-W3-02 Collaborative ATM U-space Environment Concept Development	12 - ENAIRE	355.59	1	24
WP4	Ethics requirements	1 - INDRA	N/A	1	24
<b>Total</b>			1 344.06		

### 1.3.2. WT2 list of deliverables

Deliverable Number <sup>14</sup>	Deliverable Title	WP number <sup>9</sup>	Lead beneficiary	Type <sup>15</sup>	Dissemination level <sup>16</sup>	Due Date (in months) <sup>17</sup>
D1.1	Project Management Plan	WP1	1 - INDRA	Other	Confidential, only for members of the consortium (including the Commission Services)	2
D1.2	Management Progress Report	WP1	1 - INDRA	Other	Confidential, only for members of the consortium (including the Commission Services)	12
D1.3	Final Project Report	WP1	1 - INDRA	Other	Public	22
D2.1	PJ34 Solution 1 V2 Data Pack	WP2	1 - INDRA	Report	Public	22
D3.1	PJ34 Solution 2 Initial concept description	WP3	20 - NATS	Report	Public	9
D3.2	PJ34 Solution 2 V1 Data Pack	WP3	12 - ENAIRE	Report	Public	23
D4.1	POPD - Requirement No. 1	WP4	1 - INDRA	Ethics	Confidential, only for members of the consortium (including the Commission Services)	3

### 1.3.3. WT3 Work package descriptions

<b>Work package number</b> <sup>9</sup>	WP1	<b>Lead beneficiary</b> <sup>10</sup>	1 - INDRA
<b>Work package title</b>	Project Management		
<b>Start month</b>	1	<b>End month</b>	24

#### 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

##### **WP1 - Project Management** [Months: 1-24]

##### **INDRA**

Project Management and Coordination (M1-M24). 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 organized: Review meeting with SJU (annual), PMB, EPMB. 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.

Project Quality Management and Standardisation (M1-M24). The coordinator will ensure the quality of the project. A project management handbook has been produced by SJU to define certain processes.

Reporting and Communication with the SJU (M1-M24). In cooperation with all involved partners, the POC for Communication Activities is responsible to provide the required periodic and final reports to the SJU/EC.

Technical and Scientific Coordination (M1-M24). The Project Content Integration Leader (PCIL) 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 (Project Content Integration Team).

Contributions to the SESAR2020 Programme Management (M1-M24). The coordinator provides input to the Programme Committee and its sub-committees meetings and supports discussions through the participating Members of the committee.

Administration of the project according to the grant agreement.

Communication and dissemination activities (M1-M24).

#### Participation per Partner

<b>Partner number and short name</b>	<b>WP1 effort</b>
1 - INDRA	60.00
<b>Total</b>	60.00

#### List of deliverables

<b>Deliverable Number</b> <sup>14</sup>	<b>Deliverable Title</b>	<b>Lead beneficiary</b>	<b>Type</b> <sup>15</sup>	<b>Dissemination level</b> <sup>16</sup>	<b>Due Date (in months)</b> <sup>17</sup>
D1.1	Project Management Plan	1 - INDRA	Other	Confidential, only for members of the consortium (including the Commission Services)	2

### List of deliverables

Deliverable Number <sup>14</sup>	Deliverable Title	Lead beneficiary	Type <sup>15</sup>	Dissemination level <sup>16</sup>	Due Date (in months) <sup>17</sup>
D1.2	Management Progress Report	1 - INDRA	Other	Confidential, only for members of the consortium (including the Commission Services)	12
D1.3	Final Project Report	1 - INDRA	Other	Public	22

### Description of deliverables

#### D1.1 : Project Management Plan [2]

This document will contain the plan to manage the project. including initial schedule, deliverables, risk analysis, meetings, communication and other related matters.

#### D1.2 : Management Progress Report [12]

This report progress cover the year 2021. It will contain both technical elements and financial data for 2021. the content of this report is the progress, achievements made, work completion, status of milestones and deliverables along with the forecast for the PJ34 project including the status of its risks and issues.

#### D1.3 : Final Project Report [22]

This report cover the last year 2022 and will contain the final status of technical and financial data of the project at the end of 2022. The content of this reporting is the progress, achievements made, work completion, status of milestones and deliverables along with the forecast of the PJ34 project including the status of its risks and issues.

### Schedule of relevant Milestones

Milestone number <sup>18</sup>	Milestone title	Lead beneficiary	Due Date (in months)	Means of verification
MS4	Project Kick-Off	1 - INDRA	1	A project Kick-Off will be held to launch the project. A minutes of meeting will be generated.
MS5	First Progress Report	1 - INDRA	10	2021 Progress Report containing the progress, achievements made, work completion, status of milestones and deliverables along with the forecast of the PJ34 project including the status of its risks and issues.
MS6	Final Progress Report	1 - INDRA	22	2022 progress report containing the progress, achievements made, work completion, status of milestones and deliverables.
MS7	Project Closing	1 - INDRA	24	End of the project

<b>Work package number</b> <sup>9</sup>	WP2	<b>Lead beneficiary</b> <sup>10</sup>	1 - INDRA
<b>Work package title</b>	PJ.34-W3-01 Collaborative U-space-ATM interface		
<b>Start month</b>	1	<b>End month</b>	24

### Objectives

The objective of this solution is to define, develop and validate the exchange of U-space information with ATM through SWIM. For this purpose, the main objectives are:

Identify and analyze previous works regarding SWIM and Collaborative U-space – ATM interface.

Definition of the requirements for the information exchange of the U-space SWIM candidate services.

Validation of the information exchange between a set of selected U-space services and ATM.

### Description of work and role of partners

**WP2 - PJ.34-W3-01 Collaborative U-space-ATM interface** [Months: 1-24]

**INDRA, AIRBUS, ANS CR (B4), ON (B4), PANSa (B4), DFS, DSN, ENAIRE, ENAV, FRQ (FSP), HC (FSP), HONEYWELL SAS, LEONARDO, THALES AIR SYS, THALES AVS**

The solution will be divided in three different activities.

**Activity 1: Literature Review and State-of-the-Art** (Lead partner: Airbus)

A detailed study on the state-of-the-art of ATM-U-space collaboration and integration will be conducted. The study will aim at providing a comprehensive and systematic overview on the current status, as well as the anticipated trends, of the operational concepts, architectures and enabling technologies that could support the safe and seamless integration of U-space and ATM. In addition, the study will consider the current global regulatory and standardisation framework and will provide a notional roadmap of the upcoming regulations and standards expected to be developed over the next years. Ultimately, the objective is to inform the work of Activities 2 and 3 (and of Solution 2), so that the use cases defined and the architectural decisions adopted take into consideration and build upon relevant previous work and address identified issues and gaps.

Although the focus of the review will be on Europe, the scope will be global so as to provide an overview on the status of global interoperability of ATM-U-space integration. Thus, relevant research activities and regulation initiatives in the US and other parts of the world, including at the ICAO level, will be considered.

In addition to the document review efforts, we will reach out to Subject Matter Experts in Europe and the US to conduct focused interviews on the subject, with the objectives to gather their assessment and views on ATM-U-space integration. We will also create and deliver a questionnaire to gather views and requirements from a broad stakeholder based and organise one open workshop including key stakeholders (ANSPs, Regulators, airspace users) to gather requirements and identify issues.

**Activity 2** (Lead partner: Indra)

The objective of this activity is the definition of the portfolio of harmonized U-space SWIM candidate information services. Based on these U-space SWIM candidates a concept for the data exchange between ATM and UTM shall be developed. This concept describes the in- and output requirements for the two systems as well as the necessary interface for the connection to the SWIM. One major input for this activity will be the results from activity 1. The literature review and state of the art analysis will be describing the different U-space services.

The operational requirements based on the use cases will be the input for the development of the operational concept (OSD). This operational concept will describe from an operational point of view the use of the different U-Space services and the data exchange between UTM and ATM respectively between ATM and UTM.

Therefore, during activity 2 the development of the service definition for the U-space candidate services will be performed, focusing on how to connect and interact with SWIM following SWIM standards to allow interoperability.

Establishment of web service clients or any other technology to support U-space candidate services will be analysed and decided during project implementation. Initial aim of the project is to maximize potential reutilization of existing SWIM

profiles, identifying both U-space selected services requirements and current SWIM capabilities. Identified GAPS will be analysed and solutions provided as required within project scope.

The results of this activity will also be used to trigger the standardisation of the data exchange between UTM and ATM via SWIM. Therefore, the results will be presented to the different standardisation bodies like EUROCAE. The outcomes of this activity will then be the input for activity 3.

#### Activity 3 (Lead partner: Indra)

The main objective of Activity 3 is the validation of the information exchange requirements defined in Activity 2. For this validation, a set of U-space SWIM candidate services will be selected and the information exchange will be validated in several exercises.

The validation activities have been divided in 'clusters'. All the clusters will follow a common approach, validating the collaborative interface ATM-U-space according to the requirements defined. A common set of services will be validated in every cluster, in order to guarantee the interoperability between them. This will be demonstrated in a final inter-cluster validation exercise. A cluster Coordination Team will be created.

The role of this team will be to provide a coordination and steering platform for the clusters, in order to ensure that the architecture decisions at the cluster level are interoperable and that a common approach is followed to define use cases and validation methodologies. The Cluster Coordination Team will ensure lessons learnt are shared across clusters and will aim at ensuring that the solutions proposed are interoperable across Europe. The Cluster Coordination Team will be in charge of defining a set of inter-cluster Validation Exercises to demonstrate interoperability.

Cluster Coordination Team is complementary to the Project Coordination Integration Team. The Cluster Coordination Team will be in charge specifically of ensuring the coordination between the clusters inside Solution 1 Activity 3 and the PCIT will be focus on the coordination between Solution 1 and 2 and the different external transversal projects.

There will be four clusters:

- Cluster 1, led by INDRA and based in Spain
- Cluster 2, led by FRQ (FSP) and based in Austria and Hungary
- Cluster 3, led by DSNA and based in France
- Cluster 4, led by LEONARDO and based in Italy

#### Cluster 1 (Leader: INDRA)

Cluster 1 will validate the information exchange between ATM systems and U-space following an approach based on EASA's Opinion 01/2020. The validation will be focused on scenarios in the Spanish airspace, using real airspace data and considering mainly operations in CTR areas.

Since the cluster architecture is complex and it involves several partners, an incremental approach will be followed, with consecutive, increasingly complex validation exercises, allowing for the learnings of one exercise to be considered for the next one. 4 Exercises in total are to be carried out. Exercises 3 and 4 are equivalent in complexity and they aim to test two different architecture approaches.

#### Cluster 2 (Leader: FRQ (FSP))

Cluster 2 will focus on

- validation of end to end workflows enabling international drone operations
- demonstrating technical interoperability between U-space airspaces
- enabling information exchange for ground based as well as airborne U-space services and applications.

Validation activities will aim to provide a realistic U-space and ATM operational environment. The central U-space airspace will focus on validating information exchange services and U-space services necessary to support strategic & tactical deconfliction in an integrated environment, including airborne systems.

Cluster 2 plans to use both simulations and test flights, drone operators will be an integral part of validation exercises to ensure relevant information can be exchanged end to end.

Validation exercises are foreseen in real airspace (including) CTR in Hungary & Poland. To ensure efficient validations, some cluster partners will conduct pre-tests, including test flights (e.g. in Austria).

Three exercises will be performed in cluster 2. One exercise per U-space airspace, as well as one integrated exercise. Additionally, cluster 2 will participate in an inter-cluster validation, validating technical interoperability.

#### Cluster 3 (Leader: DSNA)

Cluster 3 aims to demonstrate a simplified SWIM oriented architecture between USSPs and ATM systems, trying to establish direct SWIM interfaces between USSPs and ATM systems, keeping SWIM enabled CIS as a back-up option). This simplified architecture would benefit to two use cases :

- To enable U-space activities in areas where there would not be sufficient activity to be economically viable for a CIS provider,
- To ease interoperability for USSPs being in contact with multiple European CIS, as USSPs would use common standardised SWIM interfaces.

The objective is to implement the following services :

- U2 service : Procedural Interface with ATC
- U3 service : Collaborative interface with ATC

Validation exercises:

Exercise 1: Validation between DSNA and THALES of U2 &U3 SWIM services in one U-space Airspace including real drone flight.

Exercise 2: Validation between DSNA and USSP 2 of U2 & U3 SWIM services in one U-space Airspace

Exercise 3: Validation of U2 & U3 services in a multi USSPs and U-space Airspaces configuration

Exercise 4: Cross Cluster Validation including use of SWIM services with a USSP included in other cluster validation exercises

Cluster 4 (Leader: LEONARDO)

Leonardo will provide a Cluster between an ATM system and one U-space system (D-flight). The two systems will share:

- identification and tracking information;
- Airspace information.

Further description can be found in document Part B of the DoA.

#### Participation per Partner

Partner number and short name	WP2 effort
1 - INDRA	149.48
Indra FT	87.00
UPM	36.00
2 - AIRBUS	3.00
AOSL	67.00
5 - ANS CR (B4)	7.20
Integra	2.40
6 - ON (B4)	2.94
7 - PANSa (B4)	6.00
DRR	24.00
10 - DFS	3.00
11 - DSNA	11.94
12 - ENAIRE	5.60
CRIDA	12.00
INECO	19.80
13 - ENAV	6.07

Partner number and short name	WP2 effort
D-FLIGHT	5.50
TECHNO SKY	1.18
NAIS	8.14
15 - FRQ (FSP)	26.20
FSO	17.76
FRQ RO	22.18
FCO	13.35
16 - HC (FSP)	33.40
17 - HONEYWELL SAS	4.00
HIstro	99.30
18 - LEONARDO	61.95
LDO GMBH	42.40
TPZ	28.15
21 - THALES AIR SYS	93.00
22 - THALES AVS	28.53
<b>Total</b>	<b>928.47</b>

#### List of deliverables

Deliverable Number <sup>14</sup>	Deliverable Title	Lead beneficiary	Type <sup>15</sup>	Dissemination level <sup>16</sup>	Due Date (in months) <sup>17</sup>
D2.1	PJ34 Solution 1 V2 Data Pack	1 - INDRA	Report	Public	22

#### Description of deliverables

D2.1 : PJ34 Solution 1 V2 Data Pack [22]

The Data Pack will comprise V2 deliverables for SPR-INTEROP/OSD, TS/IRS V2, VALR V2, and CBA. The deliverables will indicate clearly which part of the work is V2 and which is V3.

#### Schedule of relevant Milestones

Milestone number <sup>18</sup>	Milestone title	Lead beneficiary	Due Date (in months)	Means of verification
MS1	V2 Gate for Solution PJ34-W3-01	1 - INDRA	23	Delivery of V2 Data Pack for Solution 1.



<b>Work package number</b> <sup>9</sup>	WP3	<b>Lead beneficiary</b> <sup>10</sup>	12 - ENAIRE
<b>Work package title</b>	PJ.34-W3-02 Collaborative ATM U-space Environment Concept Development		
<b>Start month</b>	1	<b>End month</b>	24

### Objectives

The scope of Solution 2 will go beyond the technical implementations of Solution 1 by focusing on developing the operational aspects of the interface, with high volumes of manned and unmanned traffic operating safely and concurrently in the same airspace. Thus, the objective of this WP is to develop and test a medium- to long-term concept for a collaborative ATM-U-space environment, which facilitates seamless operations of drones and manned aviation in non-segregated airspace. To reach this objective, Solution 2 will follow a top-down approach by means of sequential tasks to evolve from the definition of high-level use cases and paradigms of the novel concept up to the functional architectures and information-exchange protocols.

### Description of work and role of partners

**WP3 - PJ.34-W3-02 Collaborative ATM U-space Environment Concept Development** [Months: 1-24]  
**ENAIRE**, INDRA, AIRBUS, DLR, NLR, ANS CR (B4), ON (B4), PANSA (B4), ACG/COOPANS, LFV/  
COOPANS, DFS, DSN, ENAV, EUROCONTROL, HONEYWELL SAS, LEONARDO, SINTEF, NATS, THALES  
AIR SYS

WP3.1.- High-level use cases and operational concept overview (leader: NATS)

This task will detail the new high-level use cases that could be in operation in a new collaborative environment allowing simultaneous operation of high number of drones and manned aviation inside and outside controlled airspace. Additionally, this task will provide a high level view of the operational characteristics of the collaborative ATM-U-space concept, identifying the operational and technological evolution of the U-space and ATM systems with respect to Solution 1.

The overall performance benefits will be also identified, along with a set of high-level operational requirements to be used as reference material in WP3.2.

WP3.2.- Operational Services and Environment for ATM-U-space Collaboration (leader: LFV)

This task will define the main elements of the SESAR Solution (Solution 2 in the context of this project) that will implement the new U-space-ATM Collaborative Concept. Thus, a set of Operational Improvement Steps (OI Steps) and enablers (including system and Procedural and/or Human enablers) will be defined, based on an initial description of the benefit mechanisms associated to the prospective SESAR Solution 2.

Detailed operating methods will also be described, identifying the differences between Solution 1 and Solution 2 operating methods. In addition, this task will provide a detailed description of all use cases that are sufficient to depict how the SESAR Solution works, including nominal and non-nominal situations. Process models shall be needed to describe the interactions between services.

WP3.3.- Safety, Performance and Interoperability requirements (leader: LEONARDO [TPZ])

This task will detail the operational, safety, performance and interoperability requirements associated to the SESAR Solution (Solution 2) that will enable the new U-space-ATM Collaborative Concept.

This WP will define operational requirements associated to the new U-space-ATM Collaborative Concept

WP3.4.- Architectures and deployment technologies (leader: AIRBUS)

The objective is to define feasible architectures that build on and extend the current SESAR SWIM solutions from the perspective of Information exchange and data reference model as well as Technical Infrastructure. The proposed solutions will aim at leveraging some of the new technologies and services required to deploy U-space to improve the overall ATM system.

WP3.5.- Assessment of the solution (leader: ENAIRE)

This WP will research on the safety, efficiency and human performance impact of Solution 2. The compatibility of roles and responsibilities of the U-space service providers and ATS services will be studied, with special attention on the responsibilities dealing with separation and separation minima between manned and unmanned aircraft, and the resulting impact on safety. To this end, the analysis will consider the impact of automation and the potential delegation

of responsibilities to systems with higher automation levels and the means for human operators to interact with such systems.

Validation exercises to be carried out:

- Validation number 1. Human Factors vs Automation. Leader: ENAIRE. Expected maturity: V1

The aim of these experiment will be to:

- Validate novel concepts for ATM-U-space collaboration in a work environment with a higher level of automation.
- Definition of new service concepts for ATM supporting tools of the human actor in a mixed manned and unmanned operating environment.
- Identify bottlenecks for ATM-U-space collaboration in an airspace with fully mixed manned and unmanned air traffic (specifically within the CTR of an airport).
- Advance the state-of-the-art of research into the effects of supervising and collaborating with highly automated systems.
- Definition of a concept of operations (CONOPS) for ATM-U-space collaboration around airports providing air traffic services.

This validation exercise will build on the findings and concepts of the human factors analyses performed in WP2 (specifically those from Cluster 1), which will be used a reference scenario without the assistance of automation. HMI developments will also benefit from the lessons learned in the WP2 validation exercises.

- Validation number 2. Functional Architecture vs Safety and Efficiency. Leader: AIRBUS. Expected maturity: V1 (V2 for some specific services)

The main objective is to conduct a comparative analysis between the different architecture options proposed for the future ATM-U-space collaborative environment, focusing on their suitability to enable automated separation management in scenarios involving simultaneous operations of manned and unmanned aircraft.

- Validation number 3. Advanced drone flight plan and route definition. Leader: INDRA. Expected maturity: V1

The main objective of this exercise is to validate how the new requirements referred to drone flight plan, especially focused on drone route definition will impact on the U-space – ATM collaborative interface

- Validation number 4. Tracking, surveillance and traffic information services advanced interoperability. Leader: INDRA. Expected maturity: V1

The main objective of this exercise is to validate the exchange of information between ATM and UTM systems, regarding U-Space tracking, surveillance and traffic information services, in order to further clarify how/which drone tracking results are relevant to ATM and the impact of drone tracking on manned aviation operations and on ATM.

- Validation number 5. Human Factors vs. Contingency. Leader: AT-One. Expected maturity: V1

This exercise focuses on validating the CONOPS and ATCO display interfaces needed for coping with contingency situations involving drones in unsegregated airspace.

- Validation number 6. U-space resilience to minimize disruptions. Leader: SINTEF. Expected maturity: V1

This exercise seeks to assess how U-Space resilience can be achieved through a set of (semi-)automated algorithms acting on strategic, tactical and operational level, respectively, to minimize the impact of disruptions such as link failures, interference with manned, and other unforeseen/emergency situations. A concrete use-case may be a deviation of low level RNAV traffic in an urban environment that would violate separation minima

WP3.6.- Stakeholder collaboration management and definition of next steps (leader: INDRA)

This task will manage the continuous involvement of the wider drone community. This will be done by putting in place a U-space and ATM Community Network which will represent a broad range of U-space stakeholders. The U-space Community Network will include current and potential UAS operators, and UAS aircraft manufacturers as well as organizations offering services to UAS operators such as UAS airports and insurances. Additionally, the already existing users of the relevant airspace will be represented, including manned aviation (i.e. General Aviation, military, EHS, etc.). Solution 2 will take into consideration the successful experience of the CORUS project in managing this network.

Further description can be found in document Part B of the DoA.

Partner number and short name	WP3 effort
1 - INDRA	57.42
Indra FT	9.00
UPM	12.00
2 - AIRBUS	2.00
AOSL	25.60
3 - DLR	31.50
4 - NLR	20.66
5 - ANS CR (B4)	3.60
Integra	2.40
6 - ON (B4)	2.94
7 - PANSa (B4)	4.00
DRR	7.00
8 - ACG/COOPANS	5.00
9 - LFV/COOPANS	12.16
10 - DFS	8.03
11 - DSNA	10.96
12 - ENAIRE	0.80
CRIDA	27.00
INECO	9.00
13 - ENAV	4.00
D-FLIGHT	3.52
TECHNO SKY	1.00
NAIS	2.00
14 - EUROCONTROL	11.00
17 - HONEYWELL SAS	0.00
HIIsro	6.00
18 - LEONARDO	0.00
E-GEOS	18.58
TPZ	23.42
19 - SINTEF	21.00
20 - NATS	10.00
21 - THALES AIR SYS	4.00
<b>Total</b>	<b>355.59</b>

### List of deliverables

Deliverable Number <sup>14</sup>	Deliverable Title	Lead beneficiary	Type <sup>15</sup>	Dissemination level <sup>16</sup>	Due Date (in months) <sup>17</sup>
D3.1	PJ34 Solution 2 Initial concept description	20 - NATS	Report	Public	9
D3.2	PJ34 Solution 2 V1 Data Pack	12 - ENAIRE	Report	Public	23

### Description of deliverables

D3.1 : PJ34 Solution 2 Initial concept description [9]

The consolidating Gate AO/IR before starting V1. It will comprise the identified performance benefits, along with a set of high-level operational requirements to be used as reference material in WP3.2

D3.2 : PJ34 Solution 2 V1 Data Pack [23]

The Data Pack will comprise V1 deliverables for SPR-INTEROP/OSD, VALR V1, CBA V1 and Final Concept Description.

### Schedule of relevant Milestones

Milestone number <sup>18</sup>	Milestone title	Lead beneficiary	Due Date (in months)	Means of verification
MS2	V0 Gate for Solution PJ34-W3-02	20 - NATS	9	Initial Concept description for Solution 2
MS3	V1 Gate for Solution PJ34-W3-02	12 - ENAIRE	24	Delivery of V1 Data Pack for Solution 2.

<b>Work package number</b> <sup>9</sup>	WP4	<b>Lead beneficiary</b> <sup>10</sup>	1 - INDRA
<b>Work package title</b>	Ethics requirements		
<b>Start month</b>	1	<b>End month</b>	24

### Objectives

The objective is to ensure compliance with the 'ethics requirements' set out in this work package.

### Description of work and role of partners

**WP4 - Ethics requirements** [Months: 1-24]

**INDRA**

This work package sets out the 'ethics requirements' that the project must comply with.

### List of deliverables

<b>Deliverable Number</b> <sup>14</sup>	<b>Deliverable Title</b>	<b>Lead beneficiary</b>	<b>Type</b> <sup>15</sup>	<b>Dissemination level</b> <sup>16</sup>	<b>Due Date (in months)</b> <sup>17</sup>
D4.1	POPD - Requirement No. 1	1 - INDRA	Ethics	Confidential, only for members of the consortium (including the Commission Services)	3

### Description of deliverables

The 'ethics requirements' that the project must comply with are included as deliverables in this work package.

D4.1 : POPD - Requirement No. 1 [3]

4.2 The beneficiaries must confirm that they have appointed Data Protection Officers (DPOs) and the contact details of the DPOs are made available to all data subjects involved in the research. For those institutions not required to appoint a DPO under the GDPR, a detailed data protection policy for the project must be provided. All these elements must be submitted as a deliverable. 4.4 The beneficiaries must explain how all of the data they intend to process is relevant and limited to the purposes of the research project (in accordance with the 'data minimisation' principle). This must be submitted as a deliverable. 4.6 A description of the technical and organisational measures that will be implemented to safeguard the rights and freedoms of the data subjects/research participants must be submitted as a deliverable.

### Schedule of relevant Milestones

<b>Milestone number</b> <sup>18</sup>	<b>Milestone title</b>	<b>Lead beneficiary</b>	<b>Due Date (in months)</b>	<b>Means of verification</b>
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### 1.3.4. WT4 List of milestones

Milestone number <sup>18</sup>	Milestone title	WP number <sup>9</sup>	Lead beneficiary	Due Date (in months) <sup>17</sup>	Means of verification
MS1	V2 Gate for Solution PJ34-W3-01	WP2	1 - INDRA	23	Delivery of V2 Data Pack for Solution 1.
MS2	V0 Gate for Solution PJ34-W3-02	WP3	20 - NATS	9	Initial Concept description for Solution 2
MS3	V1 Gate for Solution PJ34-W3-02	WP3	12 - ENAIRE	24	Delivery of V1 Data Pack for Solution 2.
MS4	Project Kick-Off	WP1	1 - INDRA	1	A project Kick-Off will be held to launch the project. A minutes of meeting will be generated.
MS5	First Progress Report	WP1	1 - INDRA	10	2021 Progress Report containing the progress, achievements made, work completion, status of milestones and deliverables along with the forecast of the PJ34 project including the status of its risks an issues.
MS6	Final Progress Report	WP1	1 - INDRA	22	2022 prograss report containing the progress, achievements made, work completion, status of milestones and deliverables.
MS7	Project Closing	WP1	1 - INDRA	24	End of the project

### 1.3.5. WT5 Critical Implementation risks and mitigation actions

Risk number	Description of risk	WP Number	Proposed risk-mitigation measures
1	Lack of definition of U-space candidate services for U-space ATM interface (Low)	WP2	The initial analysis will define the U-space services, considering inputs from previous projects and fixing the scope of the validations
2	Inconsistency between clusters (Medium)	WP2	Cluster Coordination Team is established from the beginning to guarantee the interoperability.
3	Unavailability of the validation platform (Low)	WP3	Should any of the validation platforms of WP3 be unavailable for testing, simulation facilities provided by other WP3 partners can be utilized. Given the strong presence of research facilities and industry partners in the consortium, it provides many options for finding alternatives.
4	Delays in receiving inputs required for the tasks in this WP (Medium)	WP3	WP3 is following a top-down approach with sequential tasks. Thus, this risk relates to the availability of use cases (WP3.1), CONOPS (WP3.1) and services (WP3.2), as well as the established links to WP2, especially to the literature review as starting point for WP3.1. Regular discussions of the WP3 coordinator with leaders of individual tasks will assure proper coordination and management of delays. Several WP3 partners are participating in the literature review to be performed in WP2, including ENAIRE as solution leader.
5	Overlapping between Solution 1 and Solution 2 scope (Medium)	WP2, WP3	WP1 literature review will be extended to take into consideration not only the previous U-space research projects and regulatory frameworks, but also the SESAR2020 Wave 2 PJ13 as part of the work to be considered in WP2 in order to address the seamless integration between U-space and ATM in WP3 and the use of SWIM services for the initial U-space and ATM initial interactions in WP2.
6	Difficulties to complete V2 for the whole set of services as requested because Solution 2 is not starting in V1 as it was assumed in the call (High)	WP3	Identification of those services which are mature enough to address V2 after the completion of the exercises, and focus the refinement of SPR-INTEROP requirements on those V2 services in particular.
7	Risk of delays related to COVID: limitation to travel, limitation of mobility, limitation of the number of people gathered, limitation to carry out activities in laboratories, companies, test environments, etc. (High)	WP1, WP2, WP3	COVID Coordination Team will be established from the beginning to minimize the impact and to adopt required measures.
8	Risk related to external dependencies. (Low)	WP2, WP3	The consortium will define which state of the art version of SWIM will be used in the projects in order to have the same starting point and avoid

Risk number	Description of risk	WP Number	Proposed risk-mitigation measures
			any kind of misunderstanding and will monitor new version gaps.



### 1.3.6. WT6 Summary of project effort in person-months

	WP1	WP2	WP3	WP4	Total Person/Months per Participant
1 - INDRA	60	149.48	57.42	✓	266.90
· Indra FT	0	87	9		96
· UPM	0	36	12		48
2 - AIRBUS	0	3	2		5
· AOSL	0	67	25.60		92.60
3 - DLR	0	0	31.50		31.50
4 - NLR	0	0	20.66		20.66
5 - ANS CR (B4)	0	7.20	3.60		10.80
· Integra	0	2.40	2.40		4.80
6 - ON (B4)	0	2.94	2.94		5.88
7 - PANSА (B4)	0	6	4		10
· DRR	0	24	7		31
8 - ACG/COOPANS	0	0	5		5
9 - LFV/COOPANS	0	0	12.16		12.16
10 - DFS	0	3	8.03		11.03
11 - DSNA	0	11.94	10.96		22.90
12 - ENAIRE	0	5.60	0.80		6.40
· CRIDA	0	12	27		39
· INECO	0	19.80	9		28.80
13 - ENAV	0	6.07	4		10.07
· D-FLIGHT	0	5.50	3.52		9.02
· TECHNO SKY	0	1.18	1		2.18
· NAIS	0	8.14	2		10.14
14 - EUROCONTROL	0	0	11		11

	WP1	WP2	WP3	WP4	Total Person/Months per Participant
15 - FRQ (FSP)	0	26.20	0		26.20
· FSO	0	17.76	0		17.76
· FRQ RO	0	22.18	0		22.18
· FCO	0	13.35	0		13.35
16 - HC (FSP)	0	33.40	0		33.40
17 - HONEYWELL SAS	0	4	0		4
· Hlsro	0	99.30	6		105.30
18 - LEONARDO	0	61.95	0		61.95
· LDO GMBH	0	42.40	0		42.40
· E-GEOS	0	0	18.58		18.58
· TPZ	0	28.15	23.42		51.57
19 - SINTEF	0	0	21		21
20 - NATS	0	0	10		10
21 - THALES AIR SYS	0	93	4		97
22 - THALES AVS	0	28.53	0		28.53
23 - LPS SR (B4)	0	0	0		0
24 - CCL/COOPANS	0	0	0		0
25 - IAA/COOPANS	0	0	0		0
26 - NAVIAIR/COOPANS	0	0	0		0
27 - ATOS (FSP)	0	0	0		0
28 - AIRTEL	0	0	0		0
29 - SAAB	0	0	0		0
<b>Total Person/Months</b>	60	928.47	355.59		1344.06

### *1.3.7. WT7 Tentative schedule of project reviews*

<b>Review number <sup>19</sup></b>	<b>Tentative timing</b>	<b>Planned venue of review</b>	<b>Comments, if any</b>
RV1	14	Brussels	Intermediate review meeting

### 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 JU). 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
ORDP	Open Research Data Pilot
DATA	data sets, microdata, etc.

## 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

- 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,
- VA-uc if virtual access with access costs declared on the basis of unit cost,
- VA-ac if virtual access with access costs declared as actual costs, and
- VA-cb if virtual 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

Page/section	Nature of change and reason (if applicable)
<b>Part B</b>	
12	Document has been modified in order to reflect the need of the establishment of an advisory board for both solutions.
14	Document has been modified in order to reflect that Solution 2 will target the end of V1 at the end of the project.
17	Section 2.3.2.2. has been updated in order to reflect the changes asked by the SJU regarding Solution 2 in terms of Collaborative ATM U-Space Environment Concept Development.
18	Section 2.3.3. has been created in order to describe the validation exercises. Moreover, in this section, IPR management aspects are considered.
18	WP1 has been modified in order to include communication and dissemination activities in the description of work.
19	Inclusion of Chapter 2 title which has accidentally removed during the process of producing Annex 1 Part B document.
20	WP2 has been modified in order to clarify the following points: - the potential interaction between European regulations and ICAO framework, are not explicitly developed e.g. the potential impact on airspace access rules ) - the handling of military sensitive information in the ATM-U-space interface as required in the Technical Specification is mentioned but not addressed. - how the appropriate representation of U-space users will be ensured is not described clearly (their presence is mentioned only).
25, 26,27	Cluster 2 WP2 has been modified to reflect changes due to PANSA/COOPANS and Thales Las France taking the position that was hosted before by ACG/COOPANS.
26	Figure 5 has been modified in order to reflect the new Cluster 2 Architecture from WP2
31, 48, 59	Document has been modified in order to reflect that Solution 2 will target the end of V1 at the end of the project.
32,33,47	Tasks which will be carried out by Telespazio (TPZ) have been specified.
32	WP3 has been modified in order to include particular description of Solution 2 related to the specific use cases addressing the military/state aircraft needs.
32	WP3.3 has been updated by addressing the handling of military sensitive information in the ATM-U-space interface as required in the Technical Specification.
32	WP3.1 produces a new deliverable (final concept description).
34	In WP3.5, the potential interaction between European regulations and ICAO framework have been further clarified.

37	Description of validation exercise "Functional Architecture vs Safety and Efficiency" has been updated so it also involves specific services for V2 maturity
47	Added new deliverable (final concept description) in the table.
55 - 56	Project AURA Gantt Chart WP1, WP2 and WP3 Updated <ul style="list-style-type: none"> <li>•</li> </ul>
61	The breakdown of the ‘‘other direct costs’’ for NLR has been updated in order to reflect more precision
103	Appointment that Telespazio (TPZ) is leader for solution WP3.3 has been added.
119	Section 4.2.1. has been updated buy including a description of Indra Sistemas S.A. LTP Indra Factoría Tecnológica S.L.U. work.
136	Section 4.2.16 has been updated in order to reflect changes related to HC (FSP)’s subcontracting.
136	Section 4.2.17 has been updated in order to reflect changes related to Honeywell Aerospace LTPs.
140	Section 1.2.21 of Chapter 5 has been updated by providing more information regarding THALES LAS FRANCES SAS tasks to subcontract and subcontractors information.
General	<ul style="list-style-type: none"> <li>• Short names of the beneficiaries has been updated all over the document.</li> <li>• Honeywell Aerospace LTP, Honeywell International Inc. has been taken out of the project and therefore from the document.</li> <li>• Figures numbers and automatic references to figures have been updated.</li> </ul>

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## 1. Excellence

This proposal is a response to the activities described in the SESAR JU Single Programming Document 2020-2022. It is part of the Industrial Research & Validation activities, developed under the SJU Private Public Partnership. The present proposal, in response to the Call *SESAR-WAVE3-03-2020* addresses the topic “Collaborative U-space – ATM interface” which is proposed to be structured as project PJ34-W3, AURA (ATM U-space InterfAce), composed of the following Solutions:

- Solution PJ.34-W3-01 Collaborative U-space-ATM interface
- Solution PJ.34-W3-02 Collaborative ATM U-space Environment Concept Development

Solution PJ.34-W3-03 Higher Airspace Operations is not addressed in this proposal. The scope of solution 3 is identical to the scope of the H2020 ER4 call specified in Application Area 1 of section 3.3.2, SESAR-ER4-2019, call under SJU responsibility. Based on the expectation that the ER4 proposal will be approved and enter into the Grant Agreement preparation phase, to avoid double funding and complex contractual situations it has been decided to not respond to solution 3. The SESAR Members that have stated interest for solution 3 and are not involved in the ER4 proposal will be involved through an Advisory Board arrangement

In the last years, new actors have appeared in the airspace. In the Very Low Level (VLL, below 500ft), drones are being used for multiple applications, from agriculture, inspections or surveillance to future uses such as Urban Air Mobility (UAM). This VLL airspace that until now was rarely used and had a low density of operations (except in airport surroundings) will become an area with a very high demand during next years.

These new actors need to coexist with current airspace users while at least maintaining the target safety levels. This poses new challenges, from an operational, technical and regulatory point of view.

Regarding drone operations in VLL, the U-space definition through the different SESAR projects conducted between 2017 and 2020 (i.e. CORUS project) have led the way to the safe integration of drones into the airspace, demonstrating and testing a wide variety of services, including advanced U3 services. However, there is still work to be done, especially regarding the integration of drones and its coexistence with manned aviation, and therefore, of U-space services, and their interconnection with current ATM systems. Some projects (for example, GOF U-space and DOMUS) have tested this interface, but there is still a lack concept definition for the coordination and corresponding standardization between the U-space and ATM systems.

The U-space-ATM interface should leverage and remain consistent with the work of ICAO with regard to services, information, technical infrastructure and IP-based connectivity, when appropriate. Current aviation connections, through SWIM, will need to be extended to new airspace users, who will also need to use information services and data exchange models.

Taking previous initiatives and research projects, not only in Europe, but also in the rest of the world as starting point, the high-level objective of this project is to validate the information exchange of a first set of U-space services with ATM systems using SWIM and further develop the concept of operations for U-space – ATM collaborative interface.

The **AURA** project will contribute to:

- Enable the development of the VLL operation markets, allowing the introduction of new actors in a safe, harmonized, sustainable and efficient way and compatible with current ATM environment
- Increase the interoperability and avoid the segregation of the airspace, enabling the seamless exchange of information between the different stakeholders, including U-space service providers and ATM
- The evolution of two Essential Operational Changes (EOCs) as defined in European ATM Master Plan 2020, “U-space services” and “Multimodal mobility and integration of all airspace users”, focused on integration of drones into the airspace.
- Regulatory and standardization initiatives, providing inputs for European and international entities, such as EASA, EUROCAE or ICAO

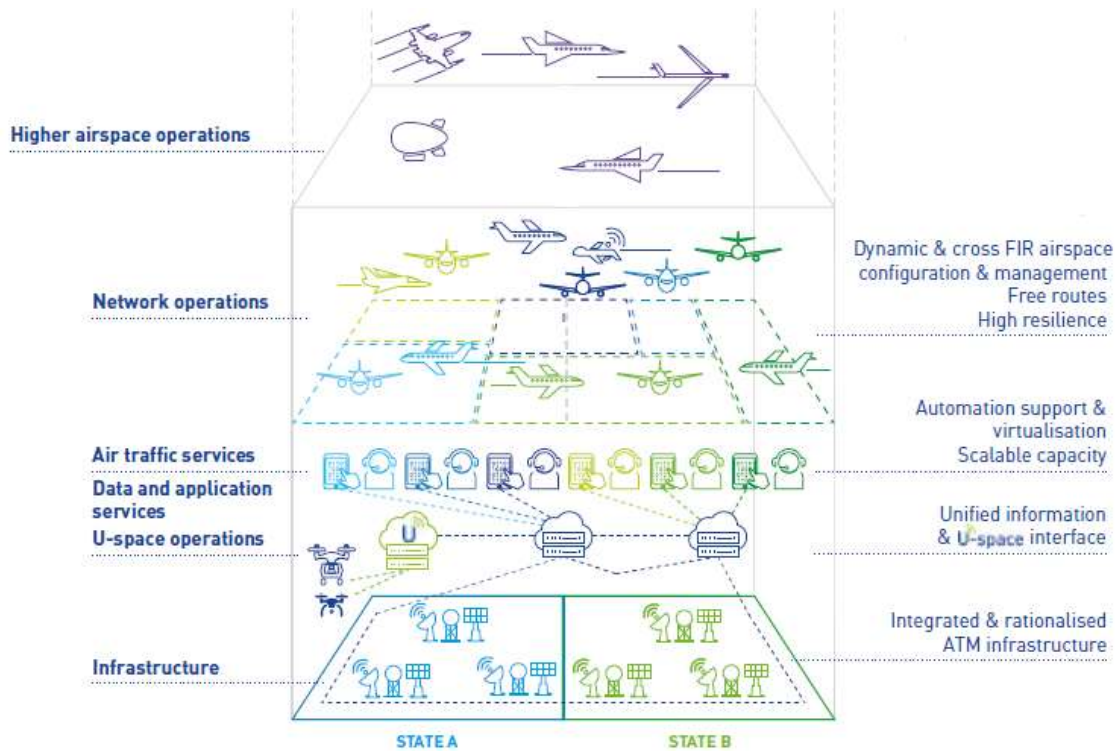


Figure 1: Evolution of the European sky, future architecture. *Source: European ATM Master Plan 2020*

### 1.1. Objectives

The global objective of AURA is to lay the foundations for the integration of the new entrants in current and future air traffic environment, developing the required concept of operations and validating U-space services information exchanges with ATM systems. In order to achieve this objective, all relevant stakeholders (drone operators and system providers, U-space service providers, data services providers, ATM providers and authorities) will be included during the project development and throughout its lifetime.

AURA is focused on the data exchange between U-space and ATM systems where voice communication between air traffic controllers and drone pilots will not be addressed. These communications could be required for drone operations in controlled airspace but its research it is out of the scope of AURA.

This objective will be further achieved through Solution 1 and 2 as defined in PJ34 W3 “Collaborative U-space – ATM interface” Call, including the development and validations (at different maturity levels) of our envisaged solutions.

The specific objectives of AURA are:

- To identify the requirements for U-space information exchange with ATM through SWIM and to validate (V2 and V3 maturity) a set of selected U-space services, developing the service definition for the SWIM candidate services and validating the availability and fitness for purpose of the SWIM U-space candidate interface service definitions (Solution PJ.34-W3-01 Collaborative U-space-ATM interface),
- To define a novel Collaborative ATM-U-space Concept of Operations (ConOps) for drones in a fully collaborative environment with ATM that go beyond the existing concepts developed for a U-space and to validate it to reach V2 maturity (Solution PJ.34-W3-02 Collaborative ATM U-space Environment Concept Development). Thus, Solution 1 will address the coordination between U-space and ATM to safely manage the interactions between drones and manned aviation for a set of specific use cases, and beyond this, Solution 2 will define a new concept of operations to ensure that drones and manned aviation can coexist safely as part of the standard way of operating daily.

Hereafter, the detailed objectives are presented for each one of the individual solutions.

### **1.1.1. Solution PJ.34-W3-01 Collaborative U-space-ATM interface**

The objective of solution 1 is to validate at V2 and V3 level the exchange of information between U-space web(U-space U2 and U3 services) and ATM through harmonized SWIM for avoiding airspace fragmentation and allow the safe operation of drones into controlled and uncontrolled airspace.

In order to achieve this high-level objective, the solution has been divided in three main activities.

1. Literature review and state-of-the art. The objectives of this activity are:
  - a. Systematic identification and applicability analysis of relevant technical concepts, including SESAR SWIM concepts, data models and architecture.
  - b. Systematic identification of relevant standardization and regulation organizations, including EUROCONTROL, EASA, EUROCAE, ICAO, ASTM, ISO, ANSI, SESAR and JARUS for a subsequent analysis and categorization of relevant standardization and regulatory documents.
  - c. Analysis of U-space information exchange requirements defined/identified in previous SESAR U-space projects.
  - d. Study of U-space-ATM interface outside Europe through consultation with international organizations (e.g. NASA and FAA).
  - e. Initial assessment of the potential U-space services for information exchange, analysing the necessity and maturity of the services.
2. Definition of the portfolio of harmonized U-space (U1, U2, U3) SWIM candidate information services. Building upon the results of activity one, the objectives of this activity are:
  - a. Creation of an evaluation catalogue containing metrics for the systematic identification of relevant services for an interface between U-space and ATM stakeholders, identifying the appropriate use cases and information exchange requirements for a selected set of U-space services.
  - b. Definition of SWIM U-space functional and non-functional requirements associated to the required information services, including cyber security considerations.
  - c. Development of the service definitions for the U-space SWIM candidate services, focusing on how to connect and interact with SWIM following SWIM standards to allow interoperability.
  - d. Based on the previous objective, selection of the services to be validated during activity 3, indicating for each of them the targeted maturity level (V2 or V3).
3. Validation of the selected U-space services. The objectives of this activity are:
  - a. Development and prototyping of the required systems to support the validation activities, including the selected U-space services in activity 2 and the SWIM interface.
  - b. Validation, through different exercises, of the information exchange between U-space services selected and ATM systems.
  - c. Assessment of human factors aspects and safety impact of the interface between ATM and U-space, including the identification of the most suitable procedures to manage alerts/instructions from/to ATM to/from U-space service providers and how to present the new information to ATCOs.
  - d. Share the validation results with the standardization bodies identified in activity 1.

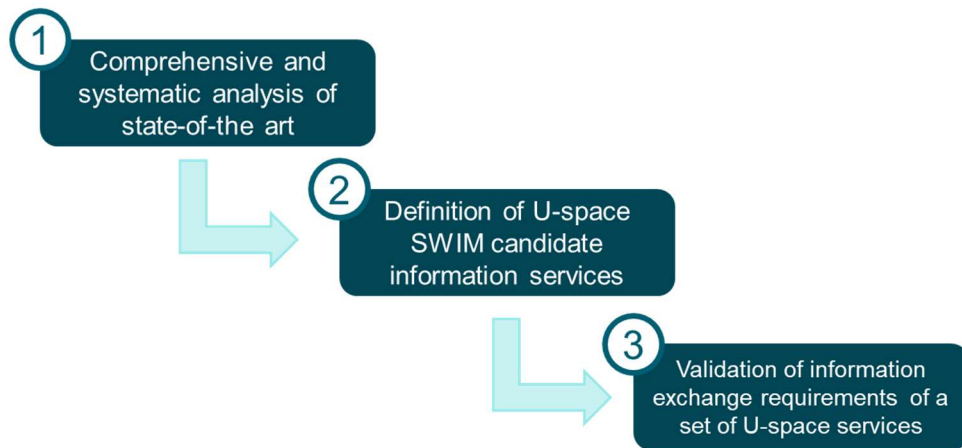


Figure 2: Solution PJ.34-W3-01 activities division

The results of the solution will be essential to continue advancing on the development of U-space and VLL operations, allowing the safe and efficient integration between U-space and ATM. This integration is required for the development of the drone market, enabling operations that today are forbidden or very restricted for safety reasons.

### 1.1.2. *Solution PJ.34-W3-02 Collaborative ATM U-space Environment Concept Development*

This solution will focus on the development and validation of a **medium- to long-term concept for a collaborative ATM-U-space environment**, which facilitates seamless operations of drones and manned aviation in non-segregated airspace. In order to develop this concept, Solution 2 will take into account the previous as well as ongoing research and demonstration projects addressing U-space, in particular the CORUS project as a starting point.

Specifically, this solution will define a novel operational concepts for drones in a fully collaborative environment with ATM that goes beyond the existing concepts developed for a non-collaborative U-space. Furthermore, it will identify what **deployment architectures and information-exchange mechanisms** are required to facilitate such a concept, and provide a baseline for a future traffic management environment which relies much more on autonomy and automated systems. In this context, the main objective for this solution is to develop a Collaborative ATM-U-space Concept of Operations (ConOps), which **ensures access and equity as key performance targets**. Given that the U-space implementation will rely on high automation in its systems, the concept will also address issues related to the collaboration of highly automated machine-based U-space with human-centric ATM.

In order to achieve the envisaged scope of the ConOps, several specific objectives have been identified:

- Provide technical and conceptual guidance on how to safely and effectively coordinate the operations of drones and manned aviation in a fully integrated ATM - U-space environment both inside and outside controlled airspace. This includes guidance for nominal as well as for non-nominal/emergency operations. Identify gaps in existing ATM and U-space concepts, which need to be addressed before implementing a collaborative environment, considering the assessment of the minimum performance of both systems to ensure the safety of the operations.
- Identify additional services that will be relevant for the consistent and seamless interaction between U-space and ATM, including information-exchange mechanisms in a fully collaborative ATM-U-space environment.
- Determine the feasibility of a fully federated service architecture which merges U-space and ATM systems into a single collaborative ecosystem.
- Address key issues related to the supervision, operation and collaboration of human actors within the ATM and U-space context with systems of higher- (and even full) automation and autonomy from a human performance perspective – this includes actors such as air traffic controllers, fleet operators and pilots of manned aircraft, - using Real-Time Simulations (RTS) with V1/V2 maturity.



- Evolve the existing SESAR Performance Framework for ATM to expand its applicability to the provision of both U-space and ATM services, with a special focus on assuring access and equity among all actors.
- Identify the impact of automation disparity between ATM and U-space and identify means to address them.

## **1.2. Relation to the work programme (SESAR JU Single Programming Document 2019-2021)**

This proposal addresses Solution 1 and 2 of PJ.34 (SESAR WAVE3-03-2020) as stated in the Call Technical Specifications. According to the SESAR project execution guidelines, this industrial research project will take previous exploratory research activities into account. Relevant project are listed in the next section. In addition, this project relates to the work programme in the following way:

The project will contribute to the following key principles, in line with the ATM Master Plan 2015:

- Defragmentation of service provision: Solutions 1 and 2 will contribute to this key principle, enabling a seamless airspace, with the validation of advanced U-space services (U2 and U3) and its collaborative interface with ATM. Solution 2 will contribute to streamlining service provision by defining interoperability requirements of technologies and service architectures to support the information-exchange needs of the collaborative ATM-U-space interface.
- Interoperability, being the main focus of the project the validation of information exchange between U-space services and ATM, aligned with current SWIM standards. This way, the interoperability between the stakeholders (both U-space and ATM ones) is guaranteed.
- Scalability, the approach follows a Service Oriented Architecture and in most of the cases, U-space services will be cloud-based, enabling scalable deployments.
- Network performance, the deployment of U-space services and the interface with ATM systems will allow the growth of drone operations across Europe. The validations will include several USSPs and drone operations.
- Deployment oriented architecture: The project will contribute to the deployment of the U-space roadmap in Europe, validating the exchange of information between U-space and ATM and being the results available for regulators and standardization bodies.
- Through the harmonized ConOps approach, the project will contribute to the tackling of the limits to growth particularly in the new entrants market. In addition, a well-defined and interoperable U-space/ATM interconnection will also allow a sustainable growth in traditional aviation especially after the impacts suffered from the COVID-19 crisis.
- The dissemination activities will contribute to a harmonized external EU aviation policy.
- The integration of new entrants and the sustainable interconnection of U-space and ATM will allow higher levels of autonomy and connectivity which will allow more efficient traffic management.
- The implementation and validation of SWIM services will allow increased connectivity and digital information exchange.

Regarding performances, the AURA project aims to improve:

- Safety, increasing the situational awareness of ATCOs and other stakeholders by providing relevant drone information for its operations and avoiding possible safety incidents (for example, in airport surroundings and CTRs).
- Access and equity, enabling the access of the new entrants into the airspace, contributing to a seamless integration of all airspace users.
- Capacity: A better management of information exchange between U-space/ATM can provide benefit in terms of optimisation of airspace usage by the different stakeholders (manned and unmanned).
- Human Performance: AURA will mitigate the impact on ATCO performance and workload through the use of novel traffic management concepts supported by automation and ecological display design of human-machine interfaces.

In relation with the geographical spread, the solutions are applicable across all Europe and there is not time scale limitations.

Solution PJ.34-W3-03 Higher Airspace Operations is not addressed in this proposal. The scope of solution 3 is identical to the scope of the H2020 ER4 call specified in Application Area 1 of section 3.3.2, SESAR-ER4-2019, call under SJU responsibility. Based on the expectation that the ER4 proposal will be approved and enter into the Grant Agreement preparation phase, to avoid double funding and complex contractual situations it has been decided to not respond to solution 3. The SESAR Members that have stated interest for solution 3 and are not involved in the ER4 proposal will be involved through an Advisory Board arrangement

### **1.3. Concept and methodology**

#### **1.3.1. Concept**

Right from the launching of U-space by the European Commission in 2016, SESAR JU has been in charge of coordinating the research and development activities regarding U-space and drone integration in Europe. Under this task, the U-space blueprint was developed, setting the basis for U-space services deployment roadmap in Europe.

From 2017 to 2020, several projects have investigated, defined and validated the new U-space services, including exploratory research projects and demonstration projects. The AURA project will use the results of these projects as a foundation and will continue advancing the development of U-space, focusing in the collaborative interface between U-space and ATM. Most of the partners involved in AURA were also involved in these initial SESAR U-space projects, guaranteeing a correct understanding of the results and avoiding duplications. Some of the projects that have investigated U-space and ATM collaborative interfaces in detail, and therefore, will be used as an input for AURA:

- CORUS
- AIRPASS
- GOF U-space
- VUTURA
- SAFIR
- DREAMS
- IMPETUS
- DROC2COM
- TERRA
- SECOPS
- DOMUS
- SAFEDRONE
- GEOSAFE
- PODIUM

In addition, AURA will maintain a high coordination with Exploratory Research 4 projects and the very large demonstrations that will be developed during the project execution. In addition, the project will seek to cooperate with other relevant projects in Europe (e.g. UAM activities in MG-3-6) and in the rest of the world (e.g. NASA U-space) Regarding SWIM, AURA project will use the inputs from previous SESAR Wave 1 and Wave 2 SWIM related projects, such as PJ17.

Besides, several organizations worldwide are working on the development of new regulations and standards for U-space and drone integration into the airspace. The work of these organizations will also be considered as a starting point to AURA. In this sense, AURA project will consider at least the outcomes of the following organizations:

- EUROCONTROL and the U-space Network of Demonstrators
- EASA, and more specifically the Opinion 01-2020: High-level regulatory framework for the U-space and the regulations “Easy Access Rules for Unmanned Aircraft Systems” (Regulation (EU) 2019/947 and Regulation (EU) 2019/945).
- EUROCAE, WG-105



- JARUS
- ICAO UTM Guidance materials
- NASA
- FAA

Considering all the inputs described above and the objectives of the project, AURA will validate the collaborative interface between U-space services and ATM through SWIM following a progressive approach. Firstly, a systematic analysis of all the inputs available and identification of the U-space services will be conducted. These U-space services will be divided in two main groups depending on the maturity and its relevance to ATM systems.

One of the groups will be analysed in detail, establishing the information exchange requirements and some selected services will be validated (up to V2 or V3 maturity), involving all the systems required, as USSPs and ATM systems.

Secondly, AURA will continue with the work started during CORUS project, defining the concept of operations for the collaborative interface U-space-ATM within an environment with elevated numbers of drone operations in un-segregated airspace. The ConOps will focus on elaborating the most relevant aspects of the U-space-ATM interface to assure that the concept is robust enough to cope with high traffic numbers, completely de-centralized services and high automation, as well as to facilitate evolving business models. This concept will go beyond the use of existing SWIM services to analyse the information requirements that best fit the ConOps from a “top-down” perspective.

In order to achieve a successful development of the project all the stakeholders involved in drone activities and its integration will be considered. In this sense, between the partners of the consortium there are a wide representation, including ANSPs, industry providers (that produce both ATM and U-space systems), research centres, USSPs and components manufacturers. External stakeholders will be engaged during the project in order to cover the end-to-end process. This engagement will be managed as an activity inside the project management, with the collaboration of the solution leaders.

In order to guarantee a correct communication with the relevant stakeholders, AURA will establish an Advisory Board common for the two solutions that will be informed of the developing of the project and will provide relevant inputs.

During the following paragraphs more details of the concept of each solution are given.

#### *1.3.1.1. Solution PJ.34-W3-01 Collaborative U-space-ATM interface*

Solution 1 will address the information exchange required between U-space and ATM to ensure a safe integration of drones and avoid airspace fragmentation. The value of the drone market is expected to reach EUR 10 billion annually by 2035, with more than 400,000 drones providing services by 2050. Even if this prediction is dated in 2016, the growth potential is expected to remain solid. It is therefore, essential to enable this market to integrate drones with the rest of airspace users and current systems, including ATM.

Operation of drones in the VLL differs from traditional aviation, from the performance of the vehicles to the needed flexibility of the operations and the requirements to own and fly a drone. For these reasons, specific services are required to maintain the safety in the VLL allowing drones operations. These services are covered by U-space, providing a framework to enable the operations. As it has been explained in the previous sections, several projects have defined and tested the U-space services, and this solution will use these services as a baseline.

Regarding the regulatory environment, EASA has published the Opinion 01-2020: High-level regulatory framework for U-space that will be considered during the development of solution 1. There are several aspects of U-space, as the federation of U-space Service Providers (USSPs) and the Common Information Service

(CIS) that are included in the Opinion. During the development of solution 1, it is not intended to validate this or any other architecture, but to follow an end-to-end approach through different U-space deployments used during the validation exercises.

The solution will first assess works from SESAR and others international entities and then the initial list of U-space U2/U3 services candidates for information exchange will be determined. In particular, the solution will determine which services and which specific information is relevant to ATM systems. This information exchange will be validated up to V2 or V3 depending on the services.

During the validations, the information exchange between the different stakeholders will be performed through SWIM. The technical and operational capabilities of SWIM will be studied, using as input previous SESAR SWIM related projects, as PJ17. The U-space candidate services and the data exchange will be defined, complying as much as possible with current formats and standards and providing new ones when there is no a proper fit.

The following principles will be taken into consideration during the development of the solution:

- The main focus is the information exchange between U-space and ATM systems, regardless of specific U-space architectures or deployments. The information exchange should be limited to the relevant information. To guarantee the interoperability between systems, the solution will use as much as possible current developments, such as SWIM interface to avoid large changes or adaptations in ATM systems. The assumption is that current matured SWIM profiles are supporting the solution needs, no specific work for defining new profiles is expected. Extensions of the data models could be envisioned to handle U-space specific information.
- U-space – ATM SWIM Interface developed in the solution will be focused on the exchange of U-space information through harmonised SWIM information services between various U-space stakeholders such as drone operators, U-space service providers, ATM service providers, data service providers, aeronautical data providers and authorities
- Normal ATCOs operations should not be impacted due to U-space information. Even though, new procedures and tools will be required for U-space-ATM integration, these should not impose an increase in the workload or impact the safety of manned aviation operations.

Operational improvements steps are not yet defined for this SESAR solution and the results of the projects will contribute to the corresponding update of ATM Master Plan.

#### *1.3.1.2. Solution PJ.34-W3-02 Collaborative ATM U-space Environment Concept Development*

The fully collaborative ATM-U-space concept developed in Solution 2 will provide the baseline for the merging of unmanned and manned traffic management. It will address the major stepping-stones and gaps identified in previous projects as well as build on novel ideas, in order to assure that the necessities of the ATM and U-space environments are addressed and can co-exist in a fair and equitable manner. The principle ideas underlying Solution 2 are summarized at a high-level as follows:

- The **U-space-ATM collaborative concept** will be drafted around previous research initiatives and concepts defined for the future U-space and ATM environment. The useful information will then be extrapolated to support the idea of a concept allowing simultaneous operations of drones and manned aviation in a new collaborative environment with high density operations and multiple automated drones under the supervision of fleet operators, allowing seamless integration between U-space and ATM. The assurance of a target level of safety - and the tight interconnection with security matters - will be at the core of the concept. This will imply to investigate, among other research areas, ways of ensuring separation between drones and manned aviation, or capability of the systems to cope with drone non-nominal events which, due to the higher probability of occurrence, should be considered as part of the daily operation.
- In order to allow for the complete, un-segregated integration of drones in mixed manned and unmanned airspace it will become necessary to design how U-space and ATM services will interact and harmonize the information exchange process between U-space and ATM thanks to a **consistent architecture with interrelated ecosystem of services**. This will require U-space information

exchange mechanisms to follow standardized formats, and the upgrade of ATM information services in line with modern information management concepts. From an information distribution point of view, service connections between U-space services, ATM services or intra U-space-ATM services should become completely transparent. This U-space-ATM collaborative architecture will take into consideration the strengths, drawbacks and gaps of exchanging U-space information through harmonised SWIM information services, which is proposed in Solution 1, and define concepts for new information services to fill the identified shortcomings.

- **Automation will become a crucial part of U-space as well as the future ATM system.** However, it will be some time before the human actor is completely removed from the loop. Solution 2 will identify the effect of the ConOps on human actors involved in the process, especially from the ATM point of view, given that the current system for traffic management revolves around the human Air Traffic Controller (ATCo). The human factors analysis of this task will build on the concept of ATM-U-space collaboration to manage mixed drone and manned air traffic within controlled airspace. ATCo acceptance of drones governed by automated U-space systems must be addressed in order to facilitate access to controlled airspace and part of the daily standard operations. The human factors analysis will be performed by comparing the solution scenario (collaborative environment with automation support) with a reference scenario (no collaborative support with limited ATCo information about drone operations).
- In a fully mixed manned and unmanned traffic environment, a fair access to airspace to all actors will be crucial so as not to put any actor at a disadvantage. This solution will build on the most current SESAR performance framework (PJ19) and U-space performance framework (DACUS) initiatives to identify the possible opportunities, overlaps or blocking points between the two concepts and propose an evolution of a **joint performance framework** applicable to areas where both U-space and ATM services are provided.

Results obtained from applying the afore-mentioned ideas will flow into the definition of the concept or operations and associated operational, safety and interoperability requirements at the end of Solution 2. The U-space-ATM Collaborative Concept will address a wide set of aspects of both systems to ensure the seamless integration between them such as drone surveillance and tracking and how this is impacting manned aviation, drone route definition or weather requirements in the collaborative environment. Although Solution 2 experiments (including real-time simulations for specific use cases) will allow testing the operational feasibility of some of the aspects of the new concept as requested by the E-OCVM to reach V2 maturity, it is not possible to ensure that V2 will be completed for the wide diversity of services in place. Consequently, the Solution 2 target will be to reach the end of V1<sup>1</sup> at the end of the project.

Achieving this goal will require collaborative effort from the participating stakeholders in the development of U-space and ATM (air navigation service providers, industry representatives, and research organizations). This effort will also include the consideration of the wider aeronautical and drone community, which includes general aviation representatives, drone operators, airports, legislating bodies and U-space service providers. The incorporation of such a large and varying group of stakeholders into the definition of the ConOps will assure the applicability of the concept defined therein to satisfy their requirements.

### **1.3.2. Methodology**

In this section, the specific methodology used for each solution is detailed.

#### **1.3.2.1. Solution PJ.34-W3-01 Collaborative U-space-ATM interface**

The validation methodology to achieve the required maturity consists on different methods, techniques and tools in line with the E-OCVM.

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<sup>1</sup> Another reason that justifies this deviation with respect to the Call is that the initial maturity of this solution at the moment of preparing this proposal cannot be considered V1 as identified in the Call. Although CORUS Concept of Operation will be the starting point for the work, this previous project was not addressing the seamless integration between U-space and ATM as requested in the scope of this solution.

The target maturity level for this solution is V2 with some services validated up to V3 level. A close coordination is planned with Solution PJ.34-W3-02 in order to avoid duplications.

The validation process will include different aspects. Apart from the development and upgrade of the required systems (most of them based on current platforms) it is very important to define the new procedures for the management of U-space information in ATM systems and analyse associated human factors aspects. There are several validation exercises planned covering all these aspects and following an end-to-end approach.

For the validation activities, Real Time Simulations (RTS) are planned, including U-space systems, ATM systems, SWIM and different simulation tools. The focus of these validations is the interface between the U-space services and ATM through SWIM. There are several validation exercises planned covering all these aspects and following an end-to-end approach.

The first validation exercises will be based on simulated drone traffic and simulated manned traffic, to perform a first evaluation of the information exchange and refine the involved systems. The scenarios will be created simulating real operations and inputs from drone operators will be considered to make the scenarios as real as possible.

At least one of the validation exercises planned involves real drone flights, connected to the U-space systems and transmitting real information. This information will be processed by U-space and then the required U-space information will be exchanged with the ATM systems and evaluated by ATCOs. The validations will include humans-in-the-loop, including ATCOs, drone pilots and U-space system operators. In this way, it will be possible to collect feedback of the stakeholders involved. It is especially relevant to obtain feedback from controllers, to evaluate the operational feasibility of the solution, their situational awareness and to avoid an increase of controller workload with the new U-space information.

The different validation techniques will allow to test the U-space – ATM interface following different approaches, from simulated traffic with focus on the technical side of the information exchange to real flights and human-in-the-loop validation with focus on the operational side.

As explained in the concept, there are still uncertainties regarding U-space architectures and different deployments are being conducted in different countries (federated, centralized or mixed modes). For this reason, the validation exercises will consider different approaches in order to demonstrate the validity of the U-space-ATM interface regardless of the U-space architecture. Some of the validations will use platforms from different vendors to ensure a correct interoperability.

The validations have been divided in ‘clusters’. Each cluster is composed of several partners providing different platforms or operational expertise. All the clusters will follow a common approach, validating the collaborative interface ATM-U-space according to the requirements defined. A common set of services will be validated in every cluster, in order to guarantee the interoperability between them that will be demonstrated in a final inter-cluster validation exercise.

In addition to the common set of services, each cluster will focus on specific use cases and services in their validation exercises. The validation exercises will involve fast-time and real-time simulations, culminating with Live-Virtual Constructive experiments combining actual drone flights with simulated traffic and controllers in the loop.

In order to ensure that the clusters remain coordinated, a coordination layer across the clusters will be established, implemented through a Cluster Coordination Team including representatives from all the clusters. The role of this team will be to provide a coordination and steering platform for the clusters, in order to ensure that the architecture decisions at the cluster level are interoperable and that a common approach is followed to define use cases and validation methodologies.

Besides the operational side, the validation exercises will also consider cyber security aspects and performance aspects, such as delays in the information exchanges, possible information losses and its impact on the operations.

#### *1.3.2.2. Solution PJ.34-W3-02 Collaborative ATM U-space Environment Concept Development*

Solution 2 will follow a **top-down approach** with the target of developing and testing a medium- to long-term **concept** for a collaborative ATM-U-space environment, which facilitates seamless operations of drones and manned aviation in non-segregated airspace. Solution 2 initial tasks will be synchronized with the analysis and description of the European and worldwide **state-of-the-art in Solution 1**. This will facilitate the consistency between the short-term solutions for U-space-ATM interfaces and the mid- to long-term concept to be addressed in this solution.

The Solution 2 top-down approach will start by **defining use cases**<sup>2</sup> which should be supported by a new collaborative environment allowing the simultaneous operation of high number of drones and manned aviation inside and outside controlled airspace. Use case definitions will consider both nominal and non-nominal/emergency situations for both drones and manned aircraft. These will be relevant business-related use cases which are intended to be in place in the medium- to long-term U-space phases and will not be fully in operation without refining or increasing the Solution 1 short-term SWIM services. These use cases will be developed by considering the following key inputs:

- Findings of the Solution 1 literature review;
- The Concept of Operations defined by the exploratory research project CORUS;
- The pending EASA regulation on U-space;
- Available material provided by SESAR Wave 1 PJ13 and existing documentation in the on-going SESAR Wave 2 Solution 115 and Solution 117.
- Results from previous SESAR exploratory research process and other H2020 activities (e.g. MG-3-6-2020 and MG-2-8-2019)
- SESAR Performance Framework in PJ19.04.

These business-related use cases will be the starting point to identify the **key principles of the collaborative ATM-U-space environment concept** such as for instance, the envisioned level of automation of ATM and U-space systems or the CNS required technologies.

Use cases will be supported by relevant services of the U-space and ATS systems that should interact to facilitate the seamless operations. Then, Solution 2 will **refine and further develop existing U-space services** to ensure the complementarity of the current and envisioned ATS services and the U-space services to be provided in the same airspace. New U-space services, including U-space traffic information services, could also emerge in this analysis. Key functionalities and processes associated to the services will be described in detail.

In this step, Solution 2 will research on **the roles and responsibilities of the actors and systems** involved in the processes and services. Complementarity of the roles and responsibilities of the U-space service providers and ATS services will be studied, with special attention to the responsibilities dealing with separation, separation minima and priority. To this respect, the impact of automation and the potential delegation of responsibilities to the systems due to the automation level will be considered as part of the analysis. Roles and responsibilities of the different actors will be considered for both nominal and non-nominal use cases.

Based on the previously defined U-space services, processes and responsibilities, Solution 2 will **develop the operational requirements** associated to the new U-space-ATM Collaborative Concept, with special attention to the drone route definition in the envisioned drone flight plan management, the requirements for the

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<sup>2</sup> Relevant business-oriented use cases which are intended to be in place in the medium- to long-term phases and cannot be widely displayed through Solution 1 SWIM services.



surveillance and tracking for drones and the impact on manned aviation operations, and the quality of weather information, considering the need of micro-weather.

Then, Solution 2 will design a **deployment architecture that will consider the information-exchange technologies** to ensure the seamless integration between U-space and ATM. Dependencies and information exchange requirements between services will be analyzed. Consistency with EASA Opinion and proposed local implementations in different European geographical areas will be studied. The exchange of U-space information through harmonized SWIM information services could be expanded to address the new information-exchange requirements.

Finally, Solution 2 will research on the necessary **evolution of the SESAR performance framework**, in particular considering Key Performance Areas (KPs) dealing with Access and Equity to extend its applicability to the areas where both U-space and ATM services are provided. Based on the new SESAR-U-space framework, several experiments are envisioned to test the performance of the new concept of operation.

These experiments<sup>3</sup> are envisioned that will allow taking decisions on the most suitable solutions from the perspective of their impact on relevant performance areas, with special attention to safety and human factors. These validations will be focused on the specific research questions that will emerge from the previous analysis, and they will be based on **low-fidelity validation techniques** such as small-scale human-in-the-loop demonstrations, modelling or fast-time simulations and initial Real Time Simulations (RTS). As an example, one of the most probable validations to be executed will validate the potential role of supervisors of drone fleets and the interactions with Air Traffic Controllers in a highly automated environment, with various roles and responsibilities depending on the level of automation and human-machine function allocation. An use case for the use of RTS is the research on how ATCOs, U-space Service Providers (USSPs) and drones/drone pilots should respond to emergency situations in a safe and predictable manner. Such a use case will need to be tested and refined in a simulated environment before it can be deployed in the field.

On the other hand, Solution 2 will work in close coordination with a **U-space and ATM Community Network** which will represent a broad range of U-space stakeholders participating in several Solution 2 workshops, allowing them to contribute to the development and review of the Solution 2 material. The U-space Community Network will include current and potential UAS operators, and UAS manufacturers as well as organizations offering services to UAS operators such as UAS airports and insurances. Additionally, the already existing users of the relevant airspace will be represented, including manned aviation (i.e. General Aviation, military, EHS, etc.). Relevant social representatives will also be invited (e.g. community organizations, etc.). Solution 2 will take into consideration the successful experience of the CORUS project in managing this network.

Deeper involvement will also come from the project **Advisory Board**, a subset of the Community Network that commit to supporting the consortium by answering questions, reviewing documents and providing technical advices to the Consortium Contributors. The Advisory Board will also enhance the project's links to other research and/or standardisation work from organisation such as EUROCAE, JARUS, EASA, and ICAO.

We will enforce links to airspace users by ensuring their participation in the U-space and ATM Community Network and including airspace user organizations (such as GUTMA or the French Civil Drone Council) as part of the Advisory Board. For these tasks we will count on SJU support to help us identify stakeholders to include in the group. Moreover, the Advisory Board will enhance the project's links to other on-going research and standardization and regulatory work from external entities.

Concerning the interactions between European regulations and ICAO framework, our aim is to identify existing working groups in order to define specific coordination actions as well as an action plan together with them. This will allow the consortium to participate in on-going discussions in these groups. Additionally, we will aim to have representatives of these working groups as participants to the Advisory Board. As for the relevance of the project concerning European regulations and the ICAO framework, we will incorporate

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<sup>3</sup> Additional experiments can be defined in the previous steps of this top-down process to solve specific questions dealing with the services requirements or the architectures and information-exchange technologies to be used.

elements, such as the **(future) airspace access rules, as part of the boundary conditions** for the exercises in Solution 2.

Finally, the consortium will also involve the European Defence Agency in Solution 2 activities via the Advisory Board and dedicated community interaction groups. This will allow capturing the view of the Agency on the handling of military sensitive information.

### **1.3.3. Validation Exercises**

In this section, the specific validation exercises are detailed.

#### **1.3.3.1. Description of WP 1**

**Project Management and Coordination (M1-M24).** 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 organized: Review meeting with SJU (annual), PMB, EPMB. 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.

**Project Quality Management and Standardisation (M1-M24).** The coordinator will ensure the quality of the project. A project management handbook has been produced by SJU to define certain processes.

**Reporting and Communication with the SJU (M1-M24).** In cooperation with all involved partners, the POC for Communication Activities is responsible to provide the required periodic and final reports to the SJU/EC.

**Technical and Scientific Coordination (M1-M24).** The Project Content Integration Leader (PCIL) 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 (Project Content Integration Team).

**Contributions to the SESAR2020 Programme Management (M1-M24).** The coordinator provides input to the Programme Committee and its sub-committees meetings and supports discussions through the participating Members of the committee.

**Administration** of the project according to the grant agreement.

**Communication and dissemination activities (M1-M24).**

#### **1.3.3.2. Description of WP2**

The solution will be divided in three different activities.

#### **Activity 1: Literature Review and State-of-the-Art (Lead partner: Airbus)**

A detailed study on the state-of-the-art of ATM-U-space collaboration and integration will be conducted. The study will include the following tasks:

Definition of the scope and requirements of the analysis (in collaboration with Solution)

Review and analysis of documentation (following agreed guidance on key elements to look for)

Interviews with Subject Matter Experts

Surveys and workshops involving representatives of key stakeholders

Compilation and analysis of all the material and elaboration of summary report, including conclusions and highlighting key inputs for Activities 2 and 3 (and Solution 2)

The study will aim at providing a comprehensive and systematic overview on the current status, as well as the anticipated trends, of the operational concepts, architectures and enabling technologies that could support the safe and seamless integration of U-space and ATM. In addition, the study will consider the current global regulatory and standardisation framework and will provide a notional roadmap of the upcoming regulations and standards expected to be developed over the next years. Ultimately, the objective is to inform the work of Activities 2 and 3 (and of Solution 2), so that the use cases defined and the

architectural decisions adopted take into consideration and build upon relevant previous work and address identified issues and gaps.

Although the focus of the review will be on Europe, the scope will be global so as to provide an overview on the status of global interoperability of ATM-U-space integration. Thus, relevant research activities and regulation initiatives in the US and other parts of the world, including at the ICAO level, will be considered.

The following material will be considered for review as part of this Activity:

Publicly available information: Published academic papers on ATM-U-space collaboration and interoperability, publications from NASA and other relevant research centres.

SESAR U-space Projects: Deliverables from completed SESAR U-space projects, including CORUS, IMPETUS, DROC2OM, SAFIR, VUTURA, DREAMS, TERRA, PODIUM, SECOPS and GOF U-space. Draft documentation from relevant ongoing SESAR ER projects, such as DACUS. We will reach out to those projects to access their preliminary results and share knowledge and lessons learnt.

SWIM: Review of general principles, service oriented Architectures, information services; status of SESAR SWIM (System Wide Information Management), including services, data Models and Technical Infrastructure (SWIM Profiles).

Regulation and standards: Systematic identification and review of relevant standardization and regulatory documents from relevant Standards Organizations, Rulemaking bodies and regulators, including ICAO (International Civil Aviation Organisation), FAA (Federal Aviation Organization), EUROCONTROL (European Organisation for the Safety of Air Navigation); EUROCAE (European Organisation for Civil Aviation Equipment); CASA (Australian Civil Aviation Regulator), CAA (UK Civil Aviation regulator), EASA (European Union Aviation Safety Agency); ASTM (American Society for Testing and Materials); ISO (International Organization for Standardization); ANSI (American National Standards Institute), especially their upcoming “Standardization Roadmap for Unmanned Aircraft Systems” and JARUS (Joint Authorities for Rulemaking on Unmanned Systems).

In addition to the document review efforts, we will reach out to Subject Matter Experts in Europe and the US to conduct focused interviews on the subject, with the objectives to gather their assessment and views on ATM-U-space integration. We will also create and deliver a questionnaire to gather views and requirements from a broad stakeholder based and organise one open workshop including key stakeholders (ANSPs, Regulators, airspace users) to gather requirements and identify issues.

**Deliverable:** Summary Report on literature review and state-of-the art of ATM-U-space Collaboration. Conclusions and implications for Solutions 1 and 2.

There will be a first delivery on T0+3 and a final delivery on T0+6

- Leader: AIRBUS
- Contributors: INDRA, ANS CR (B4), ENAIRE, FRQ (FSP), LDO
- Reviewers : ON (B4), DSNA, ENAV, Honeywell, THALES AVSActivity 2 (Lead partner: Indra)

**Activity 2: Definition of the portfolio of harmonized U-space (U1, U2, U3) SWIM candidate information services (Lead partner: Indra)**

The objective of this activity is the definition of the portfolio of harmonized U-space SWIM candidate information services. Based on these U-space SWIM candidates a concept for the data exchange between ATM and UTM shall be developed. This concept describes the in- and output requirements for the two systems as well as the necessary interface for the connection to the SWIM. One major input for this activity will be the results from activity 1. The literature review and state of the art analysis will be describing the different U-space services. This description will be used as input to fill the evaluation metrics for the identification of the relevant U-space services.

To achieve this objective, an evaluation catalogue containing metrics for the systematic identification of relevant services for an interface between U-space and ATM stakeholders will be created. The partners in this activity will identifying the relevant uses cases were the data exchange between UTM and ATM is



necessary. These use cases will be described in detail the relevant in- and output data for both systems and which information has to be sent via SWIM. Based on this results the information exchange requirements for the selected set of U-space services will be defined. These operational requirements will be translated into functional requirements to be provided by SWIM and CIS/USSPs services

The operational requirements based on the use cases will be the input for the development of the operational concept (OSED). This operational concept will describe from an operational point of view the use of the different U-Space services and the data exchange between UTM and ATM respectively between ATM and UTM. The main focus is on the information that necessary in the ATM and UTM system to fulfil the tasks in both systems.

Besides, during activity 2 the development of the service definition for the U-space candidate services will be performed, focusing on how to connect and interact with SWIM following SWIM standards to allow interoperability.

These tasks will give as a result two deliverables: Initial SPR-INTEROP/OSED V2 and Initial Technical Specifications (TS/IRS) V2. These two documents are the input for activity 3 the validation of the data exchange between UTM and ATM. The OSED will be used in the different validation exercise as input to define the working arrangement for the participants. The Technical Specification is the input for the technical developments for the validation. This technical specification shall be validated in the different exercises

Establishment of web service clients or any other technology to support U-space candidate services will be analysed and decided during project implementation. Initial aim of the project is to maximize potential reutilization of existing SWIM profiles, identifying both U-space selected services requirements and current SWIM capabilities. Identified Gaps will be analysed and solutions provided as required within project scope. Based on the results of the validation exercises conducted during Activity 3 the SPR INTEROP/OSED and the Technical Specification will be updated.

Based on the initial versions of the deliverables, a set of U-space services will be selected for its validation during activity 3.

The results of this activity will also be used to trigger the standardisation of the data exchange between UTM and ATM via SWIM. Therefore the results will be presented to the different standardisation bodies like EUROCAE.

#### Deliverables:

- SPR-INTEROP/OSED V2
  - o Leader: INDRA
  - o Contributors: AIRBUS, ANS CR (B4), PANSAs (B4), DFS, DSNA, ENAIRE, ENAV, HC (FSP), Honeywell, THALES AIR SYS
  - o Reviewers : ON (B4), FRQ (FSP), HC (FSP), LDO, THALES AVS
- TS/IRS V2
  - o Leader: LDO
  - o Contributors: INDRA, AIRBUS, PANSAs (B4), DFS, DSNA, THALES AIR SYS, THALES AVS
  - o Reviewers : ENAIRE, FRQ (FSP), Honeywell

### **Activity 3 (Lead partner: Indra)**

The main objective of Activity 3 is the validation of the information exchange requirements defined in Activity 2. For this validation, a set of U-space SWIM candidate services will be selected and the information exchange will be validated in several exercises.

The validation activities have been divided in 'clusters'. Each cluster is composed of several partners providing different platforms or operational expertise. All the clusters will follow a common approach, validating the

collaborative interface ATM-U-space according to the requirements defined. A common set of services will be validated in every cluster, in order to guarantee the interoperability between them. This will be demonstrated in a final inter-cluster validation exercise.

In addition to the common set of services, each cluster will focus on specific use cases and services in their validation exercises. The validation exercises will involve real-time simulations, culminating with Live-Virtual Constructive experiments combining actual drone flights with simulated traffic and controllers in the loop.

The proposed Cluster approach will facilitate the overall coordination of the Activity and will enable the partners to work collaboratively in smaller teams focused on concrete problems and use cases. Each cluster will be centered on a different geographical area and will focus on different validation exercises, allowing the project to cover the full scope of the problem using a “divide and conquer” approach. Thus, each cluster will be able to tackle with sufficient depth a subset of the key issues regarding ATM-U-space collaboration and the full set of validations will cover a broad variety of ATC systems and practices across Europe. In order to ensure that the clusters remain coordinated, a coordination layer across the clusters will be established, implemented through a Cluster Coordination Team including representatives from all the clusters.

The role of this team will be to provide a coordination and steering platform for the clusters, in order to ensure that the architecture decisions at the cluster level are interoperable and that a common approach is followed to define use cases and validation methodologies. The Cluster Coordination Team will ensure lessons learnt are shared across clusters and will aim at ensuring that the solutions proposed are interoperable across Europe. The Cluster Coordination Team will be in charge of defining a set of inter-cluster Validation Exercises to demonstrate interoperability. One example of possible inter-cluster exercises could be to replicate one of the exercises performed in a given cluster with a USSP that has participated in a different cluster, thereby showing that USSPs can seamlessly operate across Europe.

Cluster Coordination Team is complementary to the Project Coordination Integration Team. The Cluster Coordination Team will be in charge specifically of ensuring the coordination between the clusters inside Solution 1 Activity 3 and the PCIT will be focus on the coordination between Solution 1 and 2 and the different external transversal projects.

There will be four clusters:

- Cluster 1, led by INDRA and based in Spain
- Cluster 2, led by FRQ (FSP) and based in Austria and Hungary
- Cluster 3, led by DSN and based in France
- Cluster 4, led by LEONARDO and based in Italy



Figure 3: Cluster approach

The clusters are detailed in the next paragraphs.

#### Cluster 1 (Leader: INDRA)

Cluster 1 will validate the information exchange between ATM systems and U-space following an approach based on EASA's Opinion 01/2020. The validation will be focused on scenarios in the Spanish airspace, using real airspace data and considering mainly operations in CTR areas.

The main objective is to validate the information exchanges between different U-space services and ATM in different operational scenarios. The interface between U-space and ATM is implemented through a Common Information Service (CIS) that provides a SWIM gateway to the ATM environment for the users and services operating in the U-space under its responsibility.

On the ATM side, an ATM iTEC platform will be deployed by Indra. This platform will be connected to a SWIM Node that will be responsible of the exchange of information with the U-space ecosystem.

Several deployments will be tested in different validation exercises involving different partners and architectures.

The main focus of the validation exercises is the analysis of the information exchanges between the U-space services and the ATM system (iTEC) by means of the CIS and ATM SWIM Nodes. The specific set of U-space services exchanging information with the ATM system to be validated will be selected during Activity 2 of the project, but an initial proposal (to be refined and agreed during project execution) includes the following services:

- Operation plan processing service
- Monitoring and traffic information
- Geofence provision

The information exchange will be done fulfilling the requirements developed during Activity 2. The U-space services and the ATM system will be able to exchange data using SWIM standard data formats and protocols. Besides, during the validations it will also be studied the human factor aspects, evaluating how the new U-

space information should be displayed in the ATM systems in order to maintain the safety. The validations will be conducted with simulated manned traffic, simulated drone traffic and real drone traffic.

Cluster 1 partners are:

- INDRA: Indra will be the cluster leader, in charge of the coordination of the validation activities. Regarding platforms, Indra will provide an iTEC ATM platform, SWIM, CIS and USSP.
- Airbus: Airbus will provide a prototype USSP for the validation exercises. A SWIM interface will be prototyped to allow the USSP to interact with a variety of SWIM services to enable U-space-ATM coordination. The focus will be on Flight Authorisation (coordinated Flight Plan Management), Risk assessment, Strategic Deconfliction (including inter-USSP and ATC coordination) and contingency management.
- ENAIRE: ENAIRE will support the definition of validation scenarios and it will assess the impact on ATC regarding human factors. Additionally, ENAIRE will evaluate the interaction among CIS, USSPs and ATM.
- FRQ (FSP): FRQ (FSP) will provide the CIS for the U-space airspace 2.

Validation exercises:

Since the cluster architecture is complex and it involves several partners, an incremental approach will be followed, with consecutive, increasingly complex validation exercises, allowing for the learnings of one exercise to be considered for the next one. Exercises 3 and 4 are equivalent in complexity and they aim to test two different architecture approaches.

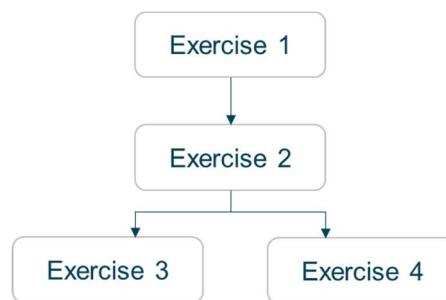
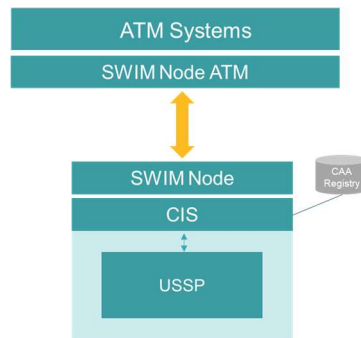


Figure 4: Cluster 1 validation exercises

These validation exercises will be refined during the project execution, based on the results of Activity 2. An initial approach is:

Validation exercise 1

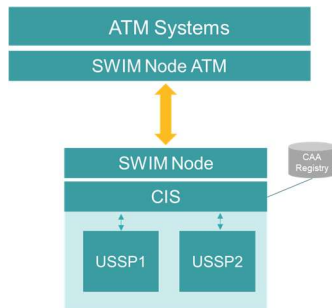
- Partners: INDRA and ENAIRE
- Architecture: 1 ATM, 1 CIS and 1 USSP
- The U-space under the responsibility of the CIS overlaps with Controlled airspace (a CTR)
- Real and simulated drone flights and simulated manned flights are expected in this exercise
- The objective is to reach V3 for some services, as operational plan processing and authorizations. Other services to be tested are monitoring and traffic information.



#### Validation exercise 2

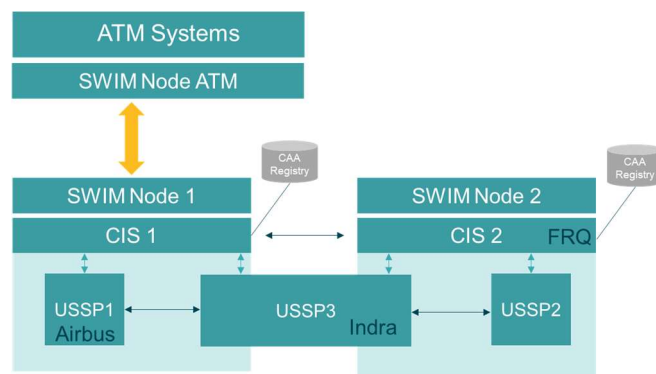
- Partners: INDRA, AIRBUS and ENAIRE
- Architecture: 1 ATM, 1 CIS and 2 USSP
- The U-space under the responsibility of the CIS overlaps with Controlled airspace (a CTR)
- Simulated drone and manned flights are expected in this exercise

The objective is to reach V2, focus on operational plan processing and geofence provision. The communication between the USSPs will be addressed in this exercise.



#### Validation exercise 3

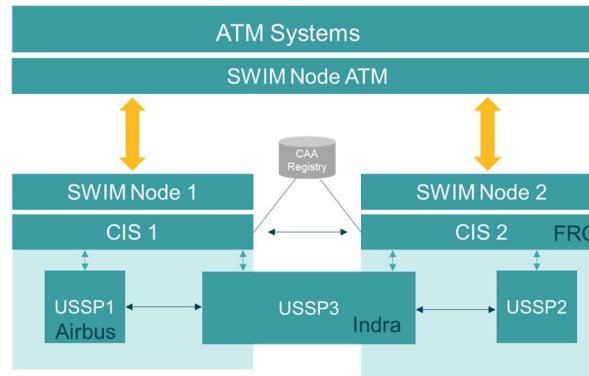
- Partners: INDRA, AIRBUS, ENAIRE and FRQ (FSP)
- Architecture: 1 ATM, 2 CIS and 2/3 USSP
- CIS 1 corresponds with Member State 1 and CIS 2 with Member State 2
- Simulated drone and manned flights are expected in this exercise
- The objective is to reach V2, focus on operational plan processing and monitoring and traffic information. The communication between the USSPs and the CIS will be addressed in this exercise.



#### Validation exercise 4

- Partners: INDRA, AIRBUS and FRQ (FSP)
- Architecture: 1 ATM, 2 CIS and 2/3 USSP
- Focus on the exchange of information between the 2 CIS and ATM system
- In order to simplify the deployment, only one ATM system is considered.
- Simulated drone and manned flights are expected in this exercise

- The objective is to reach V2, focus on operational plan processing and monitoring and traffic information. The communication between the USSPs and the CIS will be addressed in this exercise.



Besides, cluster 1 will participate in an inter-cluster exercise, to demonstrate the interoperability between clusters.

### Cluster 2 (Leader: FRQ (FSP))

Cluster 2 will focus on validation of end to end workflows enabling international drone operations demonstrating technical interoperability between U-space airspaces enabling information exchange for ground based as well as airborne U-space services and applications.

Validation activities will aim to provide a realistic U-space and ATM operational environment. The central U-space airspace will focus on validating information exchange services and U-space services necessary to support strategic & tactical deconfliction in an integrated environment, including airborne systems.

Cluster 2 plans to use both simulations and test flights, drone operators will be an integral part of validation exercises to ensure relevant information can be exchanged end to end.

A simulated international exercise could take place in the northern U-space airspace.

Technical integration will be a major focus of Cluster 2 validations from project start. Sharing of all data relevant to the cluster objectives will be technically integrated by CIS in U-space airspaces.

Cluster 2 will collaborate with PJ34 Solution 2 – validating technical & architectural aspects of the concepts of operations.



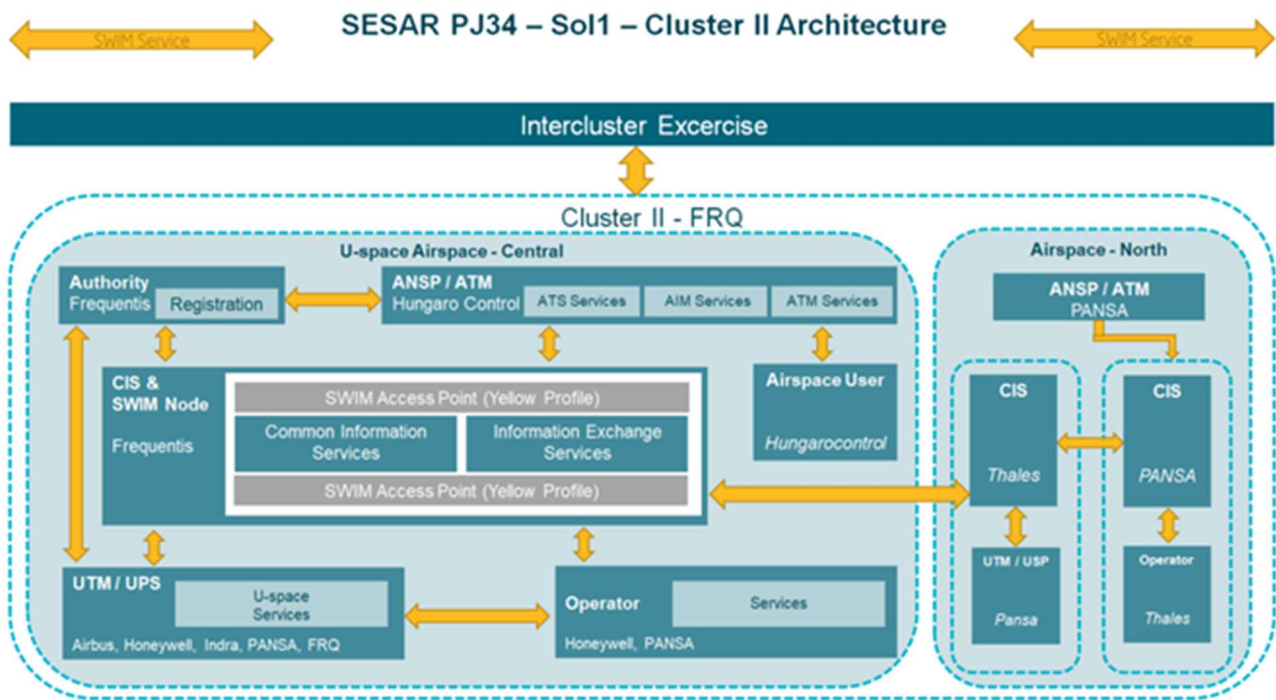


Figure 5: Cluster 2 architecture

Cluster 2 partners roles are:

- AIRBUS: USSP
- FRQ (FSP): SWIM Node, CIS, USSP, Cluster Lead, ATM System/Simulation
- Honeywell SAS: USSP/Operator/Simulation
- HC (FSP): ATM System/Simulation
- INDRA: USSP
- PANSA (B4): USSP/Operator, CIS, ATM System/Simulation
- THALES AIR SYS: SWIM Node/CIS/Documentation

Validation exercises:

Validation exercises are foreseen in real airspace (including) CTR in Hungary & Poland. To ensure efficient validations, some cluster partners will conduct pre-tests, including test flights (e.g. in Austria).

Three exercises will be performed in cluster 2. One exercise per U-space airspace, as well as one integrated exercise. Additionally, cluster 2 will participate in an inter-cluster validation, validating technical interoperability.

PANSA together with LTP (DroneRadar) will validate Controller Drone Data Link Communication (CDDL) as a means for 2-way non-verbal communication and its encapsulation within standalone module for CIS. CDDL will allow SWIM communication between ATC (ATM platform provided by PANSA) and drone pilots, through various CIS (including a PANSA CIS) and USSP. The definition of the CDDL libraries in various languages will be developed for the purpose of the standardisation process. During the exercises the bulk tests on 50+ drone pilots using PansaUTM USSP will be conducted to measure and assess human factor over ATC messages containing orders for drone operations in exercised U-space airspace.

HC (FSP) will continue to build upon the experience gained regarding U1 and U2 services in USIS Exploratory Research DEMO project, which concluded in the end of 2019. HC (FSP) will contribute to improve the Operational Environment and Methods among other aspects taking into consideration U-space and ATM. HungaroControl will host validation exercises in the Simulation HUB, one of Europe's largest commercial simulation facility at Budapest, with the support of real-life air traffic controllers (ATCOs). During the

validation, HC's experts will perform Safety and Human Performance analysis, to further evaluate the impact of the New Operation Methods and Services on ATC. In order to conclude successful and complex validation exercises, a variety of simulated and possibly real drone flights will be carried out to feed the ATM, U-space and other different system environments.

Thales will provide a CIS connected to PANSA ATM System/Simulation, PANSA UTM/Droneradar. Thales CIS will as well exchange data CIS to CIS with both the Frequentis CIS and the PANSA CIS.

The integrated validation exercise will involve an international search and rescue support mission that will require a drone to fly through controlled airspace under two different ANSPs and U-space airspace under 2 different CIS (see Figure 6: Cluster 2 Integrated International Validation exercise). In order to carry out this exercise, the information exchanges between the USSP serving the operator and the other actors in the scenario will be defined and prototyped in accordance with the architecture in Figure 5. To process the authorisation of the flight, the USSP serving the drone operator will need to access information corresponding to all the different regions of airspace that the flight will traverse. To do so, the USSP will leverage the CIS assigned to its local U-space, which interacts via SWIM with the local ANSP and the CIS responsible for the adjacent U-space airspace.

The USSP will be able to access the required SWIM information to coordinate the flight with stakeholders involved. The flight will also require coordination with other USSPs operating in the two U-space airspaces that the flight will cross. The exercise will assess coordinated flight authorisation (flight plan management) and strategic deconfliction and will study some aspects of tactical deconfliction and contingency management. The focus will be on the mechanisms to achieve a common situational awareness and coordination between the different stakeholders involve, with an emphasis on how SWIM can facilitate the process.

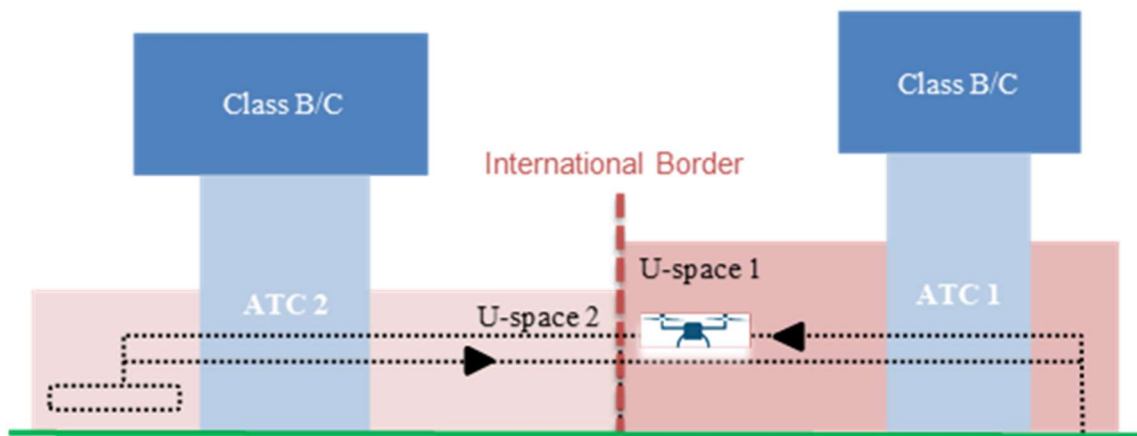


Figure 6: Cluster 2 Integrated International Validation exercise

Airbus will provide a prototype USSP for the validation exercises. A SWIM interface will be prototyped to allow the USSP to interact with a variety of SWIM services to enable U-space-ATM coordination. The focus will be on Flight Authorisation (coordinated Flight Plan Management), Risk assessment, Strategic Deconfliction (including inter-USSP and ATC coordination) and contingency management.

Honeywell will contribute to cluster 2 validations of collaborative interface between ATM and U-space from multiple perspectives: USSP role focusing primarily on strategic (U2) and tactical (U3) conflict resolution



(including emergency situations) together with various supporting services (e.g., tracking, different types of monitoring, weather); and end user's perspective covering both U-space and ATM users (drone's operators, UAM, GA, rotorcraft). Honeywell broad experience allows to address these topics not only in relation to ground services and infrastructure but also from point of view of on-board CNS systems and Detect and Avoid, and consider how optimally combine these elements in terms of operational efficiency, ensuring that the information sharing architecture and requirements support such solutions. Honeywell will contribute to cluster 2 validation exercises through experimental implementation of services interfacing with CIS/SWIM node, relevant on-board systems installed on a suitable flying platform(s), and simulations including also Honeywell cockpit simulator and system bench.

Exact times schedules for cluster 2 shall be agreed in M1-M6.

### Cluster 3 (Leader: DSN)

Cluster 3 aims to demonstrate a simplified SWIM oriented architecture between USSPs and ATM systems, trying to establish direct SWIM interfaces between USSPs and ATM systems, keeping SWIM enabled CIS as a back-up option). This simplified architecture would benefit to two use cases :

- To enable U-space activities in areas where there would not be sufficient activity to be economically viable for a CIS provider,
- To ease interoperability for USSPs being in contact with multiple European CIS, as USSPs would use common standardised SWIM interfaces.

The objective is to implement the following services :

- U2 service : Procedural Interface with ATC
- U3 service : Collaborative interface with ATC

Depending on the definition of the services and results of solution 2 operational use cases definition, these services will include operations and information derived from other U-space services identified such as :

- Network-identification,
- Geo-awareness
- Geo-fencing
- Operational plan preparation

In this cluster, the ATM system will be provided by DSN based on industrial and operational platform, completed with simulating capabilities and a SWIM node able to consume and deliver SWIM services to USSPs.

On U-space side, two to four USSPs will be included, in two non-adjacent multi USSPs U-space airspaces.

THALES will provide one of the USSPs systems as well as Thales will run real drone flight using the defined SWIM services to exchange with ATM systems, using Rennes or Lille platform.

At least one or two other USSPs, operating in DSN Airspace in relation with DSN controllers, will be included in this Cluster. They will be chosen in a list of already contracting USSPs with DSN or in a new list to come in a call which will be finalized prior to the beginning of PJ34 solution 1 activities.

In order to achieve a more effective validation of inter-operability of the SWIM services defined in solution 1, this cluster will also invite USSPs involved in the other cluster to connect to the platform and run an exercise, using a probably more limited set of services or operations.

The overall objective of this cluster will be to evaluate the feasibility of a simplified and direct architecture between ATM systems and USSPs, to validate the SWIM services and Use cases defined in solutions 1 and 2, until inter-cluster exercises in order to validate the real interoperability of the implemented SWIM services.

The architecture of this cluster will include :

- DSNA industrial and operational platform, with simulating capabilities and SWIM node
- USSPs from 2 non-adjacent U-space airspaces, providing systems implementing SWIM services through dedicated SWIM Nodes. Thales is the first USSP identified in this Cluster.
- Drones in order to run at least one live exercise demonstrating the end-to-end adequacy of the SWIM services. Thales will be one provider of drone.

The scheme bellow illustrates the intended architecture :

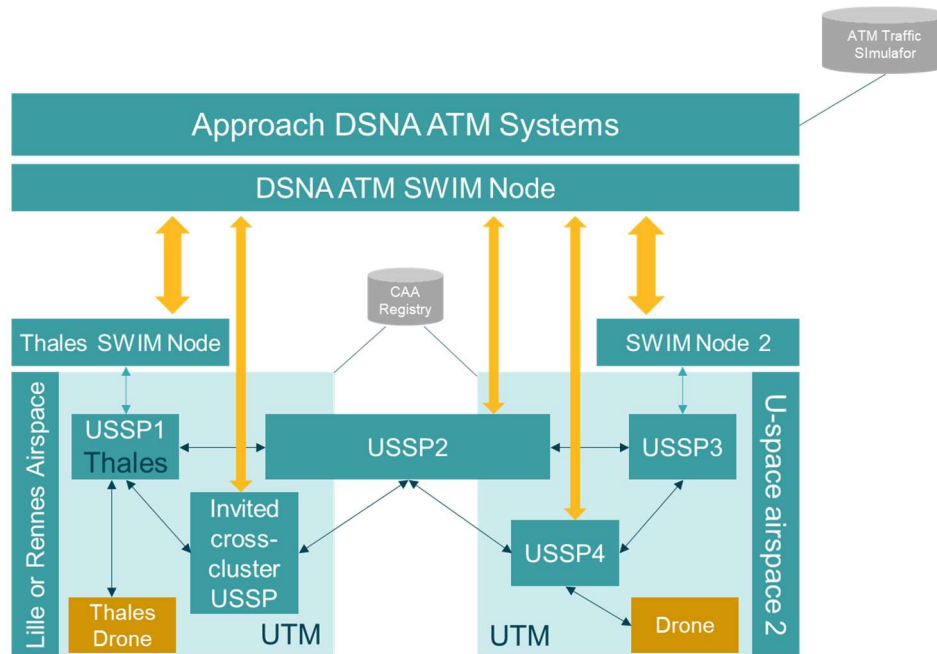


Figure 7: Cluster 3 architecture

DSNA will provide the ATM platform and SWIM Node implementing the SWIM U-space-ATC services and ATC operational expertise. DSNA will lead the cluster and organize the demonstration activities and writing of deliverables among the partners of the exercises.

THALES will provide one USSP system and SWIM Node implementing the SWIM U-space-ATC services as well as a drone in order to validate the end-to-end adequacy of SWIM services in a real life exercise, in Rennes or Lille Airspaces.

One to Three other USSPs will be selected in the list of contracting USSPs with DSNA, either from existing contracts either from a 2020 call which will be ready for the beginning of PJ34 solution 1 activities.

Validation exercises:

Exercise 1: Validation between DSNA and THALES of U2 & U3 SWIM services in one U-space Airspace including real drone flight.

Exercise 2: Validation between DSNA and USSP 2 of U2 & U3 SWIM services in one U-space Airspace

Exercise 3: Validation of U2 & U3 services in a multi USSPs and U-space Airspaces configuration

Exercise 4: Cross Cluster Validation including use of SWIM services with a USSP included in other cluster validation exercises

#### Cluster 4 (Leader: LEONARDO)

Leonardo will provide a Cluster between an ATM system and one U-space system (D-flight). The two systems will share:

- identification and tracking information;
- Airspace information.

The ATM system will share procedural data to the U-space system. Furthermore the cluster will integrate a MET data service. All services will be developed in standard SWIM format.

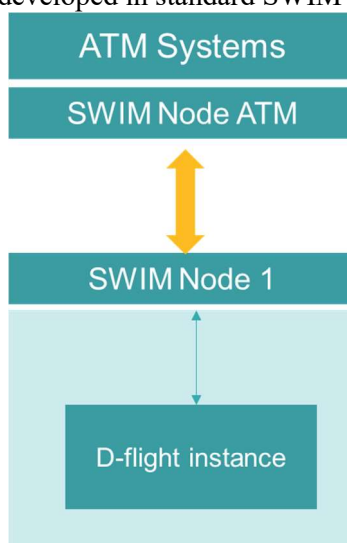


Figure 8: Cluster 4 architecture

Cluster 4 validation architecture will be based on the already deployed operational systems. Its goal will be the validation of a subset of services and use-cases defined in activity 2 in a scenario very similar to the operational one.

The exact services will be defined during the project execution but the initial focus will be on the exchange through SWIM of:

- monitoring and traffic information;
- airspace information (e.g. geofencing);
- meteo information.

The partners involved in cluster 4 are:

- ENAV
- D-Flight
- LDO Germany participating in Cluster 4 of Solution 1 as Leonardo LTP
- Telespazio S.p.A. participating in Cluster 4 of Solution 1 as Leonardo LTP

In particular way, in Cluster 4:

- ENAV and its LTP D-Flight consortium will provide the USSP system and the ATM and USSP operational expertise;
- Leonardo will provide its ATC operational expertise, the ATM platform and the SWIM interface to be used by the ATM and USSP to interact via SWIM services;
- Leonardo Germany (as Leonardo LTP) will be focused on the implementation of MET services

Regarding validation exercises, Cluster 4 will use real airspace data with simulated traffic. At least one exercise based on a RTS with simulated traffic (V2)

#### Deliverables:

- VALP V2
  - o Leader: FRQ (FSP)
  - o Contributors: INDRA, AIRBUS, PANSO (B4), DSNA, ENAV, Honeywell, LDO, THALES AIR SYS, THALES AVS
  - o Reviewers: ANS CR (B4), ENAIRE, HC (FSP)

- Availability Note:
  - o Leader: INDRA, DSNA, FRQ (FSP), LDO
  - o Contributors: PANSA (B4), Honeywell
  - o Reviewers: AIRBUS, HC (FSP)
- VALR V2:
  - o Leader: INDRA
  - o Contributors: AIRBUS, PANSA (B4), DSNA, ENAIRE, ENAV, Honeywell, LDO, THALES AVS
  - o Reviewers: ANS CR (B4), ON (B4), FRQ (FSP), HC (FSP), THALES AIR SYS
- CBA V2:
  - o Leader: THALES AIR SYS
  - o Reviewers: INDRA, AIRBUS, DSNA, ENAIRE, ENAV, THALES AVS
- Initial Validation Plan (VALP) V3:
  - o Leader: Honeywell
  - o Contributors: INDRA, PANSA (B4), DSNA, ENAIRE, ENAV, LDO
  - o Reviewers: AIRBUS, ANS CR (B4), HC (FSP) THALES AIR SYS, THALES AVS

### Deliverables Leaders

The following table summarizes the leader partner of the different deliverables expected in Solution 1:

Deliverables	Leader
Literature review and state of the art	AIRBUS
SPR-INTEROP/OSED. Operational Service and Environment Definition	INDRA
SPR-INTEROP/OSED. Safety, performance and interoperability requirements	ENAIRE
SPR-INTEROP/OSED. Part II SAR	PANSA (B4)
SPR-INTEROP/OSED. Part III ENVAR	Honeywell
SPR-INTEROP/OSED. Part IV HPAR	ENAV
SPR-INTEROP/OSED. Part V PAR	To be defined
TS/IRS	LDO
VALP V2	FRQ (FSP)
Part II Technological and Safety Assessment Plan	PANSA (B4)
Part III Security Plan	THALES AVS
Part IV HP Assessment Plan	ENAV
AN	INDRA  FRQ (FSP)  DSNA LDO
VALR V2	INDRA
CBA V2	THALES AIR SYS
Initial VALP V3	Honeywell

### 1.3.3.3. Description of WP3

#### WP3.1.- High-level use cases and operational concept overview (leader: NATS)

This task will use the analysis and description of the European and worldwide state-of-the-art in Solution 1 as the most relevant input, with particular focus on the conclusions derived from the analysis of the CORUS ConOps and existing regulatory framework and standards.

This task will detail the new high-level use cases that could be in operation in a new collaborative environment allowing simultaneous operation of high number of drones and manned aviation inside and outside controlled airspace, with particular attention on those use cases which cannot be addressed by Solution 1. In particular, Solution 2 will develop specific use cases addressing the military/state aircraft needs.

Additionally, this task will provide a high-level view of the operational characteristics of the collaborative ATM-U-space concept to address the previously identified high-level uses cases, identifying the operational and technological evolution of the U-space and ATM systems with respect to Solution 1.

The overall performance benefits will be also identified, along with a set of high-level operational requirements to be used as reference material in WP3.2.

This task will produce D3.1.1.- PJ34 Solution 2 Initial concept description (leader: NATS) and D3.1.2.- PJ34 Solution 2 Final concept description .

### **WP3.2.- Operational Services and Environment for ATM-U-space Collaboration (leader: LFV/COOPANS)**

This task will define the main elements of the SESAR Solution (Solution 2 in the context of this project) that will implement the new U-space-ATM Collaborative Concept. Thus, a set of Operational Improvement Steps (OI Steps) and enablers (including system and Procedural and/or Human enablers) will be defined, based on an initial description of the benefit mechanisms associated to the prospective SESAR Solution 2. These mechanisms will be aligned with the performance benefits identified in WP3.1.

This task will also further detail the operational environment, including roles and responsibilities, CNS/ATS performance expectations and technologies and applicable standards and regulations.

Detailed operating methods will also be described, identifying the differences between Solution 1 and Solution 2 operating methods. The operating method will be supported by the combination and interactions of procedures, inputs and outputs, actors, sequences of U-space and ATM services and infrastructure enhancements. In addition, this task will provide a detailed description of all use cases that are sufficient to depict how the SESAR Solution works, including nominal and non-nominal situations Process models shall be needed to describe the interactions between services.

This task will produce chapter 3 “Operational Service and Environment Definition” of the SPR-INTEROP/OSED as part of D3.2.- PJ34 Solution 2 V1 Data Pack (leader: LFV/COOPANS).

### **WP3.3.- Safety, Performance and Interoperability requirements (leader: LDO [TPZ])**

This task will detail the operational, safety, performance and interoperability requirements associated to the SESAR Solution (Solution 2) that will enable the new U-space-ATM Collaborative Concept.

This WP will define operational requirements associated to the new U-space-ATM Collaborative Concept, with special attention to:

- Refinements in the drone route definition in the envisioned drone flight plan management, potentially enabling new types of operations, management of non-nominal situations, etc.
- The impact of drone traffic in manned aviation operations, and also, conversely, the impact of manned aviation operations in U-Space. The analysis of this impact will result in requirements related to surveillance and tracking both for drones and manned aircraft in non-segregated airspace, to ensure complete visibility of surrounding traffic when needed while protecting privacy constraints and not overloading CWP with irrelevant drone data.
- Services enabled by the use of GNSS High precision and integrity, for dynamic geofencing and the management of satellite and mobile communication for a seamless and safe transition from VLOS to BVLOS.
- Specific security requirements regarding the handling of military sensitive information such as for example filtering criteria in order to mask sensitive operations within the collaborative environment or even changing the identification number of highly sensitive operations.

The production of requirements will be an iterative process in which the status of the requirements at the end of V1 (or V2 for specific services) will be reported. All requirements will include an explanation to justify the requirement and its allocation (e.g. Expert group workshop results, fast-time simulations, etc.). This iterative process will allow producing chapter 4 “Safety, performance and interoperability requirements” of the SPR-INTEROP/OSED as part of D3.2.- PJ34 Solution 2 V1 Data Pack (leader: LDO [TPZ]).

As an input to consolidate the requirements, SWP3.3 will produce the following annexes of the SPR-INTEROP/OSED as part of D3.2.- PJ34 Solution 2 V1 Data Pack:

- The Safety Assessment Report (leader: LDO [TPZ]), describing the results of the safety assessment work for the SESAR Solution.
- The Human Performance Assessment Report (leader: DSNA), describing the results of the Human Performance assessment work for the SESAR Solution.
- The Environment Assessment Report (leader: ENAV), providing a synthesis of essential information (qualitative and quantitative) related to the assessment of the impact on the environment that Solution 2 could have when implemented.
- The Performance Assessment Report (leader: DLR), consolidating the performance results obtained in the different validation activities.

WP3.3 will produce the necessary inputs to facilitate the definition in WP3.4 of candidate functional architectures that can fulfil the requirements, including assumptions on CNS infrastructure, required services, etc. As interoperability requirements are related to a specific technology to support the solution, inputs from WP3.4 are also expected to consolidate the final requirements.

WP3.3 will produce chapter 4 “Safety, performance and interoperability requirements” of the SPR-INTEROP/OSED as part of D3.2.- PJ34 Solution 2 V1 Data Pack (leader: LDO [TPZ]).

This task will facilitate the definition in WP3.4 of candidate functional architectures that can fulfil the requirements, including assumptions on CNS infrastructure, required services, etc. As interoperability requirements are related to a specific technology to support this solution, inputs from WP3.4 are expected to consolidate the final requirements.

#### **WP3.4.- Architectures and deployment technologies (leader: AIRBUS)**

Solution 2 will propose and analyse potential alternative functional architectures that can enable the effective deployment of the ConOps. The proposed architectures will model the logical information flows required to fulfill the SPR-INTEROP requirements and will also study how current and emerging information exchange solutions and technologies can be used to implement those information flows. The objective is to define feasible architectures that build on and extend the current SESAR SWIM solutions from the perspective of Information exchange and data reference model as well as Technical Infrastructure. The proposed architectural solutions will build on the existing SESAR ATM Digital transformation vision to define ATM-U-space collaboration mechanisms that address the challenges posed by the integration of U-space and conventional controlled airspace (e.g. CNS requirements, airspace/route structure, weather impact, tactical traffic management, etc). The proposed solutions will aim at leveraging some of the new technologies and services required to deploy U-space to improve the overall ATM system.

As part of the architecture definition and analysis process, the dependencies and information exchange requirements between U-space services and ATM services will be studied. The latest regulation and standards related to U-space (EASA Opinion, EUROCAE draft standard, FAA Mandates, etc.) will be taken into account, as well as the ongoing projects and demonstrators that are being carried out across Europe under the auspices of SESAR. The exchange of information between ATM and U-space through harmonized SWIM information services, which is the Solution 1, will be considered as the starting point for the architectural analyses within Solution 2, with the expectation that the current SWIM infrastructure and data models may need to be expanded to address the new information-exchange needs.



A link will be established with Solution 1 to leverage the results from the Literature Review Activity and to ensure that the architectural decisions and lessons learnt from Solution 1 are taken into consideration when defining the architectures that can support the ConOps of Solution 2.

This task will produce a Functional Requirements Document (FRD) that be annexed to the SPR-INTEROP/OSED as part of D3.2.- PJ34 Solution 2 V1 Data Pack (leader: AIRBUS). Additionally, this task will make an initial assessment of cost and benefits taking into consideration the potential alternative functional architectures and technologies. This information will be included in deliverables PJ34 Solution 2 Initial CBA (leader: PANSA).

### WP3.5.- Assessment of the solution (leader: ENAIRE)

This task will research on the necessary evolution of the SESAR performance framework, in particular considering Key Performance Areas (KPA) dealing with Access and Equity to extend its applicability to the areas where both U-space and ATM services are provided.

This WP will research on the safety, efficiency and human performance impact of Solution 2. The compatibility of roles and responsibilities of the U-space service providers and ATS services will be studied, with special attention on the responsibilities dealing with separation and separation minima between manned and unmanned aircraft, and the resulting impact on safety. To this end, the analysis will consider the impact of automation and the potential delegation of responsibilities to systems with higher automation levels and the means for human operators to interact with such systems.

Specific experiments are designed to do these performance assessments. Some of these experiments can also contribute to the assessments of deployments architectures to be performed in WP3.4, while other are totally focused on testing performances and their contribution to WP3.4 will be limited because performance benefits are obtained regardless of the selected architecture. All exercises will contribute to the refinement of the requirements in WP3.3.

Exercises are described in detail in the following tables. In all exercises, airspace classification and their associated service and equipage requirements provided by the European regulatory and ICAO frameworks will be taken on board as part of the boundary conditions in the exercises.

Validation number	1
Validation exercise name	Human Factors vs Automation
Lead contributor	ENAIRE
Validation technique	Human-in-the-loop simulations
Expected maturity	V1
Validation objectives	
Three validation objectives have been developed for this assessment within the context of the Collaborative ATM-U-space CONOPS:	
<ul style="list-style-type: none"> <li>Definition and refinement of roles, responsibilities and tasks of two main human actors of the collaborative ATM-U-space environment: <ul style="list-style-type: none"> <li>Supervisor of drone fleets-responsible for monitoring unmanned operations performed by highly-automated drones and,</li> <li>Air Traffic Controller responsible for ATS (monitoring, separation and information provision) for manned aircraft.</li> </ul> </li> <li>Definition of requirements for visualization of properties of drone traffic to be used by ATCos (tower controllers) to maintain adequate situational awareness without impairing the cognitive process for perception (information saturation avoidance).</li> <li>Validate the roles and responsibilities of drone supervisors and ATCos through a visualization prototype with different traffic levels and levels of automation.</li> </ul>	

All of these objectives will be tested through human-in-the-loop exercises using mockups of highly automated U-space services and ATM supporting tools to support the collaborative environment. Both supervisors and ATCos will need to utilize such systems to assure a safe and seamless flow of traffic.

Given the complexity of this working environment, the validation objectives will only be tested for nominal cases, in order to get a better understanding of how these entities would be able to collaborate with and coordinate through the automated systems.

Specifically, the aim of these experiments will be to:

- Validate novel concepts for ATM-U-space collaboration in a work environment with a higher level of automation.
- Definition of new service concepts for ATM supporting tools of the human actor in a mixed manned and unmanned operating environment.
- Identify bottlenecks for ATM-U-space collaboration in an airspace with fully mixed manned and unmanned air traffic (specifically within the CTR of an airport).
- Advance the state-of-the-art of research into the effects of supervising and collaborating with highly automated systems.
- Definition of a concept of operations (CONOPS) for ATM-U-space collaboration around airports providing air traffic services.

#### Mapping with research and development needs in the call

This exercise covers the following requirements of the call:

- Impact of automation on the ATM and U-space systems in support of the new information exchange and operational concepts
- The provision of U-space services within and outside controlled airspace where the ANSPs currently provide services, with a view of defining how the new U-space services, including in particular U-space traffic information services, could be applied safely, and how the current ATS services and the U-space services would complement each other.
- Operational aspects of the U-space – ATM collaborative environment, including in particular where applicable responsibility for separation and development of separation minima, as well as trajectory revision and update processes.
- Evolution of the flight-rules framework to account for drones and their different modes of operation.
- Evolution of the SESAR access and equity framework, in order to extend its applicability to the areas where both U-space and ATM services are provided.

#### Validation environment description

Test cases will be built around the concept of ATM-U-space collaboration at tactical level to manage mixed drone and manned air traffic within non-segregated controlled airspace. The simulation environment will visualize properties of drone traffic within controlled airspace, as well as control actions on drone-traffic performed by a highly-automated machine-based U-space services.

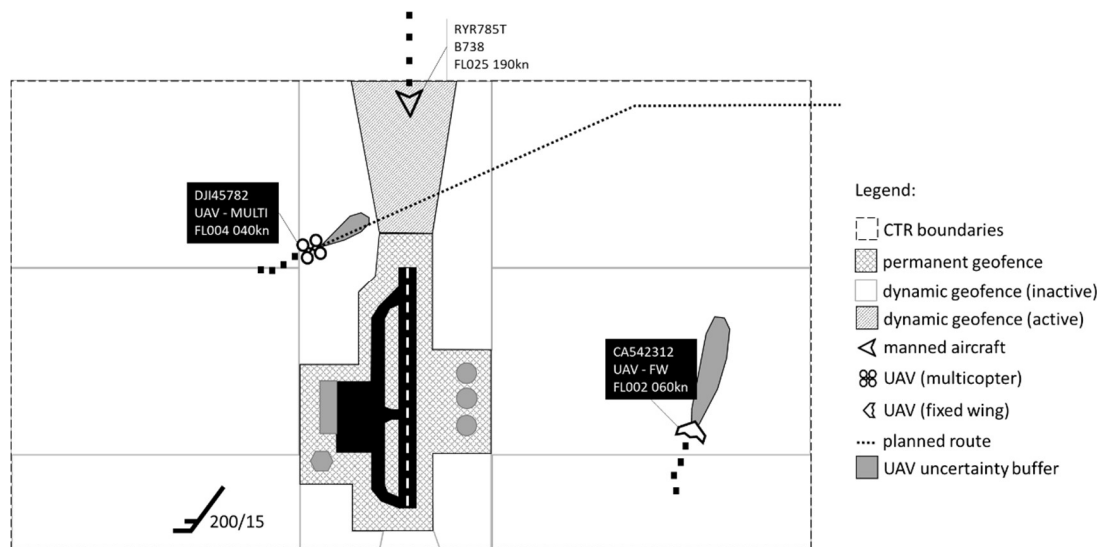
Focus will be on the interactions of a tower controller of a controlled airport and a drone fleet supervisor with automated U-space services. The test environment will be built around the assumption that the tower controller will oversee and manage manned air traffic, the drone fleet supervisor will oversee drone traffic and U-space will manage drone traffic. Collaboration between the ATCo, the drone supervisor and the U-space services will be required to resolve conflicts.

The simulation environment itself will be based around an airport and its accompanying CTR. Drones will operate in shared airspace with manned aircraft within the CTR. The TWR controller will not be able to exercise control over drone traffic directly, as these will be governed by U-space. However, they will be able to dynamically activate and deactivate preset geofences within the CTR. The idea behind this



concept is to maintain a safe air situation for manned aircraft by resolving conflicts with drone traffic simply using dynamic geofences. In this way, areas that drone traffic shall avoid can be effortlessly communicated to the U-space system, without exerting too much attention from the ATCo. The U-space system will then order the drones to reroute around those areas. The re-routing trajectories of drones could be affected by environmental effects (such as wind or precipitation), drone operating restrictions as well as vehicle limitations.

Different levels of drone information will be provided to the simulation participants, ranging from the typical “flight label” information and route information provided as standard in today’s air traffic control systems, to a more advanced concept visualizing position uncertainty of the vehicles (see below as an example). In this way, the additional factors related to drone operations can be represented in a simple format. The shape and size of these uncertainty buffer areas could be affected by drone speed, wind effects, position accuracy, latency, control actions and drone-system failures.



In addition to the standard visualizations, advanced tools and ATCo/supervisor support systems could provide information of the actions that the DTM system is performing on the drones in response to manned air traffic and dynamic geofences. These should also be visualized on the display, and could take the form of simple messages, real-time flight plan updates provided by the DTM system, or included as a determining factor for the shapes of the uncertainty buffers.

#### Validation platform description

For these simulation exercises several validation platform options exist:

##### Open-source simulation platform developed by TU Delft

ENAIRE/CRIDA is co-developing a real-time simulation platform together with TU Delft specifically designed to test fully-integrated drone and manned aircraft operations within the CTR of an airport. Given the open-access architecture of the platform, it is extremely adaptable to any kind of use-case environment to be tested within this validation.

##### ESCAPE validation platform developed by EUROCONTROL

ESCAPE is a real-time simulation platform which can be used to perform small- and large-scale simulations in airspace design for TMA as well as for the evaluation of new operational concepts and controller tools.

#### Key performance areas

The following key performance areas will be addressed by these exercises:

<ul style="list-style-type: none"> <li>• Human performance.</li> <li>• Safety.</li> <li>• Flexibility.</li> <li>• Access and equity.</li> </ul>
<b>Dependencies</b>
This validation exercise will build on the findings and concepts of the human factors analyses performed in WP2 (specifically those from Cluster 1), which will be used as a reference scenario without the assistance of automation. HMI developments will also benefit from the lessons learned in the WP2 validation exercises.

Validation number	2
Validation exercise name	Functional Architecture vs Safety and Efficiency
Lead contributor	AIRBUS
Validation technique	Fast-time simulation
Expected maturity	V1-(V2 for some specific services)
<b>Validation objectives</b>	
<p>The main objective is to conduct a comparative analysis between the different architecture options proposed for the future ATM-U-space collaborative environment, focusing on their suitability to enable automated separation management in scenarios involving simultaneous operations of manned and unmanned aircraft. The analysis will be carried out using fast-time simulation and will be based on the assessment of a set of metrics derived from simulated traffic scenarios. The simulation-based validation experiments will focus on how the proposed architecture options can enable safe and efficient automated separation management in increasingly complex mixed-traffic scenarios with different CNS performance assumptions and environmental conditions. The simulation exercises will serve to assess how different information exchange patterns and collaboration schemes between U-space and ATM services impact the feasibility and performance of an automated separation management function.</p> <p>The simulation infrastructure to be used will allow modeling the set of U-space and ATM services required to implement separation management in mixed traffic scenarios, as well as the available CNS capabilities and the operational and environmental context. For example, to define a simulation scenario it will be necessary to define the set of U-space and ATM services in place, the characteristics of the vehicles (and associated ground segments in case of a UAS), the CNS performance characteristics derived from the assumed CNS infrastructure available, the applicable rules of the air, separation minima and other relevant operational considerations, and the environmental context, such as the weather conditions. The simulation will also allow modeling the data being exchanged between the different actors as well as the performance characteristics of those exchanges (bandwidth, data rates, etc.), together with the different capabilities and performance levels of the different vehicles and services involved.</p> <p>In principle, the validation exercises will initially refer to strategic and tactical deconfliction as two separate functions contributing to automated separation management and will assess their impact on safety and efficiency, considering different information exchange patterns and different services architectures. The impact of uncertainty, especially related to CNS capabilities and weather, will be considered, in order to assess the requirements on real-time tactical interventions by ATM and U-space services. The impact of the timeliness and nature of information sharing, as well as potential contingencies (communication failures, etc) will also be considered.</p>	
<b>Mapping with research and development needs in the call</b>	
<p>The proposed Validation experiments will seek to assess to what extent the proposed Functional Architectures for Solution 2 can enable the Collaborative ATM-U-space concept. To that aim, a set of relevant operational scenarios will be simulated and several safety and efficiency metrics will be</p>	

evaluated. The simulation infrastructure will allow modeling U-space and ATM services, together with their data exchanges and interactions, according to different architectural layouts, as well as a variety of CNS infrastructure and operational and environmental elements that affect the management of traffic in scenarios involving manned and unmanned aircraft. For example, the simulation will allow modeling different CNS capabilities, weather conditions and their effects and vehicle characteristics. The focus of the experiments will be on separation management under different architectural assumptions and CNS performance levels. The experiments will require the definition of the applicable separation minima and rules of the air. The separation minima will be derived from the CNS capabilities and performance levels assumed for the scenario. The simulation exercises will serve to assess how a specific solution for separation management, which will in principle include both strategic and tactical deconfliction functions, will result in actual losses of separation in scenarios with increasing traffic load and complexity. In addition to actual conflicts, other safety and efficiency metrics will be defined for the assessment.

The following research topics highlighted in the call will be addressed in the exercises:

- Interaction and collaboration of ATM and U-space services in mixed traffic deconfliction scenarios: “The provision of U-space services within and outside controlled airspace where the ANSPs currently provide services, with a view of defining how the new U-space services, including in particular U-space traffic information services, could be applied safely, and how the current ATS services and the U-space services would complement each other.”
- Assess the impact of different CNS characteristics in mixed traffic deconfliction scenarios: “Altimetry requirements for U-space and their impact on the ATM-U-space interface and the coordination between manned aviation and drones.”
- Assess the impact of separation minima in mixed traffic deconfliction scenarios assuming different CNS infrastructure and services architecture: “Operational aspects of the U-space – ATM collaborative environment, including in particular where applicable responsibility for separation and development of separation minima, as well as trajectory revision and update processes “.
- Assess the impact of different CNS characteristics in mixed traffic deconfliction scenarios: “Impact of geographic vs. magnetic navigation concepts for the ATM-U-space interface, and elaboration of associated requirements”.
- Assess the impact of different CNS characteristics in mixed traffic deconfliction scenarios: “Development of requirements for surveillance and tracking for drones, definition of how tracking is to be used, and the impact of drone tracking on manned aviation operations and on the ATM/U-space interface”
- Assess the impact of different weather information in mixed traffic deconfliction scenarios: “Impact of weather on drone operations and on the collaborative ATM-U-space interface, including requirements on the quality of weather information”.
- Assess the impact of the rules of the air and other operational aspects in mixed traffic deconfliction scenarios: “Evolution of the flight-rules framework to account for drones and their different modes of operation”.

#### Validation environment description

Set of synthetic traffic scenarios of increasing load and complexity including both manned and unmanned aircraft.

#### Validation platform description

Flexible U-space fast-time simulation infrastructure prototype including, among others, the following modeling capabilities:

<ul style="list-style-type: none"> <li>• U-space and ATM services models, including flexible data formats and exchange models.</li> <li>• Synthetic Traffic generation: high fidelity trajectory models for different vehicle performance characteristics, both manned and unmanned, including weather effects.</li> <li>• Parameterized CNS performance characteristics and operational rules.</li> <li>• Ability to exchange data with other platforms.</li> <li>• Data analysis.</li> </ul>
<b>Key performance areas</b>
<p>Safety and efficiency. Metrics to be assessed will be related to safety and operational efficiency.</p> <ul style="list-style-type: none"> <li>• Safety metrics may include the number of conflicts avoided, including situations with degraded performance (non-nominal).</li> <li>• Efficiency metrics will include the number and extent of maneuvers and trajectory deviations required to resolve conflicts, as well as the use of communications and other resources.</li> </ul>
<b>Dependencies</b>
N/A

Validation number	3
Validation exercise name	Advanced drone flight plan and route definition
Lead contributor	INDRA
Validation technique	Small-scale simulation
Expected maturity	V1
<b>Validation objectives</b>	
<p>The main objective of this exercise is to validate how the new requirements referred to drone flight plan, especially focused on drone route definition will impact on the U-space – ATM collaborative interface.</p> <p>During Solution 1, drone flight plan basic information exchange with ATM will be defined and validated using as much as possible the SWIM protocols for information exchange that are defined today. In this exercise, the new requirements defined in WP3.3, supporting future concept of operations regarding drone route definition will be studied and validated, taking into consideration how these new routes will impact in ATM systems and in manned aviation. Also, it will be studied how a change on the drone route during the flight (re-planning due to emergency, for example) can impact on ATM.</p> <p>These objectives will be tested through simulations, in order to model the new drone flight plan definition and to evolve the SWIM interface in order to be able to support the new requirements regarding drone route definition.</p>	
<b>Mapping with research and development needs in the call</b>	
<p>This exercise covers the following requirements of the call:</p> <ul style="list-style-type: none"> <li>• Impact of automation on the ATM and U-space systems in support of the new information exchange and operational concepts</li> <li>• The provision of U-space services within and outside controlled airspace where the ANSPs currently provide services, with a view of defining how the new U-space services, including in particular U-space traffic information services, could be applied safely, and how the current ATS services and the U-space services would complement each other.</li> <li>• Impact of drone route definition, formatting and navigation performance options on the U-space-ATM interface and elaboration of associated requirements.</li> </ul>	

<b>Validation environment description</b>
<p>The validation is planned to be developed in a simulated environment, focus on the simulation of drone flight plans and its exchange with ATM. Also, manned aviation will be simulated to test the interaction between them. Several scenarios with different complexity level will be tested.</p> <p>The scenarios will be mainly based in non-segregated controlled airspace, especially in CTR environment, where the higher interaction between ATM and UTM systems is envisioned.</p>
<b>Validation platform description</b>
<p>The base validation platform used will be the one deployed for Solution 1 - Cluster 1 - Validation Exercise 1. The platform is composed by:</p> <ul style="list-style-type: none"> <li>• iTEC ATM Platform, including manned aviation simulator.</li> <li>• CIS.</li> <li>• USSP.</li> <li>• SWIM nodes between CIS and ATM system.</li> </ul> <p>This platform will be enhanced with the necessary improvements to test the new concepts.</p>
<b>Key performance areas</b>
<p>The following key performance areas will be addressed by the exercise:</p> <ul style="list-style-type: none"> <li>• Safety.</li> <li>• Efficiency.</li> </ul>
<b>Dependencies</b>
<p>During Solution 1 initial and basic drone flight plan information exchange between ATM and U-space will be validated. During Solution 2, a refinement of the requirements of drone flight plan data exchange will be performed, including more advance drone route information addressing future needs.</p>

Validation number	4
Validation exercise name	Tracking, surveillance and traffic information services advanced interoperability
Lead contributor	INDRA
Validation technique	Small-scale simulation
Expected maturity	V1
<b>Validation objectives</b>	
<p>The main objective of this exercise is to validate the exchange of information between ATM and UTM systems, regarding U-Space tracking, surveillance and traffic information services, in order to further clarify how/which drone tracking results are relevant to ATM and the impact of drone tracking on manned aviation operations and on ATM.</p> <p>The impact of drone traffic in manned aviation operations, and also, conversely, the impact of manned aviation operations in U-Space will be analyzed. The tracking requirements defined during WP3.3 will be used as input for this exercise.</p> <p>The operational objective of this validation is to ensure complete visibility of surrounding drone traffic in ATM systems when needed while protecting privacy constraints and not overloading CWP with irrelevant drone data. Conversely, complete visibility of surrounding ATM traffic in U-Space is to be validated, following rules compliant with the same kind of privacy/security constraints.</p>	
<b>Mapping with research and development needs in the call</b>	

<p>This exercise covers the following requirements of the call:</p> <ul style="list-style-type: none"> <li>• Impact of automation on the ATM and U-space systems in support of the new information exchange and operational concepts.</li> <li>• The provision of U-space services within and outside controlled airspace where the ANSPs currently provide services, with a view of defining how the new U-space services, including in particular U-space traffic information services, could be applied safely, and how the current ATS services and the U-space services would complement each other.</li> <li>• Development of requirements for surveillance and tracking for drones, definition of how tracking is to be used, and the impact of drone tracking on manned aviation operations and on the ATM/U-space interface.</li> </ul>	
<b>Validation environment description</b>	
<p>The validation is planned to be developed in a simulated environment, focus on the simulation of drone tracks and its exchange with ATM. Also, manned aviation will be simulated to test the interaction between them. Several scenarios with different complexity level will be tested.</p> <p>The scenarios will be mainly based in non-segregated controlled airspace, especially in CTR environment, where the higher interaction between ATM and UTM systems is envisioned.</p>	
<b>Validation platform description</b>	
<p>The validation platform used will be the one deployed for Solution 1 - Cluster 1 - Validation Exercise 1.</p> <p>The platform is composed by:</p> <ul style="list-style-type: none"> <li>• iTEC ATM Platform, including manned aviation simulator.</li> <li>• CIS.</li> <li>• USSP.</li> <li>• SWIM nodes between CIS and ATM system.</li> </ul> <p>This platform will be enhanced with the necessary improvements to test the new concepts.</p>	
<b>Key performance areas</b>	
<p>The following key performance areas will be addressed by the exercise:</p> <ul style="list-style-type: none"> <li>• Safety</li> <li>• Efficiency</li> </ul>	
<b>Dependencies</b>	
<p>During Solution 1 initial and basic drone tracking information exchange between ATM and U-space will be validated. During Solution 2, a refinement of the requirements of drone tracking data exchange will be performed, taking into account in more detail timely access to traffic data only when necessary.</p>	

Validation number	5
Validation exercise name	Human Factors vs. Contingency
Lead contributor	AT-One
Validation technique	Human-in-the-loop simulations
Expected maturity	V1
<b>Validation objectives</b>	
<p>This exercise focuses on validating the CONOPS and ATCO display interfaces needed for coping with contingency situations involving drones in unsegregated airspace. To this end, the following three objectives have been developed for this exercise:</p>	



- Definition of CONOPS for this use case including description of the roles, responsibilities and tasks of ATCOs, Drone Operators, and U-space Service Providers to safely and efficiently resolve contingency scenarios involving drones.
- Definition of ATCO display interface requirements in order to minimize workload and maximize situational awareness during emergency situations involving drones.
- Validation of the display interface requirements and CONOPS using a human in the loop simulation.

#### Mapping with research and development needs in the call

This validation covers the following requirements of the call:

- Validation of U-space-ATM integration CONOPS for contingency scenarios.
- Defragmentation and interoperability of simultaneous ATM and U-space operations with the same controlled airspace.
- Operational aspects of the U-space – ATM collaborative environment, including in particular where applicable responsibility for separation during contingency scenarios.
- Impact of ATCO display interface design on the ATM and U-space systems in support of the new information exchange and operational concepts.
- Evolution of the flight-rules framework to account for drones and their different modes of operation.

#### Validation environment description

##### Scenarios

This validation exercise will consider several drone contingency scenarios including C2 link loss, loss of propulsion, and other hardware failure that leads to accidental incursion of restricted airspace (e.g. runway approach path) or conflict with manned aircraft. In addition, to the contingency situations, a nominal scenario, i.e., without contingencies, will be used as a baseline in this exercise. Furthermore, to ensure realism, the contingencies will occur during typical drone mission profiles including aerial photography, inspection and package delivery. For added complexity, some simulation runs will include multiple drones operating within the same area at the same time.

##### Display Interfaces

To integrate U-space and ATM operations, Air Traffic Controllers (ATCOs) will need to be provided with sufficient information on the drone operations in their sector to manage workload and maintain sufficient Situational Awareness (SA), especially with potential interactions with manned aircraft. This information will include, amongst others, aspects such as drone type, call-sign, RPAS operator, and flight plan. Such information could be provided to ATCOs in several forms. Therefore, the focus of this exercise is not to produce final display interface designs for ATCOs. Instead, the goal is to understand what elements of display interfaces are necessary, and the corresponding requirements, for ATCOs to interact effectively with drone traffic during contingency situations without overloading the ATCO display. Potential display interface elements that will be considered will include, but not limited to, the following possibilities:

- Automated digital flight strips (relevant data automatically filled in using flight plan).
- Table with drone operations on radar display (for ANSPS that do not use digital flight strips)
- Drone mission areas/trajectories and their interactions with manned aircraft flight paths.

##### Airport and Airspace

Amsterdam Airport Schiphol and its CTR will be used as the airport and airspace of interest in this exercise. This will include both APP and TWR sectors.

##### Experiment Participants

Several human participants will be involved in the experiment including:

- 1 TWR ATCO

- 1 APP ATCO
- Up to 3 RPAS operators
- Up to 3 Pseudo pilots

### **Manned Aircraft Traffic Sample**

The manned aircraft traffic sample will consider a mixture of both IFR and VFR manned aircraft. High traffic demand will be simulated to stress test the performance of the CONOPS and display interfaces considered in this exercise. To prevent learning effects, a multiple traffic samples will be used.

### **Drone Aircraft Types**

A mixture of both multicopter and fixed wing drones will be considered.

### **Validation platform description**

This exercise will be performed using the NLR ATM Research Simulator (NARSIM) and the DLR U-FLY RPAS ground control system and operations center. Part of the effort will be dedicated to creating a Distributed Interactive Simulation (DIS) interface between the two simulators.

### **NLR ATM Research Simulator (NARSIM)**

NARSIM is used to simulated manned air traffic, and it also offers multiple Air Traffic Controller (ATCO) and pseudo pilot working positions. Its aim is to evaluate new operational procedures, new controller assistance tools, and new human-machine interfaces. The NARSIM software simulates the most important aspects of a real ATC system, including realistic radar information and aircraft behavior. It has the capability to use actual recorded radar data, computer-generated data, pseudo pilot generated data, or combinations of the three. In this experiment, pseudo pilot generated data will be used to drive the simulation. NARSIM consists of two parts:

- NARSIM Radar for approach and en-route radar simulation.
- NARSIM Tower for airport simulation with a 360° visual system.

Both the Radar and Tower parts of NARSIM will be used in this exercise. During the simulations, TWR and APP ATCOs will control the traffic, with a focus on ensuring safe and expeditious operations. The role of the pseudo-pilots, on the other hand, will be to provide the controllers with realistic interaction (R/T) and to control the aircraft by providing inputs to the simulator by following the instructions of ATC.

### **DLR U-FLY**

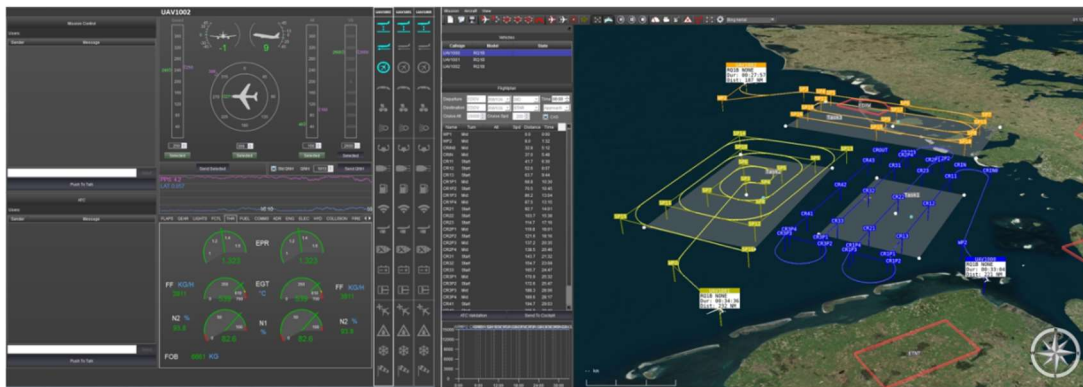
The U-FLY is a ground control station for unmanned aircraft systems (UAS). The U-FLY is a human-machine interface for the simultaneous supervision and guidance of multiple highly automated UAS. Empirically validated human factors methods were applied in order to design a novel human-machine interface that optimally meets the needs of UAS-pilots. Furthermore, the degree of abstraction of presented information is being varied systematically, enabling the UAS-pilot to quickly perceive safety critical system states of all UAS under control.

The U-FLY provides input devices for efficient and precise mission planning, high level flight control (e.g. change of heading or altitude) and simulation of different aerial platforms for the purpose of scientific research. Further, the U-FLY can serve as the main mission planning tool to be used for this validation exercise. The main features are the preparation, planning and creation of optimized 4D-trajectories, the assistance and/or adoption of the communication activities of the pilots with e.g. ATC, the automated conflict prediction with other aviation participants and the accessibility of further important information such as NOTAMs, weather data or navigation charts.





*HMI for the supervision and guidance of multiple UAS in controlled airspace*



*HMI for the supervision and guidance of three UAS during a reconnaissance mission (screenshot)*

### Key performance areas

The following key performance areas will be addressed by this exercise:

- Workload.
- Situational Awareness.
- Safety.
- Robustness/Flexibility.
- U-space/ATM interoperability.

The analysis will include questionnaires for the ATCOs to evaluate the subjective workload and the situational awareness. The recorded separation distances between air traffic will be used to assess safety. The combination of the different metrics will enable the project to assess the interoperability between U-space and traditional ATM for this defined use case.

### Dependencies

This exercise will be dependent on the use-cases and requirements identified in WP 3.1-3.4. Additionally, the human factors analysis performed in WP3.2 will impact both ConOps and display interfaces that will be considered here.

Validation number	6
Validation exercise name	U-space resilience to minimize disruptions
Lead contributor	SINTEF
Validation technique	Expert workshops supported by fast-time simulation and interactive visualization
Expected maturity	V1
Validation objectives	
<p>This exercise seeks to assess how U-Space resilience can be achieved through a set of (semi-)automated algorithms acting on strategic, tactical and operational level, respectively, to minimize the impact of disruptions such as link failures, interference with manned, and other unforeseen/emergency situations. A concrete use-case may be a deviation of low level RNAV traffic in an urban environment that would violate separation minima. The target maturity level for this exercise is V1.</p>	
Mapping with research and development needs in the call	
<ul style="list-style-type: none"> <li>As the main aspect, this exercise will address "U-space resilience principles and their impact on ATM."</li> <li>Due to the projected high level of automation in U-Space, disruptions will need to be handled differently. How to handle disruptions with possibly also a high level of automation support, will address the "Impact of automation"</li> <li>The tactical measures to re-route drones in the impacted area will relate to "Operational aspects of the U-space – ATM collaborative environment, including in particular where applicable responsibility for separation and development of separation minima, as well as trajectory revision and update processes.", as well as "Impact of drone route definition, formatting and navigation performance options on the U-space-ATM interface and elaboration of associated requirements." Increasing resilience may require to further develop the strategic and tactical deconflicting services. Therefore, we will relate also to the "provision of U-space services within and outside controlled airspace where the ANSPs currently provide services, with a view of defining how the new U-space services, including in particular U-space traffic information services, could be applied safely, and how the current ATS services and the U-space services would complement each other."</li> </ul>	
Validation environment description	
<p>A two-step approach for validation which will be conducted through workshops:</p> <ol style="list-style-type: none"> <li>Through a number of low-fidelity fast time simulations we will identify the fundamental requirements of a resilient U-Space.</li> <li>These requirements will be further developed through the results of expert evaluation using an interactive visualization of a concrete use case. The visualization allows for traffic to be initiated and managed in real-time. KPIs that reflect the U-Space performance will be automatically extracted and visualized, and can be further analyzed.</li> </ol> <p>Synthetic data will be generated with different properties (e.g. different aircraft / drone traffic loads) for use throughout the validation. Appropriate scenarios of the area over Linköping / Norrköping would be readily available and can be adapted to stakeholders' expectations for the selected environment.</p>	
Validation platform description	
<p>The following tools and platforms are available to form the validation platform, dependent on the needs determined during the project:</p>	

<ul style="list-style-type: none"> <li>• SIMADES, an Agent Based Discrete Event simulator developed by SINTEF that can incorporate individual behavior of the involved agents (e.g., different operational rules, technical characteristics of aircraft and drones).</li> <li>• The SINTEF ATC optimization library, a library for rapid prototyping ATM optimization algorithms, which has been used in numerous SESAR projects.</li> <li>• Interactive visualisation platform available through LFV/COOPANS with built in capabilities for extracting KPIs.</li> </ul>
<b>Key performance areas</b>
Operational performance: Efficiency of the airspace, time to recovery Environment: Noise Human Performance: Transparency and usability Safety: Number of infringements between manned and unmanned aircraft, and between drones and geofences defining exclusion areas.
<b>Dependencies</b>
The exercise depends on the use-cases and requirements identified in WP 3.1-3.4.

Validation Plan (leader: INDRA) and Validation Report (leader: ENAI) will be produced to detail the experiments and planning and to consolidate the results of the different experiments. Given that the experiments should quantify specific indicators and metrics suitable for a new collaborative environment, this WP will also describe the changes to the SESAR performance framework which are necessary to take into consideration this seamless integration of U-space and ATM. The proposed updates to the SESAR Performance Framework will be coordinated by ENAI.

All these results will be the most relevant inputs to produce the Safety Assessment Report (SAR), the Human Performance Assessment Report (HPAR), the Performance Assessment Report (PAR) and the Environment Assessment Report (ENVAR) in WP3.3.

#### **WP3.6.- Stakeholder collaboration management and definition of next steps (leader: INDRA)**

This task will manage the continuous involvement of the wider drone community. This will be done by putting in place a U-space and ATM Community Network which will represent a broad range of U-space stakeholders. The U-space Community Network will include current and potential UAS operators, and UAS aircraft manufacturers as well as organizations offering services to UAS operators such as UAS airports and insurances. Additionally, the already existing users of the relevant airspace will be represented, including manned aviation (i.e. General Aviation, military, EHS, etc.). Solution 2 will take into consideration the successful experience of the CORUS project in managing this network. Several mechanisms will put in place to ensure the involvement of the participants, in particular:

- Specific surveys to capture drone community view on the relevance of the high-level use cases to be addressed by the solution, the operational and technological paradigms of the U-space and ATM collaborative concept or the envisioned changes in existing regulations and standards among other topics.
- On-line technical workshops to specifically address technical and operational challenges e.g. automation challenge and digitalization in the U-space and ATM collaborative environment or required evolution of CNS technologies, among others.
- Organization of three workshops with the U-space Community Network, and inviting also to other social representatives such as community organisations, etc. The objectives and location of the three workshops are:

- 1<sup>st</sup> workshop will be hosted by INDRA. This workshop will allow consolidating the high-level use cases and the operational characteristics of the collaborative ATM-U-space concept to address them.
- 2<sup>nd</sup> workshop will be hosted by EUROCONTROL. This workshop will be focused on the operational environment, including roles and responsibilities and detailed operating methods and services, CNS performance expectations along with potential functional architectures that can enable the effective deployment of the ConOps.
- 3<sup>rd</sup> workshop will be hosted by ANS CR. This workshop will allow explaining the results of the experiments and getting conclusions on the changes to the ConOps and applicable standards and regulations.

This task will also put in place standard procedures to ensure the revision of deliverables by all Solution 2 partners, optimizing the effort in the rest of the WPs – partners in other WPs will be actively contributing to the tasks as leaders, main contributors or minor contributors –. In this review process, a subset of the Community Network will support the consortium by answering questions, reviewing documents and providing technical advices. The Advisory Board will also enhance the project's links to other research and/or standardisation work from organisation such as EUROCAE, JARUS, EASA, and ICAO.

This task will conclude the work by completing PJ34 Solution 2 Initial Validation Plan Report V2.- Roadmap for the next phase (leader: EUROCONTROL).

### Deliverables Leaders

The following table details the leader partner of the different deliverables expected in Solution 2:

Deliverables	Leader
Initial concept description	NATS
Final concept description	To be defined
SPR-INTEROP/OSED. Operational Service and Environment Definition	LFV/COOPANS
SPR-INTEROP/OSED. Safety, performance and interoperability requirements	LEONARDO [TPZ]
SPR-INTEROP/OSED. Part II SAR	LEONARDO [TPZ]
SPR-INTEROP/OSED. Part III ENVAR	ENAV
SPR-INTEROP/OSED. Part IV HPAR	DSNA
SPR-INTEROP/OSED. Part V PAR	LEONARDO [TPZ]
Functional Requirements Document (FRD)	AIRBUS
Initial CBA V1	PANSA
VALP V1	INDRA
Part II Technological and Safety Assessment Plan	DLR (safety) / SINTEF (technology)
Part III Security Plan	SINTEF
Part IV HP Assessment Plan	NLR
Performance framework update <sup>4</sup>	ENAIRE
VALR V1	ENAIRE
VALP V2	EUROCONTROL

<sup>4</sup> Internal deliverable to coordinate the updates to be done in the SESAR Performance Framework to capture the needs of the U-space and ATM collaborative environment.

#### *1.3.3.4. IPR Management*

IPR Management will be performed following the Grant Agreement principles. Background IPR shall remain on the owning beneficiary. Access Rights (rights of use of results or background) will be provided by the beneficiaries to the other beneficiaries for the implementation of their own tasks under the action in the terms determined by the owning beneficiary in accordance with clause 25 of the Grant. Results are owned by the beneficiary that generates them.

In the event of joint ownership of any Result, 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 the Grant Agreement.

### **1.4. Ambition**

The main ambition of AURA is to enable the safe integration of the new actors in the current airspace to avoid airspace fragmentation and ensure interoperability between the different systems.

The results of the project will be a very valuable input for EASA and the development of the current U-space regulation and for the different entities working on the standardization process of traffic management information.

#### *1.4.1. Solution PJ.34-W3-01 Collaborative U-space-ATM interface*

Solution PJ.34-W3-01 main ambition is to develop and validate information exchange services between U-space systems and ATM systems to reach V2/V3 maturity. This integration will bring benefits to all the stakeholders involved:

- To drone operators, easing the access to the airspace, especially in areas close to or in controlled airspace, allowing new operations and increasing therefore drone applications.
- To USSPs, providing new interfaces with the rest of ATM environment.
- To ATM stakeholders, that will be able to access U-space information in an easy way and reusing as much as possible current standards and technologies.
- To regulators and standardization bodies, using the results of the project as inputs for its activities.
- To drone system manufacturers, allowing them to develop systems widely interoperable with compliant USSPs thanks to standardised U-space-ATM data models

The solution will use previous exploratory research and demonstration U-space projects as well as SWIM related projects but it will go deeper in the U-space-ATM interface, setting the basis for the new standards for information exchange.

The solution will contribute to the further deployment of U-space roadmap in Europe, allowing the proliferation of drone operations and contributing to avoid airspace fragmentation.

#### *1.4.2. Solution PJ.34-W3-02 Collaborative ATM U-space Environment Concept Development*

The ambition of the Solution 2 is to develop a **medium- to long-term concept for a collaborative ATM-U-space environment**, which facilitates seamless operations of drones and manned aviation in non-segregated airspace and validate it to reach V1 maturity.

This will benefit the drone community at large by opening up large portions of currently inaccessible urban airspace to drone operations and facilitate new business cases. Having these new types of airspace users involved in day-to-day operations will directly impact the evolution of services and businesses at large.

The collaborative concept will provide the framework for industry, regulators and airspace users to work together to establish a fully seamless air traffic environment which is flexible enough to adapt to new users,

diverse usage of airspace and new technologies. In this way it will facilitate the merging of the manned and unmanned aviation environments to a single, unified concept.

By describing the possible architecture and services of collaborative ATM- U-space systems, Solution 2 will provide guidance for the rising industry of U-space service providers on how to effectively work together with ATM to provide the most value to their customers while supporting U-space regulatory initiatives to facilitate their introduction into controlled airspace.

Solution 2 will address automation as a crucial part of U-space as well as the future ATM system, setting the baseline for the seamless integration of both systems. Given that U-space is anticipated to be dependent on a high level of automation, Solution 2 will be an opportunity of using U-space to encourage the evolution of ATM towards increasing automation in its own systems by providing concrete evidence on how to integrate such systems into the current ATM environment.



## 2. Impact

### 2.1. Expected impacts

The project is expected to have a big impact on the integration of new actors into the airspace. The results of the projects will be key to enable a new market with multiple applications that will bring multiple benefits to aviation stakeholders and society in general.

To ensure the expected impacts detailed in this section, AURA project will have an Advisory Board, with different members, including international organizations (for example, ICAO, EASA, JARUS, NASA, FAA) and different stakeholders of drone industry, as drone operators. Several workshops will be organized during the development of the project to guarantee the involvement of Advisory Board and external stakeholders.

The main positive impact of the project are explained in the following points:

- Contribute to the safe and fair integration of drones especially in controlled airspace around airports.
- Contribute to the development of U-space in Europe, accelerating the deployment roadmap and allowing an interoperable U-space through Europe.
- Development and validation of information exchange between U-space services and ATM systems through SWIM, contributing to the safe integration of drones into the airspace.
- Contribute to SESAR Key Performance aspects, Safety and Access to the airspace and equity. The project will enable the access of new actors to the airspace and at the same time, it will maintain the safety of current airspace users, avoiding negative impacts in current stakeholders.
- Obtain feedback from the relevant parties on the U-space-ATM integration ConOps and information exchange protocols to facilitate stakeholder acceptance of combined drone and manned aircraft operations.
- Contribute to avoid the defragmentation of the airspace and interoperability, enabling seamless operations and avoiding airspace fragmentation and interoperability between U-space and ATM systems.
- The results of the project will be provided as input to regulators (EASA) and to standardization bodies working actively in U-space (for example EUROCAE)
- Contribute to the evolution of two Essential Operational Changes (EOCs) as defined in European ATM Master Plan 2020, “U-space services” and “Multimodal mobility and integration of all airspace users”, especially in the integration of all airspace users, easing the integration of drones by developing U-space – ATM interface.

#### 2.1.1. Technical Impact

The technical impact will be different depending on each solution.

Solution 1 will affect on the development and deployment of U-space services, since new data and information exchange requirements will be derived from the solution. As it has been stated in the previous section, these requirements will not impact the possible different U-space architectures.

Regarding current ATM systems, in order to integrate the new data coming from U-space services, several adaptations will be required by the ANSPs, mostly regarding how to display this information in a safe way, to increase situational awareness for ATCOs and avoid safety impacts and workload increases. The Solution 1 will study the human factors aspect of the problem, proposing solutions to be implemented by the ANSPs. In relation with the information exchange, the solution will use SWIM based interfaces, aligned with current standards and proposing new requirements when necessary. The cyber security aspects of the information exchange will be also studied during the project.

Regarding future U-space systems, easy and standardised access to ATM information will improve safety of operations and ensure better sharing of the airspace between drones and manned aircraft. As envisioned in CORUS, U-space will be highly automated. In that perspective, fast and reliable information exchange is key,



and providing a solid technical framework for deployment of U-space services will allow USSP to quickly develop their offering with a high level of quality and safety. One of the goals is to reduce the changes required in the ATM side, in order to avoid big investments or technical impacts.

Solution 2 will require the adaptation of both the ATM and the U-space systems to guarantee the seamless integration between both systems, as requested by the mid- and term-phases of SESAR.

### **2.1.2. *Economic Impact***

In order to reach the promising economic impact, it is essential to deploy the necessary tools for the safe integration of new comers into the airspace in the Very Low Level.

According to the European Drone Outlook Study 2016, the value of the drone market will exceed EUR 10 billion annually, reaching a cumulative benefit of EUR 140 billion by 2035.

In order to reach this economic impact, it is essential to deploy the necessary tools for the safe integration of drones into the airspace. Today, drone operations in VLL are highly restricted and the authorization processes for some type of operations, for example, in controlled airspace are usually long and with very demanding requirements. The new European regulations are easing this process in order to unify the differences between the countries and to enable the opening of the airspace.

AURA will contribute to reach the expected economic potential of the drone market, through the development and validation of the integration between U-space services and current ATM systems. The further development of U-space services concept of operations through Solution 2 will also contribute to the rapid deployment of U-space roadmap in Europe.

### **2.1.3. *Social Impact***

The new drone applications will have a direct impact in society that will obtain direct benefit from the new services provided by drones. Today these benefits are a reality, for example with the use of drones for search and rescue missions or transport of medicines or blood preservation. This direct impact will grow in the future with the use of drones for applications as delivery or urban air mobility.

AURA will contribute enabling the development of the drone sector, easing the deployment of the U-space services that will allow a safe use of the drones in the airspace.

## **2.2. Measures to maximise impact**

### **2.2.1. *Dissemination and exploitation of results***

Coordinated dissemination activities and exploitation strategies of the project results are key instruments to achieve the expected project impacts. To ensure an effective approach, the strategies will be defined in a dissemination plan and an exploitation plan. These plans will be included in the project management activities and it will require the collaboration of all consortium members.

In this section, a first draft of the expected dissemination and exploitation activities is presented. The plans will be updated during the development of the project to consider the results and to grant the correct communication with the target audiences. It will be taken into account the new updates in regulation during the dissemination and communication of the different results.

Each partner will contribute at specific levels according to their expertise and business activities. Specific distribution of tasks between the partners will be established in the beginning of the project.

The first step for dissemination activities is to identify the target audiences. AURA project involves a very wide audience, since the project does not involve only ATM or airspace stakeholders, it has also direct impact in drone market stakeholders, final users and general public. Taking into account the different target audiences, several strategies for dissemination will be used. The following groups have been identified as target audience for AURA and the following dissemination goals and messages have been identified:

1. **U-space Service Providers.** These stakeholders are responsible for the safety management of UAS operations in the VLL and are directly influenced by the project development and results. They will be responsible for the exploitation of one part of the project, implementing the U-space side of the U-space ATM interface.
2. **UAS operators.** These are the main users of the U-space airspace. The dissemination message for this audience will be centred in the advantages of this integration. The message will focus on the increase of capacity in non-segregated airspaces, the higher incomes due to new areas of operation (e.g. high populated areas in controlled airspace), and the safer and efficient operations.
3. **UAS equipment manufacturers.** As they will need to identify the added value features they can include in their products to bring their customers the benefits of a safe collaborative ATM U-space environment.
4. **Air Navigation Service Providers.** They have one of the most important roles in the development of the collaborative ATM-U-space environment. The message to this audience will focus on how they can use this integration to improve the safety of manned aviation and which changes in its work procedures will be required. It will be important to remark that the benefits in safety will be much more valuable than the changes that will be required, as well as the low impact in its workload.
5. **European and National Aviation Authorities.** They are in charge of regulating UAS operations. The authorities will be able to use the results of the project as input for the development of new regulations and some current regulation aspects (still not approved, such as Opinion 01/2020) will be tested during the project, providing a valuable feedback for the authorities.
6. **Standardisation bodies.** They will be the main users of requirements designed by AURA to proceed for further standardisation. National and international standardisation organizations will be reached with specific strategies. This dissemination will be eased by the relations that some AURA partners have with those organizations.
7. **Researchers and professionals of the sector.** The principal idea is to increase the knowledge and awareness of this innovative integration concept.
8. **General population.** One of the biggest barriers in drone market is the social acceptance. The public concerns about the use of UAS in VLL (specially the urban one) is still present. The dissemination strategy will target the perception of safety among citizens and highlighting the direct benefits that the general public can obtain from drone activities.

The dissemination means will include the creation of the project specific website in SJU website, publications in specialized and mass media and participation in national and international conferences.

The dissemination plan will be adapted to each project phase. At the beginning of the project, the specific plan with milestones and partners responsibilities will be defined. In this phase the communications material will be produced and the main objective is to inform of the start and scope of the project to the involved stakeholders. During the development of the project, the different target groups will be addressed with specific communications informing about the evolution of the different solutions including workshops opened to external reviewers. Finally, the results of the project will be shared with the corresponding groups, ensuring that the materials produced during the project are used as input by the identified targets, such as the regulation and standardization authorities.

Regarding the exploitation of the results of the project, AURA project foresees several exploitation opportunities for the different stakeholders involved. Firstly, the results can be exploited by the regulatory and standardization entities, considering the validations and documentation produced as an input for the development of new standards and drone regulations, specially focused in the interface U-space-ATM. This exploitation will be guaranteed with the early involvement of these organizations in the project.

Secondly, the industrial exploitation of the results will be guaranteed by the industry stakeholders that are partners of the consortium. The platform developments and enhancements performed during the project will be used as a basis by the partners to start the industrialization of the ATM-U-space interface.

As a consequence of the project, a safe integration of the new actors into the airspace will be enabled, favouring the appearance of new drone applications and enabling a new market, which will benefit the general public and the commercial activities across Europe.

### **2.2.2. Communication activities**

Alongside the project dissemination activities described in section before, and to their support, communication activities will be planned and implemented throughout the project. The success and impact of this project remains in good communication actions intended for the identified target audiences. During the communication phase, there will be clear acknowledgement of SESAR funding in all dissemination and communication activities, creating awareness and outreach about SESAR 2020 and the research outcomes and benefits that these solutions can bring to real day-to-day U-space and ATM operations.

With the objective of guarantee the accomplishment of those communication actions and facilitate an efficient and transparent project management, as well as results, a Communication Plan will be developed giving more visibility to the project achievements worldwide. The Communication Plan will contain both the objectives and strategy of the project and will keep a close contact with SJU communications area to ensure that the communications are consistent with the SESAR and H2020 brand. In addition, it will contain a calendar of the key Project milestones associated with communications activities and their target audience. Finally, the communication plan will take advantage of the expertise in communication matters of large organizations that are members of the consortium.

The communication material will be developed taking into account both the message to communicate and the characteristics and needs of the targeted audiences as explained before. The communication materials will consist of:

- Visual and Corporative identity. It will guarantee the project gets a professional and consistent look.
- Project Website. The website will include information of the project as well as the possibility to get contact with project partners for interested stakeholders. The website will contain, as a minimum, information about the project scope and goals, work plan, involved partners, public deliverables and SESAR funding.
- During the development of the project, specific workshops will be organized with the different target groups. These workshops will have a double scope, first to disseminate the project evolution and second to get the inputs of the required stakeholders for the correct development of the project.
- Open Days will be organized after the main validation exercises of the Solution 1, to communicate the results and activities to other SJU members, authorities and drone community.
- Presentations in public congress or seminars, in coordination with SESAR JU Communication area. These congresses will include oriented ATM events, as World ATM Congress but also drone related events, as Amsterdam Drone Week or ICAO Drone Enable .
- Mass media presence, with press releases in the different countries of the partners.
- Technical papers and articles to be published for presentation on related conferences or newspapers and specialised magazines.
- Social networks. A social media strategy will be designed to best use social media according to the project objectives, taking advantage of the partners social media accounts.
- Posters will be developed for presenting the project at conferences, workshops and exhibitions, describing the work in progress to the target audience and enabling to obtain any feedback.

The Communication activities will be led during the entire project by the Project Coordinator and each partner will use its own Communication means to make sure the project and its outcome are known worldwide.

### 3. Implementation

#### 3.1. Work plan — Work packages, deliverables

##### 3.1.1. Project Structure

The project is divided into two different Solutions; each split into a certain number of activities and to a certain extent, coordinated independently by its Solution Leader (SL). The project structure is displayed in Figure 9.

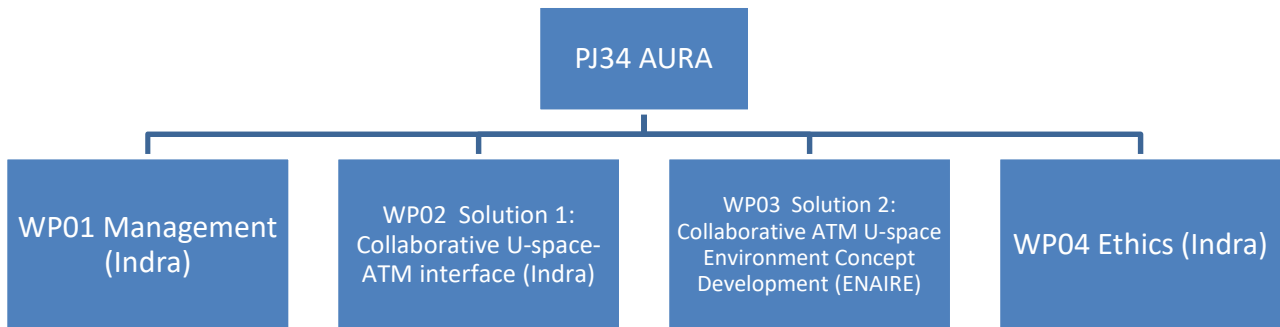


Figure 9: AURA Work Break Down Structure

In order to ensure the appropriate coordination and performance of the activities related to transversal activities, two additional roles are proposed at project level: 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 and UTM 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.

A detailed work package description follows in chapter 3.4, in the following figures the Gantt chart and Pert diagrams of the project are included.

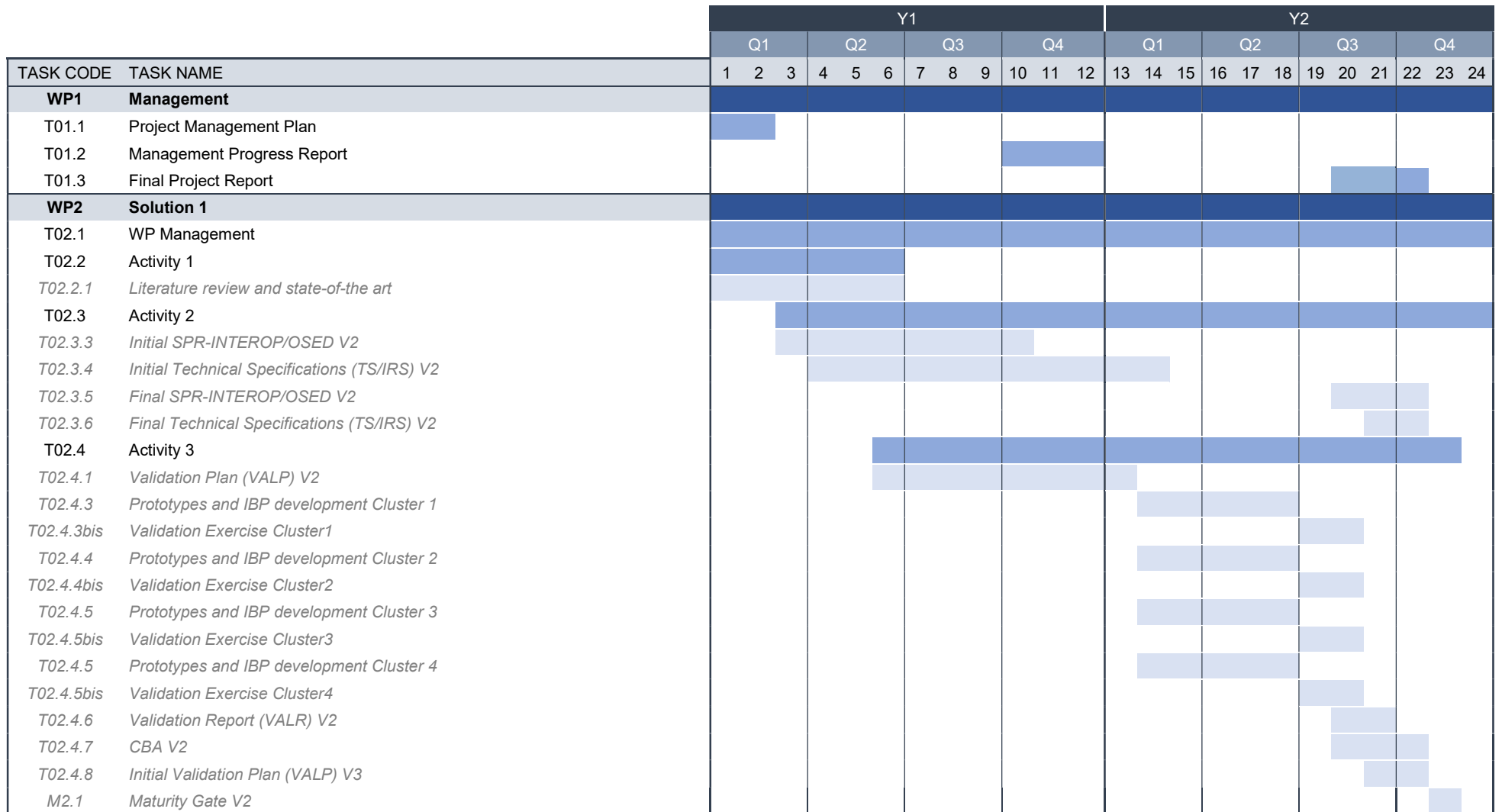


Figure 10: Project AURA Gantt Chart WP1 and WP2

TASK CODE	TASK NAME	Y1												Y2											
		Q1			Q2			Q3			Q4			Q1			Q2			Q3			Q4		
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
<b>WP3</b>	<b>Solution 2</b>																								
T03.0	WP Management																								
T03.1	High-level use cases and operational concept overview																								
T03.1.1	Initial concept description																								
T03.2	Operational Services and Environment for ATM-U-Space Collaboration																								
T03.2.1	OSD- Initial version																								
T03.2.2	OSD- Consolidation																								
T03.3	Safety, Performance and Interoperability requirements																								
T03.3.1	SPR-INTEROP.- Initial version																								
T03.3.2	OSD Annexes SAR. ENVAR, HPAR, PAR																								
T03.3.3	SPR-INTEROP.- Consolidation																								
T03.4	Architectures and deployment technologies																								
T03.4.1	Functional Requirements Document - Initial version																								
T03.4.2	Functional Requirements Document - Consolidation																								
T03.4.3	V1 Initial CBA																								
T03.5	Assessment of the concept																								
T03.5.1	VALP and annexes																								
T03.5.2	Exercise 1.- Human Factors vs Automation- ENAIRE																								
T03.5.3	Exercise 2.- Functional Architecture vs Safety and Efficiency- AIRBUS																								
T03.5.4	Exercise 3.- Drone flight plan and route definition- INDRA																								
T03.5.5	Exercise 4.- Tracking, surveillance and traffic inf. services- INDRA																								
T03.5.6	Exercise 5.- Human Factors vs Contingency- AT-ONE																								
T03.5.7	Exercise 6.- U-space resilience to minimize disruptions- SINTEF																								
T03.5.8	VALR and annexes																								
T03.6	Stakeholder collaboration management and definition of next steps																								
T03.6.1	External collaboration and deliverables review																								
T03.6.2	Initial Validation Plan V2.- Roadmap for the next phase																								

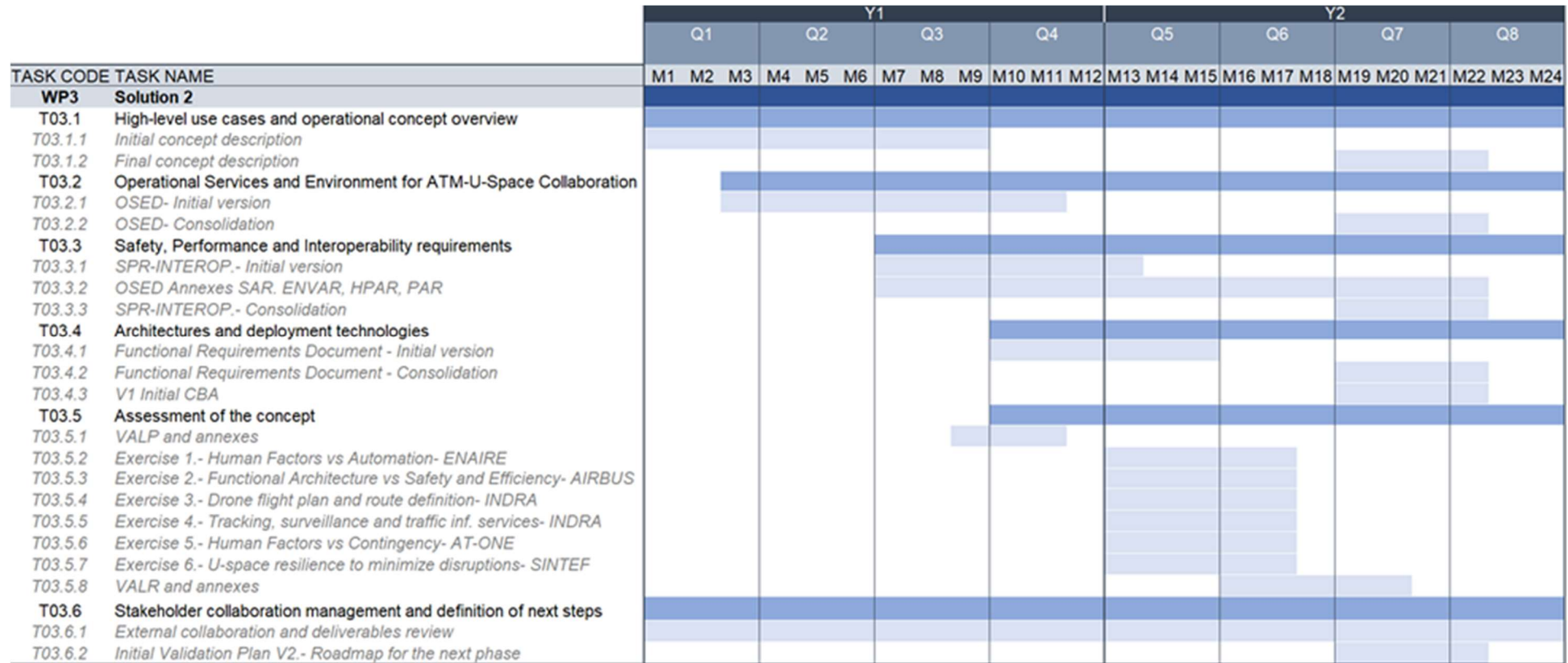


Figure 11: Project AURA Gantt Chart WP3



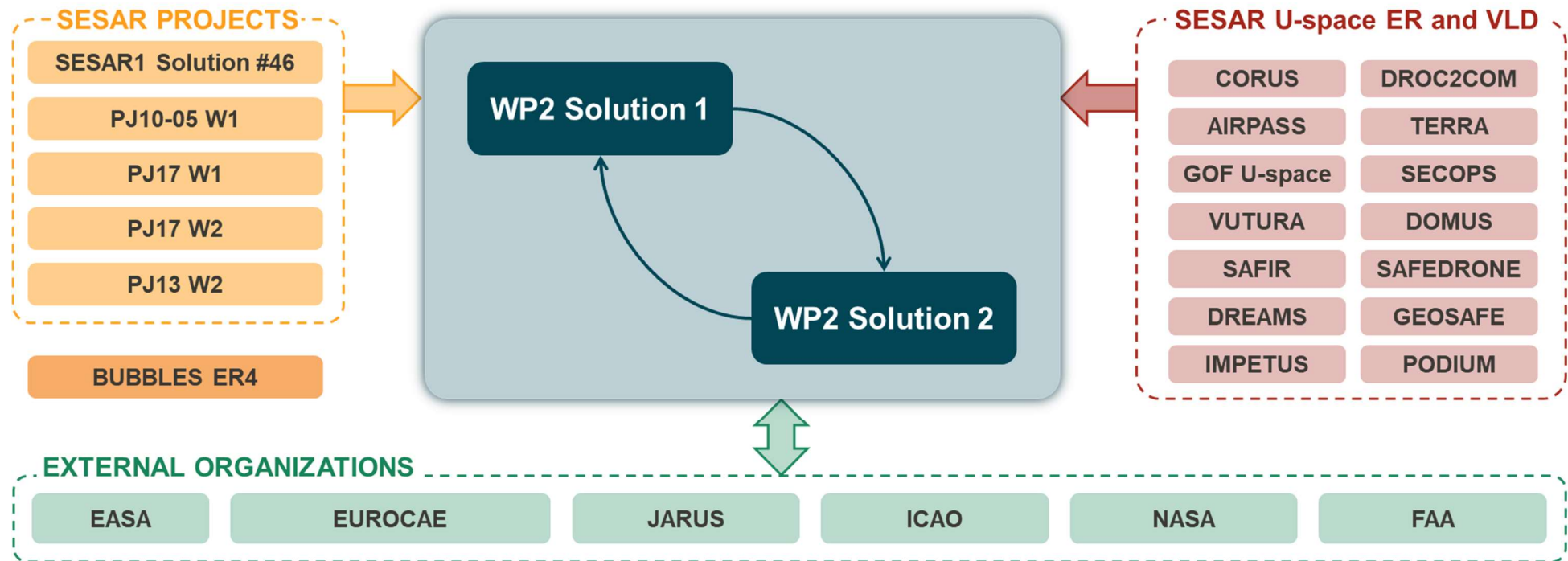


Figure 12: AURA Pert Diagram

### 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 SESAR2020 Membership Agreement (SMA) specifies management rules that govern the project's workflow as well as all responsibilities and duties of the partners during the course of the project. The administrative and organisational management activities are hosted in WP01. 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 13.

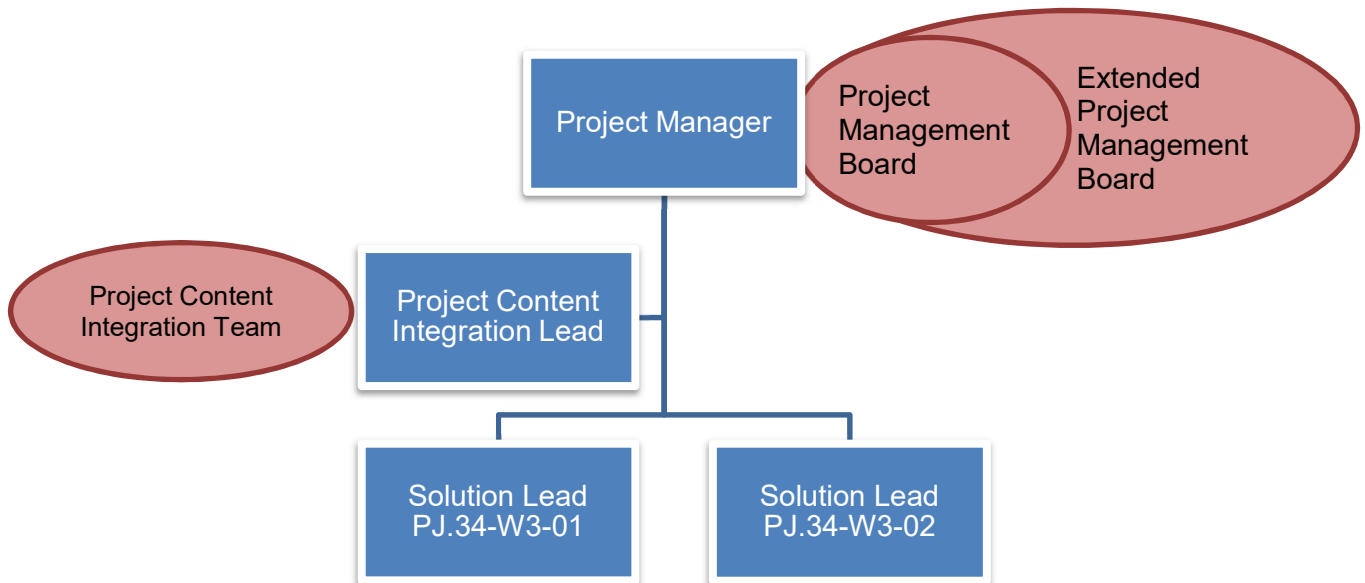


Figure 13: Project Structure for Solution/Enabling Project

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. The Project Content Integration Lead (PCIL) 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.

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;

the preparation, execution and maintenance of a Project Management 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;

ensuring with partners the engagement of 3rd parties (such as but not limited to airspace users, staff associations, etc.), where applicable;

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.

### **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 SJU Membership 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;
- Solution Leaders or WP leaders;
- Representatives of key contributor to the project (if not represented by above categories).

SJU may be invited for specific agenda items.

### **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. SJU may be invited for specific agenda items.

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
- CBAs (approved by contributors to the solution)
- V1/V2 Data Pack (depending on the solution)

Change Request to the SGA.

Decision making principles are the same as for the Project Management Board.

### **3.2.4. Solution Leader (SL)**

The Solution Leader 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 Leader 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 and V2);

Prepare and represent the solution at the maturity gate, notably responsible for producing the Maturity Report;

Participate to the PMB/EPMB.

### **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 WP01.

### 3.2.7. *Project Content Integration Team (PCIT)*

The Project Content Integration Team is a virtual team composed of the ATM and U-space Focal Points, 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.

## 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 22 active organisations from 12 member states of the European Union, and 2 organisations from 2 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.

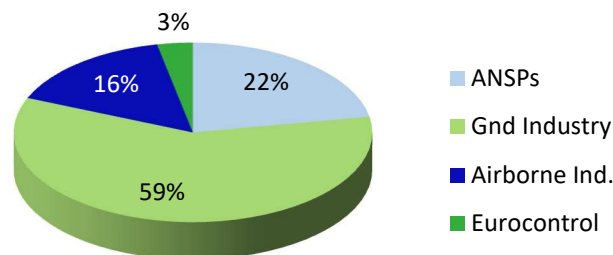


Figure 14: Budget share between stakeholder groups

The consortium is composed by a well balanced mix of ground industry, airborne industry, ANSPs and EUROCONTROL. Most of the members are active in the drone activities and in the different working groups of the international organizations, such as EUROCAE and ICAO. Multiple partners have been involved in previous SESAR U-space projects, ensuring the relation with them. At the same time, the consortium has partners with wide experience in ATM, both industry and operational experience, to ensure a proper integration of drones in current ATM system, one of the main objectives of the project.

## 3.4. Resources to be committed

**Table 3.4b: ‘Other direct cost’ items (travel, equipment, other goods and services, large research infrastructure). Only if exceeds 15% of the personnel costs for that participant (according to the budget table in section 3 of the proposal administrative forms).**

Participant/NLR	Cost €	Justification
Travel	€ 6,000.00	Estimate for travel costs based on 2 people attending 4 meetings in other countries, especially meetings needed for technically coordinating the AT-One real-time simulations in solution 2
Equipment		
Other goods and services	€ 12,750.00	The cost of computing and support from operations experts (airline pilots, rpa pilots, ATC tower and approach controllers) who will take part in the design and execution of the AT-One real-time simulations in solution 2
Internally invoiced goods	€ 27,980.00	The costs for the usage of the NARSIM tower + radar simulators. According to audit report BAEA366019, NLR will report the NARSIM costs as internally invoiced goods and services.
<b>Total</b>	<b>€ 46,730.00</b>	

## References

- [1] SJU “H2020-SESAR-2020-2 WAVE 3 Call Technical Specifications” Ed. 1.0, 13 March 2020
- [2] SJU “Single Programming Document 2020-2022”, Ed. 1.0, 17 December 2019
- [3] SJU “European Drones Outlook Study”, November 2016
- [4] SJU, “European ATM Master Plan”, Ed. 2015
- [5] SJU, “European ATM Master Plan”, Ed. 2020
- [6] SJU, “Supporting safe and secure drone operations in Europe”, March 2020

## 4. Members of the consortium

### 4.1 Participants (applicants)

#### 4.1.1 Companies profile

##### 4.1.1.1 INDRA SISTEMAS S.A.

Organisation	1 INDRA	Ground Industry
Description	<p>Indra is one of the leading global technology and consulting companies and the technological partner for core business operations of its customers world-wide. It is a world-leader in providing proprietary solutions in specific segments in Transport and Defence markets, and the leading firm in Digital Transformation Consultancy and Information Technologies in Spain and Latin America through its affiliate Minsait. Its business model is based on a comprehensive range of proprietary products, with a high-value innovation component. In the 2017 financial year, Indra achieved revenue of €3.011 billion, with 40,000 employees, a local presence in 46 countries and business operations in over 140 countries. Indra ranks second in Europe by R&amp;D spent.</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&amp;D, we are one of the leading companies in the SESAR program, the key technology behind the Single European Sky initiative.</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. New partners are PANSA (Poland), AVINOR (Norway), Oro Navigacija (Lithuania). iTEC is currently the most advanced next-generation air traffic management system, after entering full operational service at the Prestwick control center in Scotland</p>
Previous experience	<p>Since 2009, Indra is full member of the SESAR Joint Undertaking. In SESAR 1 Indra participated in more than 120 projects within the Programme and co-leading both WP10 (En Route and Approach ATC) and WP12 (Airports) Work Packages, as well as playing a key role in many projects under WP14 (SWIM), WP15 (Non-Avionics CNS) and WP13 (NIMS). Indra has also participated in SESAR Demonstration projects.</p> <p>In SESAR2020 Wave 1, Indra participated in IR/VLD Projects 01, 02, 03a, 03b, 04, 05, 06, 07, 08, 09, 10, 11, 14, 15, 16, 17, 18, 19, 20, 22, 24, 25, 27, 28 and 31, being Project Coordinator in PJ15 and PJ18. We have been involved also in SESAR U-space Demonstration projects SAFEDRONE and DOMUS.</p> <p>In SESAR2020 Wave 2, Indra is participating in IR/VLD Projects 01, 02, 04, 05, 09, 10, 13, 14, 18, 19, 20 and VLD1 (this last, under signature at the time of preparing the current Bid). Indra is also participating in Exploratory Research 4 projects TAPAS (ATM) and BUBLES (RPAS). In the H2020 ECSEL JU framework, Indra is leading the RPAS project COMP4DRONES.</p>
Entity Profile matching the task	<p>As explained in the previous sections, Indra has a solid entity profile in ATM Research due to the background knowledge, human resources and facilities to perform the R&amp;D activities. The ATM background has continuously grown from the 80's first developments for the Spanish ATM system, to joint ventures with other ATM worldwide companies, until alliances with key European ANSPs (iTEC). In term of human resources, hundreds of skilled personnel support the activities, while in terms of facilities, a significant number of laboratories and hardware resources equipped with the latest technology are used.</p>
Contribution	<p>Indra will be in charge of the project management of PJ34. Besides, it will lead PJ34-W3-01 "Collaborative U-space-ATM interface" solution, where the interface between U-space and ATM is defined and validated using SWIM. Indra will provide ATM and U-space platforms for the validations.</p> <p>Indra will also actively contribute in Solution PJ.34-W3-02 Collaborative ATM U-space Environment Concept Development, defining the ConOps and conducting validation exercise.</p>



#### 4.1.1.2 AIRBUS

Organisation	2 AIRBUS	Airborne 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 A220 Family to the double-deck A380.</p> <p>Over the last 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 A320 is one aircraft in four sizes (A318, A319, A320 and A321), representing the most successful and versatile jetliner family ever. Seating from 100 to 240 passengers and flying throughout the world – and landing on every continent – an A320 takes off or lands every 1.6 seconds. 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. The A220 expands the Airbus single-aisle family to cover the 100-150 seat segment – and respond to a worldwide market demand for smaller single-aisle jetliners.</p> <p>In the wide-body segment, the A330neo is powered by high-bypass ratio, new generation engines and designed with an advanced high-span wing vastly improving the aerodynamics. New materials have also been used across the wing including titanium pylon and composite nacelle. All these features combined, ensures that the A330neo has the lowest seat-mile cost of any mid-size widebody and burns 25% less fuel burn than the previous generation A330. 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>Continuously striving to develop new technologies, Airbus is a world leader in the modern aviation industry. Helping it stay at the forefront is the introduction of new systems, materials and designs that improve the quality and efficiency of aircraft to benefit everyone – from the passengers to airlines.</p> <p>In SESAR Airbus provides expertise in several areas. More precisely Airbus has a large development background for UAVs (drones) and integration of these novel platforms in airspace. With the European Medium Altitude Long Endurance Remotely Piloted Aircraft System (MALE RPAS) major development steps such as the System Preliminary Design Review are achieved.</p>	
Previous experience	<p>AIRBUS has in-depth knowledge of both ATM and UTM concepts and technologies, with extensive experience gained from the successful execution of a large number of ATM and UTM research and deployment projects in Europe and the US. More specifically, the following projects, initiatives and capabilities can be highlighted in relation to this proposal:</p> <ul style="list-style-type: none"> <li>- Airbus contributed to the SESAR 1 and SESAR 2020 wave 1 activities related to TCAS enhancements and to ACAS X</li> </ul>	

	<ul style="list-style-type: none"> <li>- Airbus contributes to International bodies related to UAS and UTM, such as ICAO – RPAS Panel, JARUS, EUROCAE WG75 and WG105, ASTM UTM-related working groups (RemoteID, deconfliction, etc), GUTMA, ASD UTM group and 3GPP.</li> <li>- Airbus is an FAA certified provider of the LAANC service (Low Altitude Authorization and Notification Capability), the official US authorization service for drone operations in controlled airspace. Airbus provides complementary UTM tools to the LAANC service, including mission planning, flight briefings and risk assessment.</li> <li>- Airbus is participating in the NASA Advanced Aerial Mobility National Challenge in the US, contributing to simulation experiments that will explore how UTM can enable future Urban Air Mobility operations.</li> <li>- Airbus has developed a set of prototype UTM/U-Space services to contribute to the future integrated ATM-U-Space ecosystem. These services will contribute to enable safe and efficient UAS operations that integrate seamlessly with manned aviation.</li> </ul> <p>Other relevant SESAR Contributions by Airbus:</p> <ul style="list-style-type: none"> <li>- SESAR 1 WPs 4.8.2, 4.8.3</li> <li>- SESAR 2020 Wave 1 PJ 11-A1</li> </ul>
Entity Profile matching the task	As a leading aircraft manufacturer, capable of managing large complex programmes, AIRBUS employees are highly skilled professionals, competent and motivated in their respective fields and well accustomed to working within an international, multicultural environment.
Contribution	AIRBUS, through its UTM team, will contribute to define, prototype and validate solutions for the seamless integration of U-Space and ATM using SWIM principles and components. Specifically, AIRBUS will develop SWIM interfaces for several U-Space services and will test their interaction with ATM in relevant use case scenarios working collaboratively with the project partners. AIRBUS will also contribute to define the future ConOps for ATM-U-Space collaboration, focusing on the design and early validation of feasible logical architectures that could enable the proposed ConOps.

#### 4.1.1.3 DEUTSCHES ZENTRUM FUER LUFT - UND RAUMFAHRT EV

Organisation	3 DLR	RTO
Description	<p>The German Aerospace Center (DLR) 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, digitalisation 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 one of Germany's largest project management agencies. DLR has approximately 9100 employees at 21 locations in Germany.</p> <p>Several DLR research institutes are participating in SESAR which are shortly introduced in the following:</p> <p>DLR 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</p>	

	<p>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 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 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.</p> <p>The DLR 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.</p> <p>DLR 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.</p> <p>AT-One Consortium is composed of its two members Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR) and Netherlands Aerospace Centre (NLR).</p>
Previous experience	<p>Previous and ongoing projects:</p> <p>CORUS: Concept of Operations for European UTM Systems. CORUS established a CONOPS for nominal situations, developing use cases for major scenarios, addressed drone operations in the vicinity of airfields and controlled airspace and for transfer between controlled and non-controlled airspaces, described how losses of safety in non-nominal drone situations can be minimized, examined non-aviation aspects, identifying key issues for society and offering solutions to ease social acceptance, identified necessary technical developments, quantifying the level of safety and performance required. The Project was funded by the Horizon2020 Programme (SESAR).</p> <p>AIRPASS: Advanced Integrated RPAS Avionics Safety Suite. The project covered Detect And Avoid (DAA) systems for cooperative and non-cooperative traffic, auto-pilot systems as well as Communication, Navigation and Surveillance (CNS) systems. This project identified the available CNS infrastructure and on-board technologies to formulate an implementation approach. Based on this an on-board system concept was developed and evaluated. The Project was funded by the Horizon2020 Programme (SESAR).</p>

	<p>AW-Drones: Airworthiness of mass-market drones is a project aiming to support the on-going EU regulatory process for the definition of technical rules, standards and procedures for civilian drones. This will enable safe, environmentally sound and reliable operations in the EU.</p> <p>City-ATM: In the project, a concept for future air traffic management (ATM) in urban airspace and for the safe and efficient integration of UAVs is being developed. This includes the definition and validation of operational and technical concepts for airspace management, information provision, traffic flow control and monitoring, as well as CNS-infrastructure. This comes along with the development of a concept of operations, the definition of requirements and framework conditions for the future ATM system as well as the considerations on the technical feasibility for users to operate safely in these environmental conditions. The target system is intended to enable and support flight testing within the developed City-ATM, initially in simulated - later real, but delimited - airspace. The aim of the project is also to bring together relevant stakeholders (such as UAS manufacturers, UTM system providers, aviation authorities and users) to develop a secure and efficient overall solution for the U-space.</p> <p>TRAWA: Traffic Awareness. Funded by EDA, in September 2016, the TRAWA project was launched. In order to be able to cleanly integrate unmanned aviation into manned aviation, both parties must play by the same rules. The prevailing definition of Remain Well Clear (RWC) from manned aviation must therefore be precisely defined. Derived from this, the necessary detection ranges of sensors for Detect and Avoid (DAA) can be determined.</p>
Entity matching the task	<p>DLR-FL operates the Air Traffic Validation Center and is a respected validation specialist with experience in unmanned aviation and air traffic integration. In addition, DLR-FL participates in different working groups, e.g. EUROCAE and JARUS. Furthermore, the institute was involved in multiple national and international activities regarding the integration of new entrants into the airspace and the generation of CONOPS and the respective validation.</p>
Contribution	<p>DLR will participate in PJ34 in solution 2. DLR' Institute of Flight Guidance will work on the generation of the CONOPS in solution 2. Through its involvement in several European U-space, DLR-FL will make sure that the envisaged operations are harmonized with the concept of operations (CONOPS) for U-space under development in the CORUS project and interoperable with current ATM-systems. Additionally, DLR-FL will work on a real time simulation in solution 2 to test and validate chosen use cases of the developed CONOPS.</p>

#### 4.1.1.4 STICHTING NATIONAAL LUCHT- EN RUIMTEVAARTLABORATORIUM

Organisation	4 NLR	RTO
Description	<p>NLR is the Netherlands Aerospace Centre for identifying, developing and applying advanced technological knowledge in the area of aerospace. NLR activities are relevant to society. They are market-oriented and carried out on a non-profit basis. NLR strengthens the innovativeness, competitiveness and effectiveness of government and business.</p> <p>The mission of NLR is to increase the sustainability, safety and efficiency of air transport. NLR is renowned for its leading expertise, professional approach</p>	

	<p>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 &amp; 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 is participating with two divisions in SESAR which are shortly introduced in the following:</p> <p>The division Aerospace Operations of NLR 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&amp;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 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 has deep expertise in GNSS.</p> <p>AT-One Consortium is composed of its two members Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR) and Netherlands Aerospace Centre (NLR).</p>
Previous experience	<p>Relevant previous and ongoing projects</p> <ol style="list-style-type: none"> <li>1. Metropolis (2013-2015): Investigation of multiple airspace design concepts to enable urban air mobility using fast-time simulations. NLR was responsible for the design of 1 of the airspace designs (4D tubes), and also facilitated the simulations using its Traffic Manager (TMX) simulator.</li> <li>2. PODIUM (2018-2019): Demonstration of initial U-space services to assess the capabilities of those services. Drone flights were conducted in Denmark, France and the Netherlands. NLR led the test campaign in the Netherlands at the NLR Drone Center.</li> <li>3. AIRPASS (2017-2019): Evaluation and analysis of the on-board technologies needed to enable U-space services. For this project NLR contributed to develop the on-board architecture.</li> <li>4. TERRA (2017-2019): Analysis of drone performance requirements to develop the architecture needed for the ground-based infrastructure to enable drone operations at very low altitudes. NLR contributed to the definition of the requirements for ground-based infrastructure, and also developed a drone detection algorithm.</li> </ol>



	<ol style="list-style-type: none"> <li>5. SECOPS (2017-2020): Identification and mitigation of drone-related security risks to ensure that drones do not affect the safety of other entities in their environment, especially in the very low altitude setting. This effort was initiated and led by NLR.</li> <li>6. VUTURA (2018-2020): Very large-scale demonstration of initial U-space services in the Netherlands. The project completed three test flights with multiple drones connected to different U-space service providers in both urban and rural areas. NLR acts as the coordinator of this project, and performed one of the demonstrations at the NLR Drone center.</li> <li>7. Hydra Drone (2017-ongoing): Development and flight testing of a hydrogen powered drone. This is the first hydrogen powered drone in the Netherlands. The aim is to improve the sustainability of drone flights in the future. First tests were carried out at the NLR Drone Center in 2019.</li> <li>8. METSIS (2020-ongoing): In the Meteo Sensors In the Sky project NLR is investigating the use of drones as a wind sensor network for hyper-local wind now-casting at low altitudes (&lt;1000ft) for U-space applications. NLR is inventor of the METSIS concept, and is in the process validating the concept through flight tests at the NLR Drone Center.</li> </ol>
<p>Entity matching the task</p>	<p>The ATM and Airports (AOAP) department of NLR, which will participate in this project, has a rich heritage in conducting research in the U-Space and Urban Air Mobility (UAM) domains, including active participation in several U-space exploratory research and VLD projects. Through these projects, AOAP has become skilled in the development and validation of new concepts for U-space, particularly in the fields of urban airspace design and airborne conflict detection &amp; resolution algorithms, using both simulations (fast and real time) as well as live flight trials. Recently, AOAP successfully organized flight trials of multiple drones in both urban and rural settings as part of the VUTURA project, the Dutch U-space VLD 1 project.</p>
<p>Contribution</p>	<p>In PJ 34, NLR will contribute to solution 2: Collaborative ATM U-space Environment Concept Development. Here NLR, together with its AT-One partner DLR, will focus on the development use-cases and corresponding ConOps for non-nominal/emergency situations, including scenarios where drones malfunctions/extreme wind gusts cause them to drift into the path of a manned aircraft. The resulting ConOps will be validated using Real-Time Simulations (RTS) with the NLR ATM Research Simulator (NARSIM) and the DLR U-FLY RPAS ground control station. In addition, the RTS will be used to test display interfaces to provide ATCOs with the situational awareness necessary to allow the operation of drones in controlled airspaces.</p>

#### 4.1.1.5 RIZENI LETOVEHO PROVOZU CESKE REPUBLIKY STATNI PODNIK

Organisation	5 ANS CR (B4)	Service Provider
Description	<p>Air Navigation Services of the Czech Republic (ANS CR) is a progressive provider of safe and cost-effective air traffic services designated by Czech Ministry of Transport. Its task is to provide services to airspace users within the Czech airspace and at 4 international airports - Prague, Brno, Ostrava and Karlovy Vary. Covering rather small but very complex airspace, the company handled more than 850.000 flights in 2017, reaching to 900.000 flights in 2018 as well as in 2019, with minimal level of delay.</p> <p>Operating fleet of jet and propeller calibration aircraft, ANS CR offers wide range of flight inspection services. In addition, ANS CR provides specialized aviation training. The portfolio includes ATC training, pilot and other aviation staff training using its own facilities including ATC and aircraft simulators. The abovementioned activities together with ATM consultancy services are provided to international customers on commercial basis by subsidiary companies CANI (Czech Air Navigation Institute) and CATC (Czech Aviation Training Centre).</p> <p>Being member of SESAR Joint Undertaking via B4 Consortium, ANS CR actively contributes to SESAR 2020 Programme. Participation in SESAR Deployment Programme is ensured by involvement in several implementation projects. Together with other central European countries the Functional Airspace Block Central Europe (FAB CE) was formally established. All such activities contribute to implementation of the Single European Sky (SES) legislation.</p>	
Previous experience	<p>Previous EU/SESAR projects with ANS CR participation:</p> <ul style="list-style-type: none"> <li>▪ EMMA project, 2004-2006, Sixth Framework Programme (EC),</li> <li>▪ EMMA2 project, 2006-2009, Sixth Framework Programme (EC),</li> <li>▪ INSuRE project, 2013-2015, SESAR 1 Demonstration Activities,</li> <li>▪ AAL project, 2015-2016, SESAR 1 Demonstration Activities (SES Award '17),</li> <li>▪ Malorca project, 2016-2017, Horizon 2020 (EU Research and Innovation programme).</li> <li>▪ SESAR Wave 1 Projects: PJ.01, PJ.03a, PJ.03b, PJ.07, PJ.10, PJ.16, PJ.18, PJ.28</li> </ul> <p>General SESAR experience:</p> <p>ANS CR has experience with various research and development topics being content of SESAR, and also with contribution and development of all main project deliverables and with a preparation of big validation exercises. ANS CR has a skilled internal team to coordinate the SESAR projects/contribution of ANS CR to the SESAR projects.</p> <p>Currently is ANS CR actively involved in following SESAR 2020 Wave 2 Projects: PJ.05-W2, PJ.07-W2, PJ.10-W2, PJ.18-W2, VLD 2-W2</p>	
Entity matching the task	Profile	



	<p>ANS CR is taking part in the provision of cost effective, long-term sustainable aviation navigation services. By its position in the aviation system of the Czech Republic, ANS CR significantly contributes to the creation of a completely innovative system capable of integrating unmanned aerial vehicles into common airspace.</p> <p>Within the integration of the UAS into the common airspace and the support activities required for this task, ANS CR has an expert team to fulfil this task. The team members have been involved for a long time in several working groups at the global level focused on shaping the basic rules for UAS operations worldwide and also in Europe, including the national level.</p>
Contribution	<p>ANS CR intends to contribute to Sol.01 and Sol.02 within the following activities:</p> <ul style="list-style-type: none"> <li>▪ Review of documents and deliverables</li> <li>▪ Analysis of the new U-space regulations</li> <li>▪ Defining airspace requirements</li> <li>▪ Reviewing the use cases related to the SWIM services operating with aeronautical (AIM) data.</li> <li>▪ Reviewing the service definitions for SWIM candidate services related to aeronautical (AIM) information.</li> <li>▪ ANSP Support to validation exercises</li> <li>▪ Minor contribution to: <ul style="list-style-type: none"> <li>○ Defining of relevant services for ANSP partners</li> <li>○ Defining the uses cases and requirements for validation</li> <li>○ VALP and VALR</li> <li>○ Information Exchange concept and requirements</li> <li>○ Operational aspects of the U-space collaborative environment</li> <li>○ U-space resilience principles and their impact on ATM</li> <li>○ Impact of drone route definition</li> <li>○ Handling of military sensitive info in the ATM-U-space interface</li> <li>○ Evolution of the flight-rules framework</li> </ul> </li> </ul> <p>ANS CR will contribute in cooperation with its LTP INTEGRA.</p>

#### 4.1.1.6 VALSTYBES IMONE ORO NAVIGACIJA

Organisation	6 ON (B4)	Service Provider
Description	<p>Founded by the Ministry of Transport and Communications of the Republic of Lithuania in 1995, valstybes imone Oro navigacija (ON) is a state-owned enterprise providing Air Navigation Services, including Air Traffic Management Services, Communication, Navigation and Surveillance Services, Aeronautical Information Services, as well as Search and Rescue, in the airspace of Republic of Lithuania and over the part of Baltic Sea.</p> <p>With a total staff of 290 (including 90 ATCOs) and altogether five operational units, among them one ACC (Vilnius), three APPs (Vilnius, Kaunas, Palanga), one TWR (Siauliai), ON (B4) controls the airspace of Republic of Lithuania and over the part of Baltic Sea (Vilnius FIR) of the total size of 76 126 km2 and provides ATC services at four designated Lithuanian international airports. Each year providing safe and efficient air traffic control services to more than</p>	

	<p>250 thousand flights ON continues to maintain zero delays level and to meet users' expectations.</p> <p>ON (B4) is a Member of Baltic FAB, a part of B4 Consortium composed of four ANSPs from Central and Eastern European countries and a Member of SESAR Joint Undertaking. Being a member of SESAR Joint Undertaking via B4 Consortium, ON (B4) actively participates in the industrial and transversal projects by SESAR 2020 Programme while participation in SESAR Deployment Programme allows to implement several projects. In 2017, ON (B4) officially joined the European iTEC (Interoperability Through European Collaboration) alliance developing a high-end air traffic management system for busy and complex airspace.</p>
Previous experience	<p>Previous projects:</p> <p>SESAR 2020 Wave1:</p> <ul style="list-style-type: none"> <li>▪ PJ.05: Remote Tower for Multiple Airports</li> <li>▪ PJ.06: Trajectory based Free Routing</li> <li>▪ PJ.14: Essential and Efficient Communication Navigation and Surveillance Integrated System</li> <li>▪ PJ.19: Content Integration</li> <li>▪ PJ.20: Master Plan Maintenance</li> <li>▪ PJ.22: Validation and Demonstration Engineering</li> </ul> <p>SESAR 2020 Wave 2:</p> <ul style="list-style-type: none"> <li>▪ PJ.05 -W2: Digital technologies for Tower</li> <li>▪ PJ.10-W2: Separation Management and Controller Tools</li> <li>▪ PJ.13-W2: IFR RPAS</li> <li>▪ PJ.19-W2: Content Integration, Performance Management and Business Case Development</li> <li>▪ PJ.20-W2: Master Planning</li> </ul>
Entity Profile matching the task	<p>ON (B4) has ATM Operational experts, ATM System experts, Air Traffic Controllers, Safety experts who could participate in this project.</p>
Contribution	<p>Contribution on documentation, participation in the literature review, work on an OSED and on the content of the data exchange between UTM, ATM, AIS and other stakeholders and related requirements.</p> <p>Expert review of all documents and deliverables</p>

#### 4.1.1.7 POLSKA AGENCJA ZEGLUGI POWIETRZNEJ

Organisation	7	PANSA (B4)	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. In 2019 PANSA handled over 910 thousands IFR 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> <p>PANSA is also a founding member of the SESAR Deployment Alliance that was mandated by the European Commission to perform functions of the SESAR Deployment Manager that is responsible for synchronisation and coordination of PCP-related implementation projects.</p>
Previous experience	<p>Until now PANSA has been successfully working on various internal and external U-Space projects, among others containing conceptual and operational aspects of the Polish U-Space, PANSA UTM/DTM, Central-European Drone Demonstrator (CEDD), European Network of U-Space Demonstrators and numerous other national and international initiatives, including UAVs regulations contribution, usage procedures development, flights coordination, as well as cooperation with international aviation organisations and agencies.</p> <p>PANSA successfully implemented for operational use a UTM system ("PansaUTM") which is a digitalised and automated UAV flight coordination and flight plans management concept. The system processes hundreds of Drone Flight Plans (DFP's) in controlled airspace and is used by ATC on a daily basis since March 2020. "PansaUTM" is unique solution which comprises of PANSA's operational concept for U-Space ecosystem and the system delivered by PANSA's technological industrial partner and integrated with DroneRadar application, the most popular among drone operators in Poland.</p> <p>PANSA contributes to SESAR 2020 Wave Project PJ.19-W2 by providing its vast expertise on U-Space environment to development of "Concept Of Operation (ConOps)" in relation to integration of U-Space elements into the Operational Concept Document (OCD).</p>
Entity matching the task	<p>Profile</p> <p>Air Navigation Service Providers including the profiles:</p> <ul style="list-style-type: none"> <li>▪ UTM/DTM expertise</li> <li>▪ ATM Operational expertise,</li> <li>▪ AMS expertise,</li> </ul> <p>PANSA has a unique expertise in development of the U-Space environment, in cooperation and joint implementation with business partners, and of solutions aiming at safe and massive integration of UAVs into airspace. It includes, inter alia, operational needs and concept of operations (ConOps) defining.</p> <p>PANSA will bring profile of its Linked Third Party which has vast and proven track expertise on U-Space environment, development of solutions for digitalised and automation of UAV flight coordination and management.</p>
Contribution	<p>PANSA together with its Linked Third Party will contribute to SESAR 2020 Solution PJ.34-W3-01. The contribution will focus on development and validation of Controller Drone Data Link Communication (CDDL) as a means for 2-way non-verbal communication and its encapsulation within standalone module for CIS. PANSA supported by its LTP will also contribute to deliverables of Solution 01 under Activity 2 and Activity 3 (VALP V2, VALR V2).</p>

PANSA together with its Linked Third Party will also participate in works under SESAR 2020 Solution PJ.34-W3-02 through to the contribution to the following activities: definition of Use-cases and high-level concept (WP3.1.), U-space and ATM Services and environmental description (WP3.2.), definition of operational requirements for new U-space-ATM Collaborative Concept (WP3.3.), definition of architecture enabling deployment of new U-space-ATM Collaborative Concept (WP3.4.) and assessment of the ConOps (WP3.5).

#### 4.1.1.8 AUSTRO CONTROL OSTERREICHISCHE GESELLSCHAFT FUR ZIVILLUFTFAHRT MBH

Organisation	8 ACG/COOPANS	Service Provider
Description	<p>ACG/COOPANS 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 are responsible for the corporate governance. An audit committee is also established.</p> <p>The primary business of the ANS part of ACG/COOPANS 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>ACG/COOPANS is a member of COOPANS Consortium consisting of 5 Air Navigation Service Providers: ACG/COOPANS (ACG), CCL/COOPANS, IAA/COOPANS, Naviair/COOPANS and LFV/COOPANS. All five Air Navigation Service Providers have already for a long time been working under a common framework agreement together with Thales in COOPANS. COOPANS is 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 &amp; Innovation by the establishment of the COOPANS Consortium.</p> <p>ACG/COOPANS 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>ACG/COOPANS 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>	

WP8 Information Management: 08.01.01, 08.01.06, 08.03.03, 08.03.06, 08.03.10

WP10 En-Route & Approach ATM Systems: 10.02.01, 10.02.03, 10.03.01, 10.03.08, 10.07.01, 10.10.03

WP12 Airport Systems : 12.02.01, 12.06.03

WP13 Network Information Management Systems: 13.02.02

WP14 SWIM Technical Architecture: 14.02.03, 14.04

WP16 R&D Transversal Areas: 16.01.01, 16.06.01, 16.06.01.b

WP B Target Concept and Architecture Maintenance: B.04.05

WP C: Master Plan Maintenance C.02, C.03

ACG/COOPANS has participated in SESAR 2020 Wave 1 in the following Projects, Solutions or VLDs:

PJ.01-01

PJ.02-01

PJ.03a-01

PJ.04-02

PJ.05-02

PJ.05-03

PJ.06-01

PJ.09-02

PJ.10-02A

PJ.10-02B

PJ.16-03

PJ.16-04

PJ.17-08

PJ.18.02

PJ.18.04

PJ.19-CI01

PJ.19-CI02

PJ.20

PJ.24

PJ.27

ACG/COOPANS currently participates in SESAR 2020 Wave 2 in the following Projects, Solutions or VLDs:

PJ.05-35

PJ.05-97

PJ.09-44

PJ.10-96

	<p>PJ.18-53</p> <p>PJ.18-56</p> <p>PJ.20</p> <p>VLD3</p>
Entity Profile matching the task	<p>In general, ACG/COOPANS has a long experience in cooperating with our industry partner THALES at expert and management level for the development of ATM systems, e.g. the recent implementation and customization of TopSky as a new core ATM system.</p> <p>TopSky is one of the most modern ATM systems in the world, and ACG/COOPANS together with the COOPANS partners are continuing to develop the</p> <p>ATM system in anticipation of future European Mandates and SESAR in a cost-efficient manner.</p> <p>Expertise can be offered in many areas:</p> <ul style="list-style-type: none"> <li>• Development and supervision of operational concepts</li> <li>• Safety concepts &amp; Safety Assessments</li> <li>• Collaborative Decision Making</li> <li>• Air traffic forecast/Capacity planning incl. runway capacity enhancement</li> <li>• Development and implementation of ATM systems &amp; Tools (common development and implementation of TopSky)</li> <li>• Trajectory management (core functionality in TopSky)</li> <li>• Development and implementation of safety and monitoring tools (core functionality in TopSky – 4D MTCD)</li> <li>• Flight procedures, special approach procedures (incl. RNAV)</li> <li>• Performance Based Navigation</li> <li>• Validation and Integration</li> <li>• Participation in European deployment activities (IDSG)</li> <li>• Human Performance Assessment</li> </ul> <p>The strategic relevance of the UTM for ACG/COOPANS has been reflected by the creation of a dedicated organizational unit dealing Drone Competence Center. This unit subsumes all R&amp;I as well as operational topics related to UTM and drone operations, with its staff being involved in several ongoing research projects.</p>
Contribution	<p>ACG/COOPANS will contribute to the project with operational and engineering expertise supporting the development of an ATM U space Environment Concept that meets the needs of all involved actors and stakeholders.</p>

#### 4.1.1.9 LUFTFARTSVERKET

Organisation	9 LFV/COOPANS	Service Provider
Description	<p>LFV/COOPANS is a member of COOPANS Consortium consisting of five Air Navigation Service Providers: ACG/COOPANS, CCL/COOPANS, IAA/COOPANS, Naviair/COOPANS, Navegação Aérea de Portugal (NAV Portugal) and LFV/COOPANS. 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</p>	



	<p>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 expanded to Research &amp; Innovation by the establishment of the COOPANS Consortium.</p> <p>LFV/COOPANS 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/COOPANS 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>
Previous experience	<p>LFV was involved in several work packages in SESAR1 – in several of them LFV/COOPANS had a leading role.</p> <p><b>In SESAR 2020, wave 1</b>, LFV/COOPANS has contributed to and also been leading solutions via COOPANS Consortium in the following solutions:</p> <ul style="list-style-type: none"> <li>- PJ.01-01 - Extended Arrival Management with overlapping AMAN operations and interaction with DCB</li> <li>- PJ.01-03B - Use of Arrival and Departure Management Information for Traffic Optimisation in the TMA</li> <li>- PJ.02-08 - Traffic optimisation on single and multiple runway airports (lead)</li> <li>- PJ.02-11 - Enhanced Terminal Area for efficient curved operation</li> <li>- PJ.05-02 - Remotely Provided Air Traffic Service for Multiple Aerodromes (lead)</li> <li>- PJ.05-03 - Remotely Provided Air Traffic Services from a Remote Tower Centre with a flexible allocation of aerodromes to Remote Tower Modules (lead)</li> <li>PJ.06-01 - Optimized traffic management to enable Free Routing in high and very high complexity environments</li> <li>- PJ.10-01a - High Productivity Controller Team Organisation</li> <li>- PJ.10-02b - Controller Automated Support Tools in En-Route Environment</li> <li>- PJ.10-05 - IFR RPAS Integration</li> <li>- PJ.15-09 - Data Centre Service for Virtual Centres Service</li> <li>- PJ.16-03 - Virtual Centre Concept</li> <li>- PJ.16-04 - Workstation, Controller productivity</li> </ul>



	<ul style="list-style-type: none"> <li>- PJ.18-02 - Integration of trajectory management processes</li> <li>- PJ.19-CI01 - ATM operations</li> <li>- PJ.19-CI02 - Systems and services</li> <li>- PJ.19-CI04 - Support and Evolution of the Content Integration Framework</li> <li>- PJ20 - Masterplan maintenance</li> <li>- PJ.25 - E-AMAN VLD</li> <li>- PJ.27 - Flight Object Interoperability VLD</li> <li>- PJ.31 - Initial Trajectory Information Sharing VLD</li> </ul> <p><b>SESAR Explatory Research</b></p> <ul style="list-style-type: none"> <li>-SAFECLLOUDS.eu</li> <li>-SAFELAND</li> <li>-MAHALO</li> </ul> <p><b>SESAR2020 Wave 2:</b></p> <ul style="list-style-type: none"> <li>-PJ01-W2 EAD</li> <li>-PJ02-W2 AART</li> <li>-PJ04-W2 TAM</li> <li>-PJ05-W2 DTT</li> <li>-PJ09-W2 DNMS</li> <li>-PJ10-W2 PROSA</li> <li>-PJ13-W2 ERICA</li> <li>-PJ14-W2 I-CNNS</li> <li>-PJ18-W2 4D Skyways</li> <li>-PJ19-W2 CI</li> <li>-PJ20-W2 AMPLE</li> <li>-VLD3-W2 SORT</li> </ul>
Entity matching the task	<p>Profile</p> <p>An AoR with many airports and with several major airports close to each other and close to AoR boundaries has given LFV/COOPANS extensive experience in optimization of arrival and departure management.</p> <p>Expertise is present in the company in many areas:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Remote airport ATC</li> <li><input type="checkbox"/> Development and supervision of operational concepts</li> <li><input type="checkbox"/> Safety concepts &amp; Safety Assessments</li> <li><input type="checkbox"/> Airport safety support tools</li> <li><input type="checkbox"/> Collaborative Decision Making</li> <li><input type="checkbox"/> Air traffic forecast/Capacity planning incl. runway capacity enhancement</li> <li><input type="checkbox"/> CWP design</li> </ul>

	<input type="checkbox"/> Development and implementation of ATM systems & Tools (common development and implementation of TopSky) <input type="checkbox"/> Trajectory management (core functionality in TopSky) <input type="checkbox"/> Development and implementation of safety and monitoring tools (core functionality in TopSky – 4D MTCD) <input type="checkbox"/> Flight procedures, special approach procedures (incl. RNAV) <input type="checkbox"/> Performance Based Navigation <input type="checkbox"/> Integration, validation and analysis of test result <input type="checkbox"/> Extended lab environment including NARSIM <input type="checkbox"/> Participation in European deployment activities (IDSG) <input type="checkbox"/> Human performance assessment
Contribution	LFV/COOPANS will contribute to operational concept development and participate in validation exercises. LFV/COOPANS plans to use workforce containing operational experts (ATCOs), validation experts and platform development experts.

#### 4.1.1.10 DFS DEUTSCHE FLUGSICHERUNG GMBH

Organisation	10 DFS	Service provider
Description	DFS Deutsche Flugsicherung GmbH, the German air navigation service provider, is a State-owned company under private law with 5,600 employees as at 31/12/2019. DFS ensures the safe and punctual flow of air traffic over Germany. Around 2,200 air traffic controllers guide up to 10,000 flights in German airspace every day, more than three million movements every year. This makes Germany the country with the highest traffic volume in Europe. The company operates control centres in Langen, Bremen, Karlsruhe and Munich as well as control towers at the 16 designated international airports in Germany. The subsidiary DFS Aviation Services GmbH markets and sells products and services related to air navigation services, and provides air traffic control at nine regional airports in Germany and at London Gatwick Airport and Edinburgh Airport in the UK. DFS has been working on the integration of drones into air traffic since 2016 and has set up a joint venture, Droniq GmbH, with Deutsche Telekom.	
Previous experience	Previous and ongoing projects: <ul style="list-style-type: none"> <li>• CORUS</li> <li>• SESAR 2020 W1 (PJ10.5):</li> <li>• SESAR 2020 W2 (PJ13 – ERICA)</li> <li>• European Defence Agency Project Enhanced RPAS Automation (ERA)</li> <li>• National RPAS and UAS projects</li> </ul>	
Entity matching the task	DFS as ANSP is bringing in the experience from the ATM point of view. DFS has participated on a lot of SESAR and other international projects as well as national projects. Experience in projects related to SWIM or UTM can help the project to reach the aims. To reach the aims of the project different departments from DFS will participate. Operational departments with experience in SWIM as well as concept and UTM development department will participate to have a broad input into this project.	

	Participation on different working groups. For example DFS is the German representative (Member) in the ICAO RPAS Panel. Furthermore DFS is working active in different working groups on national and international level.
Contribution	<p>DFS will participate in PJ34 in all two solutions. In both solutions DFS will mainly participating on the development of the operational concept (OSED). In Solution 1 “Collaborative U-space-ATM interface (Indra)” DFS is participating in activity 2. In this activity the development of the operational concept (OSED) for the data exchange between UTM and ATM via SWIM will be the main activity. DFS is supporting this activity with the experience from different SWIM projects like SESAR PJ17. Especially the SWIM concept for the data exchange will be from interest for the DFS. Furthermore DFS will bring in the experience as developer of an UTM system, so that experience from both sides, ATM and UTM, can be provided.</p> <p>The main portion of work in AURA will be done by DFS is on solution 2 “Collaborative ATM-U-space environment concept development”. As in solution 1 DFS will mainly working on the development of the OSED (WG 2). Therefore, DFS will bring in the experience of the concept development from SESAR CORUS project. The CORUS concept will be the baseline for the development of the UTM – ATM OSED which will be validated in solution 2. Furthermore, DFS will participating in WG3 “Operational and safety requirements” and WG 4 “Deployment arch. and information-exchange tech” as reviewer.</p>

#### 4.1.1.11 DIRECTION DES SERVICES DE LA NAVIGATION AERIENNE

Organisation	11 DSNA	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 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 and has participated as a major contributor to its definition phase study, has been a major active contributor to the SESAR 1 development phase, to SESAR2020 wave 1 and is an active contributor to SESAR2020 wave 2. DSNA is also involved in the deployment of many PCP and non PCP SESAR solutions.</p>	
Previous experience	<ul style="list-style-type: none"> <li>• Airspace organization and management,</li> <li>• U-space CONOPs, including contingency situations,</li> <li>• Think tank with national industry on Higher airspace operation</li> <li>• Safety management.</li> <li>• Coordination with national and European H2020/S2020 projects (Exploratory and Industrial R&amp;D, Demonstrations). U-space/ ATM experimentations on different operational sites</li> <li>• Virtual Centre architecture definition and demonstrations</li> <li>• SWIM services definitions (AMAN, Virtual Centre), use of Eurocontrol SWIM registry</li> </ul> <p>As far as drones operations are concerned, DSNA participated to SESAR 2020 IR wave 1 in the PJ10-05 (IFR RPAS integration) and PJ11-a2 (ACAS Xu).</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.</p> <p>In 2018, DSNA also participated to the LLRTM (Low Level RPAS Traffic management) project led by ONERA which studied the feasibility of developing a multi- sensor system (FLARM and GSM chip) to locate small drones during operations and enable anti-collision.</p> <p>DSNA was involved in the SESAR 2020 ER project CORUS and in the VLDs PODIUM (Proving Operations of Drones with Initial UTM) and USIS (U-space Initial Services).</p> <p>Finally, DSNA is currently involved in the SESAR 2020 IR wave 2 PJ13</p>
Entity Profile matching the task	<p>Knowledge of operational ATM and UTM environment: ATFCM, Airspace management, operational procedures and regulations.</p> <p>Know-how on technical aspects such as CNS matters (especially ADS-B), small drones technical features and capabilities.</p> <p>Experience with drones operations and drones operational procedures :</p> <ul style="list-style-type: none"> <li>• UAS related regulations in France;</li> <li>• UAS integration into IFR airspace;</li> <li>• UAS manufacturers and users in France;</li> <li>• UAS use cases in France;</li> <li>• UAS surveillance concepts and systems.</li> </ul> <p>Experience on SWIM services definition and implementation in front of an ATM system.</p> <p>DSNA provides the control services, as well as ATFCM and CNS services in the French airspace, in Europe and overseas. It has recently implemented more than one hundred GNSS based approach trajectories, including some with vertical precision navigation (LPV200). This has been achieved thanks to the use of the EGNOS services provided by the ESSP company from which DSNA is a shareholder.</p> <p>DSNA has also engaged a comprehensive modernization plan that should last 7 years and will update the totality of the controllers' consoles both in En-Route centers and airports.</p> <p>Finally DSNA is among the major actors in the Airport Collaborative Decision Making process, which is dedicated to improving the performance of major airports through improved information exchange for a better use of terminal, apron, runway and airspace capacity.</p> <p>DSNA is currently involved in drones' accommodation in National and overseas airspaces.</p> <p>DSNA has also been a major contributor to Virtual Centre concept using SWIM services and is offering with other European partners a SWIM CCS platform implementing Flight Plan and Trajectory related services.</p>
Contribution	<p>DSNA is deploying a SWIM infrastructure able to support SWIM interfaces between ATM systems and external partners with respect of safety and security requirements, which will be used for the current project.</p>

#### 4.1.1.12 ENAIRE

Organisation	12 ENAIRE	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 5 En-route/TMA ATC Centres and 21 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 manages the air traffic control and aeronautical information services, as well as the communication, navigation and surveillance networks required so that airlines and their fleet can fly safely and smoothly throughout the Spanish airspace.</p> <p>ENAIRE is the leading air navigation and aeronautical information service provider in Spain, the fourth largest in Europe by traffic volume and one of the most important in the world. As a public business entity reporting to the Ministry of Public Works, we manage the Spanish airspace over a territory of 2,190,000 square kilometres. ENAIRE provides air traffic services to 2 million flights carrying over 250 million passengers each year. Through our five control centres, 21 control towers and a comprehensive network of aeronautical infrastructure and equipment, we provide en-route, approach and aerodrome ATC services, as well as flight information, alerts and consulting services. We are the communications, navigation and surveillance service provider across the whole of the Spanish airspace and at airports in Aena network</p> <p>ENAIRE is a major European company in ATM, R&amp;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&amp;D related activities, in order to support the cooperative accomplishment of the European ATM Target Network and the associated European ATM Master Plan.</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"> <li>• Up to 5 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;</li> </ul>	

	<ul style="list-style-type: none"> <li>• Platforms are able to assume validations and simulations in a wide range of maturity levels, covering from the more immature phases of the R&amp;D till complex simulations using both industrial products and also prototypes;</li> <li>• ATCOs from different ACC's, who are familiar with traffics, contingencies and events of multiple characteristics; and also from towers of different categories;</li> <li>• Engineers/ATCOs with vast expertise on the definition of future CNS and ATM;</li> </ul> <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>ENAIRE has been an active part of the SESAR from the very beginning of the Programme, contributing substantially as a SJU member in different fields (airports, ANS management, ANS planning and provision, etc.). This has been done in order to support the cooperative accomplishment of the European ATM Master Plan. The participation within the SESAR Programme began with SESAR 1, where ENAIRE took an active role in several projects, being the project leader in some of them. After the work performed in SESAR 1, ENAIRE has contributed in the great majority of the projects launched in SESAR 2020 Wave 1 programme, being an important part of the Service Providers Stakeholder group.</p> <p>Participation in SESAR 1 projects:</p> <ul style="list-style-type: none"> <li>• WP3 – Validation infrastructure adaptation and management</li> <li>• WP4 – En route Operations</li> <li>• WP5 - TMA Operations</li> <li>• WP6 – Airport Operations (taking the leadership of the work package)</li> <li>• WP7 – Network Operations</li> <li>• WP8 – Information Management</li> <li>• WP10 – En-Route &amp; Approach ATC Systems</li> <li>• WP12 – Airport system</li> <li>• WP13 – Network Information Management System</li> <li>• WP15 – Non-Avionics Communication, Navigation, Surveillance (CNS) System</li> <li>• WP16 – R&amp;D Transversal Areas</li> <li>• WPB – Target Concept and Architecture Maintenance</li> <li>• WPC – Master Plan Maintenance</li> </ul> <p>Within these projects, ENAIRE has participated in the operational concept development and has been also responsible for the execution of several validations.</p> <p>Participation in SESAR 2020 Wave 1:</p> <ul style="list-style-type: none"> <li>• PJ01: Enhanced Arrivals and Departures</li> <li>• PJ02: Increased Runway and Airport Throughput</li> <li>• PJ03a: Integrated Surface Management</li> <li>• PJ04: Total Airport Management</li> <li>• PJ06: Trajectory based Free Routing</li> <li>• PJ07: Optimised Airspace Users Operations</li> <li>• PJ08: Advanced Airspace Management</li> <li>• PJ09: Advanced DCB</li> </ul>



- PJ10: Controller Tools and Team Organisation for the Provision of Separation in Air Traffic Management
- PJ11: Enhanced Air and Ground Safety Nets
- PJ14: Essential and Efficient Communication Navigation and Surveillance Integrated System
- PJ15: Common Services
- PJ16: Controller Working Position / Human Machine Interface - CWP/HMI
- PJ17: SWIM Technical Infrastructure
- PJ18: 4D Trajectory Management
- PJ19: Content Integration
- PJ20: Master Plan Maintenance
- PJ24: Network Collaborative Management
- PJ27: Flight Object Interoperability VLD Demonstration

Participation in SESAR 2020 Wave 2 projects:

- PJ02-w2: Airport airside and runway throughput
- PJ04-w2: Total Airport Management
- PJ05-w2: Digital technologies for Tower
- PJ07-w2: Optimised airspace users operations
- PJ09-w2: Digital Network Management Services
- PJ10-w2: Separation Management and Controller Tools
- PJ13-w2: IFR RPAS
- PJ14-w2: Integrated CNSS
- PJ18-w2: 4D skyways
- PJ19-w2: Content Integration, Performance Management and Business Case Development
- PJ20-w2: Master Planning

Other projects managed by the SESAR Joint Undertaking:

- DEMORPAS (Demonstration Activities for Integration of RPAS in SESAR), playing ENAIRE a leading role.
- ARIADNA (Activities on RPAS Integration Assistance and Demonstration for operations in Non-segregated Airspace).

Previous participation in EC projects:

- OPTIMAL – Optimized Procedures and Techniques for IMprovement of Approach and Landing
- RESET – Reduced separation minima
- GIANT – GNSS Introduction In the Aviation sector & GIANT 2 – GNSS Introduction In the Aviation sector -2
- ACCEPTA – ACCelerating EGNOS adoPTion in Aviation
- FilGAPP – Filling the Gap in GNSS Advanced Procedures and Operations
- HEDGE Next – Helicopter Deploy GNSS in Europe – NEXT
- CREDOS – Crosswind Reduced Separations for Departure Operations

Additionally, ENAIRE and its linked third parties has contributed to several Framework Programme (FP) projects such as:



	<ul style="list-style-type: none"> <li>• EPISODE 3, Single European Sky Implementation support through validation, FP6, 2004-2010, Key Performance Targets for the future ATM system.</li> <li>• GATE TO GATE, Validation of a European ATM gate to gate operational concept for 2005 – 2010, FP5, 2002-2005, operational concept development and validation.</li> </ul> <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"> <li>• FRASAI, TENT-T, 2014, Free Routing concept implementation in Santiago – Asturias sector.</li> </ul> <p>In addition to these projects, ENAIRE is currently carrying out the following research projects related to RPAS:</p> <ul style="list-style-type: none"> <li>• DOMUS</li> <li>• SAFEDRONE</li> </ul>
Entity matching the task	<p>ENAIRE plus its Linked Third Parties will contribute with their long experience like ANSP, R&amp;D and engineering entities, matching the task with the following profiles:</p> <ul style="list-style-type: none"> <li>• Operational expert</li> <li>• ATC system expert</li> <li>• En Route, App and Tower Air Traffic Controllers</li> <li>• Environment expert</li> <li>• Performance expert</li> <li>• Platform integration/maintenance</li> </ul>
Contribution	<p>ENAIRE will contribute in the two solutions of PJ34.</p> <p>Within solution PJ34-W3-01, ENAIRE will participate in the 3 activities committed, ensuring the link with the ER projects, identifying information exchange requirements as well as SWIM functional and non-functional requirements and contributing on the execution of a human-in-the-loop simulation focused on the human factors aspects and safety impact of the interface between ATM and UTM.</p> <p>In solution PJ34-W3-02, ENAIRE will participate in the development of U-Space-ATM Collaborative ConOps, addressing the simultaneous operation of drones and manned aviation, and in particular in airports' vicinity. In addition, will research on how highly automated U-space systems will work and interact with ATM in the new collaborative environment inside and outside controlled airspace, addressing operational aspects and separation responsibilities.</p>

#### 4.1.1.13 ENAV SPA

Organisation	13 ENAV	Service Provider
Description	<p>ENAV S.p.A. (ENAV) is one of the 5 largest European Air Navigation Service Provider in terms of traffic managed, investments in innovation technology and R&amp;D and is one of the top performers in terms of quality of services provided.</p> <p>ENAV is fully committed to the Single European Sky and, since 2006, operates under the Common Requirement for ANS provision and from 2012 is subject to the European Performance Scheme, as all other European ANSPs.</p> <p>ENAV is a Joint-Stock Company, the only ANSP worldwide listed on a stock exchange, 53% of the share capital is held by the Italian Government, in charge of the provision of air traffic control and navigation services within the airspace and the airports placed under its own responsibility by national law without time limit.</p> <p>ENAV core business is to manage the regulated Air Traffic Control Services (ATCS), for which it is entrusted, allowing aircraft to fly within the assigned airspace with constantly enhanced levels of safety, optimizing the effectiveness of the service provided and the efficiency of the company, in particular:</p> <ul style="list-style-type: none"> <li>• “En route” services: handling of air traffic crossing Italian airspace managed from 4 Areas Control Centres located in Rome, Milan, Padua and Brindisi;</li> <li>• “Terminal” services: assistance during the phases of approach, takeoff and landing from 45 Control Towers located throughout Italy and divided into 3 charging zones.</li> </ul> <p>Thanks to these complex operational units, ENAV provides around the clock air traffic services ensuring air traffic flow and regularity, with absolute safety. ENAV provides ATCS to more than 1.8 million flights per year, with peaks of up to 6,575 per day.</p> <p>ENAV provides also supporting services to other ANSP on a commercial basis, forming an independent source of revenue which is not regulated.</p> <p>ENAV leverages its significant experience and reputation for promoting development projects worldwide, pursuing further opportunities for growth: currently delivers services in Malaysia, Saudi Arabia, Kenya, Morocco, Albania, UAE and Libya.</p> <p>As in all high complexity sectors, a constant and consistent technological innovation has to be placed side by side to human skills and experience. For this reason, ENAV continues to invest in modernisation, new technologies and professional training. ENAV is a component of the European ATM (Air Traffic Management) system and participates with full rights in all the activities of development, operational validation, research and coordination with systems that are perfectly integrated with the international technological context.</p> <p>The ENAV Group consists of:</p> <ul style="list-style-type: none"> <li>• Techno Sky, responsible for the operational management, the support, the maintenance and the hardware/software development of the entire range of systems and equipment used to provide flight assistance services.</li> <li>• IDS AIRNAV is the company of the ENAV Group that serves the world of Air Traffic Management (ATM) and airports with Commercial Off-The-Shelf (COTS) solutions and software products aimed at supporting the transition from Aeronautical Information Services (AIS) to Aeronautical Information Management (AIM) in full compliance with the ICAO and EUROCONTROL mandates for Aeronautical Data Quality (ADQ).</li> <li>• D-Flight is the first public-private partnership created by ENAV and its partners</li> </ul>	

	<p>for the timely development and deployment of U-space, in order to safely and seamlessly integrate complex drone operations within the civil aviation airspace. The company is controlled by ENAV, with a 60% stake, with the remainder of the share capital held by a group of leading Italian technological partners.</p> <ul style="list-style-type: none"> <li>• ENAV Asia Pacific, set up in 2013 with head office in Kuala Lumpur, provides air traffic control management and consultancy services, as part of marketing and sales activity, as well as other essential air navigation services.</li> <li>• ENAV North Atlantic is a company established in USA in January 2014 for the purpose of managing the acquisition of 12.5% of the Aireon LLC share capital. Aireon is the company responsible for the development, financing and deployment of a global satellite surveillance system.</li> <li>• ESSP - with a 16.6% stake in the Company, ENAV provides the European satellite navigation service EGNOS.</li> </ul> <p>The services delivered by the Company are Planning, management and provision of Air Navigation Services (ANS) including:</p> <ul style="list-style-type: none"> <li>• Air Traffic Services (ATS), including Air Traffic Control Service (ATC), Flight Information Service (FIS) and Alerting Service (ALRS);</li> <li>• Aeronautical Information Service and related publications (AIS);</li> <li>• Meteorological Services for Air Navigation (MET);</li> <li>• Communication, Navigation, Surveillance Services (CNS);</li> <li>• Airspace Management;</li> <li>• Air space design and air traffic capacity planning;</li> <li>• Flight procedures design and obstacles analysis;</li> <li>• ATM system definition, acquisition, operation and maintenance of operational infrastructures;</li> <li>• Flight inspection services of radio navaids, broadcasting and surveillance systems for Air Traffic Services;</li> <li>• Training of ATM personnel.</li> </ul> <p>ENAV is among the main players in SESAR (Single European Sky ATM Research), the ambitious initiative launched by the European Commission to implement the Single European Sky (SES) by supporting technical developments for fully interconnected and interoperable systems at European level. ENAV is also member of the SESAR Joint Undertaking, created under European Community law on 27 February 2007, with EUROCONTROL and the European Union as founding members, in order to manage the SESAR Development Phase. ENAV contributes to SJU in a lot of projects providing the technical and operational expertise and infrastructures necessary to develop and validate the evolution of the operational concepts.</p>
Previous experience	<p>ENAV is involved in R&amp;D, strategic planning, technical co-operation and service provision programmes 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.</p> <p>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 research, developments and validations.</p> <p>ENAV has been participating in the SESAR Programme since its very beginning (SESAR1 and SESAR2020) and is strongly determined to support the successful outcome of the initiative in line with its strategic objectives.</p> <p>Previous R&amp;D projects:</p> <ul style="list-style-type: none"> <li>• SESAR2020 Wave 1 IR Projects (H2020, 2016-2019): PJ01, PJ02, PJ03a, PJ03b, PJ05, PJ06, PJ08, PJ09, PJ10, PJ15, PJ16, PJ19, PJ20, PJ22</li> </ul>

	<ul style="list-style-type: none"> <li>• DIODE VLD (SJU/CEF2017, 2018-2020)</li> <li>• CORUS ER (H2020, 2017-2019)</li> <li>• SESAR1 (2009-2016): WPB, WPC, WP3, WP4, WP5, WP6, WP7, WP8, WP10, WP12, WP13, WP14, WP15, WP16</li> <li>• SESAR1 Large Scale Demonstrations: <ul style="list-style-type: none"> <li>○ ATC Full Datalink (AFD)</li> <li>○ WE-FREE</li> <li>○ MEDALE</li> <li>○ RACoon</li> <li>○ FREE SOLUTIONS</li> </ul> </li> <li>• BEYOND (H2020, 2015-2017)</li> <li>• DARWIN (H2020, 2015-2018)</li> <li>• SAWSOC (FP7, 2013-2016)</li> <li>• GAMMA (FP7, 2013-2017)</li> <li>• FUTURE SKY SAFETY (H2020, 2015-2019)</li> <li>• OPTIMAL (FP6, 2004-2008)</li> <li>• AD4 (FP6, 2005-2007)</li> <li>• RETINA (H2020, 2016-2018)</li> <li>• BLUEGNSS (H2020, 2016-2018)</li> </ul> <p>Current R&amp;D projects:</p> <ul style="list-style-type: none"> <li>• SESAR2020 Wave 1 IR PJ18 Project (H2020, 2016-2020)</li> <li>• SESAR2020 Wave 1 VLD PJ31 (H2020, 2016-2020)</li> <li>• SESAR2020 Wave 2 IR Projects (H2020, 2019-2022): PJ01, PJ02, PJ05, PJ07, PJ09, PJ10, PJ13, PJ14, PJ18, PJ19, PJ20</li> <li>• ECARO - Egnos Civil Aviation ROadmap project (European GNSS Agency, 2019-2021)</li> <li>• CRUISE - Cyber secuRity in Uas mISSIONS by SatellitE link (ESA, 2019-2022)</li> <li>• RPASinAir - IFR RPAS integration into controlled airspace (Italian Ministry of Education, University and Research, 2018-2021)</li> </ul>
Entity Profile matching the task	<p>ENAV profiles matching the tasks include:</p> <ul style="list-style-type: none"> <li>• ATM Operational expert</li> <li>• U-space and RPAS expert</li> <li>• ATM R&amp;D expert</li> <li>• Air Traffic Controller</li> <li>• Human Performance KPA experts</li> </ul> <p>All those skills will be made available by ENAV to support the project developments and conduct validation activities.</p>
Contribution	<p>ENAV is highly interested in U-space operations and is willing to participate in PJ34 Solutions 1 and 2. ENAV will bring in the experience of the concept development from CORUS and DIODE projects and will contribute, both as ANSP and U-space service provider (through its LTP D-Flight), to the development of collaborative ATM-U-space interface and concept.</p> <p>In detail, in Solution 1 ENAV will contribute to the following activities:</p> <ul style="list-style-type: none"> <li>• Activity 1: participation in the analysis of background work on interoperability and data exchanges from relevant SESAR U-space projects and initiatives, primarily the ones where ENAV contributed such as CORUS and DIODE, as well as in the analysis of the list of potential services, roles and responsibilities.</li> <li>• Activity 2: contribution to the identification and definition of use-cases and their Information Exchange Requirements, with particular attention to the interface with ATM; contribution to the definition of SWIM U-Space functional and non-functional requirements associated to the required information services.</li> <li>• Activity 3: participation in “Cluster 4” validation activities, led by Leonardo, by providing ATM, UTM and validation expertise. Furthermore, latest D-</li> </ul>

	<p>Flight pre-operational baseline will be made available for SWIM industrial partners and validation customisation.</p> <p>In Solution 2, ENAV will focus its effort on:</p> <ul style="list-style-type: none"> <li>• use-cases elaboration and high-level definition of the concept;</li> <li>• U-space/ATM services and environment definition;</li> <li>• operational requirements development and ATM-U-space architectural aspects definition/refinement.</li> </ul>
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#### 4.1.1.14 EUROCONTROL - EUROPEAN ORGANISATION FOR THE SAFETY OF AIR NAVIGATION

Organisation	14 EUROCONTROL	Intergovernmental organization
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"> <li>• 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.</li> <li>• The Maastricht Upper Area Control Centre provides Air Traffic Control services for the Netherlands, Belgium, Luxembourg and northern Germany.</li> <li>• The Central Route Charges Office handles billing, collection and redistribution of aviation charges.</li> <li>• It provides a unique platform for civil-military aviation coordination in Europe.</li> <li>• 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.</li> <li>• EUROCONTROL is supporting the deployment through contributions to the Deployment Programme and is supporting the European Commission, EASA and National Supervisory Authorities in their regulatory activities.</li> </ul> <p><b><i>EUROCONTROL's position with regard to funding</i></b></p> <p><b><i>Should this tender be successful EUROCONTROL, as part of the consortium, 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.</i></b></p>	
Previous experience	<p>EUROCONTROL has produced and participated to the following UAS/U-space related publications:</p> <ul style="list-style-type: none"> <li>• UAS ATM Integration Operational Concept, Vers. 1.0 – 11.2018 EUROCONTROL &amp; EASA Document (<a href="https://www.eurocontrol.int/sites/default/files/publication/files/uas-atm-integration-operational-concept-v1.0-release%2020181128.pdf">https://www.eurocontrol.int/sites/default/files/publication/files/uas-atm-integration-operational-concept-v1.0-release%2020181128.pdf</a>)</li> </ul>	

- UAS ATM Airspace Assessment, Vers. 1.2 – 11.2018 EUROCONTROL Document ([https://www.eurocontrol.int/archive\\_download/all/node/10681](https://www.eurocontrol.int/archive_download/all/node/10681))
- UAS ATM Flight Rules, Vers. 1.1 – 11.2018 ([https://www.eurocontrol.int/archive\\_download/all/node/11149](https://www.eurocontrol.int/archive_download/all/node/11149))
- UAS ATM Common Altitude Reference System (CARS), Vers. 1.0 – 11.2018 ([https://www.eurocontrol.int/archive\\_download/all/node/11150](https://www.eurocontrol.int/archive_download/all/node/11150))

CORUS - U-space Concept of Operations Vers. 01.01.01 – 08.2019

### **RPAS Real Time Validation Exercises performed for S2020 PJ 10-05 on “IFR RPAS Integration”.**

EUROCONTROL has conducted a series of studies on the IFR RPAS Integration subject, as part of the SESAR 2020 PJ10.05 between September 2017 and March 2019. Seven V1 and V2 real time simulations were conducted on the ESCAPE platform at the Brétigny Experimental Centre with the participation



of air traffic controllers from ENAV (Italy) and MATS (Malta), building on their experience in managing military drones' segregated operation.

The exercises involved simulating a multinational En-route airspace environment (Italian and Maltese airspace) with realistic traffic flows. RPAS, mainly military types but also a possible future generation of civil cargo RPAS, were inserted into the traffic mix.

By conducting exercises with an incremental level of complexity, EUROCONTROL researchers have been able to assess:

The impact that different communication delays have on the way the controllers manage all of their traffic, not just the RPAS. The simulations indicated that the controllers tend to prioritise their tasks somewhat differently, depending on the amount of RPAS they were handling at the time.

How RPAS contingency measures (what the RPAS would do if/when it had a significant link failure problem) will fit in with rules that apply to conventional traffic.

The ATC needs to also accommodate RPAS special missions for surveillance (i.e. loitering missions and mission changes).

This study finally allowed capturing the requirements of air traffic controllers in term of procedure and system support, such as means for the clear identification of RPAS (specific phraseology and Human Machine Interface support), access to relevant data (information related to specific missions and procedures), communication requirement (maximum acceptable latency values) and acceptability of contingency procedures.

**SESAR-JU H2020 CORUS (Concept of Operation for EuRopean UTM Systems) Project - <https://www.sesarju.eu/projects/corus>**



The Concept of Operations for European Unmanned Traffic Management (UTM) Systems (CORUS) project has encompassed two years of exploratory research in order to adopt a harmonised approach to integrating drones into very low level (VLL) airspace. CORUS's main task was to describe in detail how U-space should operate so as to allow the safe and socially acceptable use of drones.

To achieve that CORUS project has gathered experts from aviation (manned and drone), research and academia to develop, through an iterative process involving considerable consultation with stakeholders, a reference Concept of Operations (CONOPS) and initial U-space Service Levels (mainly U1 & U2) for UTM (UAS Traffic Management) in the Very Low Level (VLL) airspace in Europe.

The project has also considered the diverse needs of Europe's future U-space, balancing regional specificities while addressing the requirements related to the safety of airspace users and the public.

EUROCONTROL has been the CORUS project's main contributor and coordinator of a wide consortium composed by ENAV (Italian Air Navigation Service Provider, DFS (Deutsche Flugsicherung), DSN (Direction des Services de la navigation aérienne), DLR (German Aerospace Center), HEMAV, NATS, UNIFLY and the Polytechnic University of Catalonia.

The validation and the broad acceptance of the CORUS CONOPS and the relevant set of initial U-space Services has been achieved thanks to the support of a broad "U-space Community Network" (UCN) drawing on a wide range of stakeholders. This UCN has guided and reviewed the CORUS U-space CONOPS development through a series of workshops. A subset of the "UTM community Network" was forming the project Advisory Board used as reference external experts group to review draft documents and answer questions before the discussion with the UCN as a whole.

Through these bodies coordination with other ongoing RPAS/U-space research and rulemaking initiatives from the European Commission, EUROCAE, EASA, JARUS and NASA's UTM research project were successfully ensured, as well as the regular interaction with the other S2020 and H2020 RPAS/U-space related projects.

**SESAR-JU H2020 PODIUM (Proving Operations of Drones with Initial UTM) Project - <https://www.sesarju.eu/projects/podium>**

PODIUM (Proving Operations of Drones with Initial UTM Management) is a SESAR Horizon 2020 Very Large Scale Demonstration Project supporting U-space, the European vision for the safe, secure and efficient handling of drone traffic and a key enabler for the growing drone market to generate economic and societal benefits. The aim of PODIUM was to demonstrate the maturity of the UTM system and its services, procedures and technologies at five operational sites in Denmark, France and the Netherlands throughout 2018 and 2019.



EUROCONTROL is leading the PODIUM Consortium, which consists of 10 partners, and around 20 third linked parties. EUROCONTROL has been strongly involved in all PODIUM activities and demonstrations, moreover the Agency coordinated the consortium, provided the project management, and led the work packages on the Concept and Architecture, and Demonstrations Assessment and Recommendations work.

EUROCONTROL has acted as project manager and provided its contribution to the PODIUM project coordination. The Agency has also been strongly involved in PODIUM Communication activities, aiming to bring the results of PODIUM demonstrations to the wider aviation community (EC, EASA, ICAO, others).

PODIUM as a first SESAR U-space demo project, under EUROCONTROL lead has developed the project Concept and Architecture which was extensively used by partners in order to prepare the PODIUM demonstrations.

EUROCONTROL was responsible for the development of validation tools and approach for PODIUM, which carried out consistent assessments across five demo sites in Denmark, France and the Netherlands, consolidating outcomes at project level and took into account specific site constraints. As a result, by the end of 2019 PODIUM will provide its final conclusions and recommendations on U-space services maturity.

The PODIUM project has also been used as a practical “use case” in the framework of the SESAR Horizon 2020 U-space related projects where EUROCONTROL supports SESAR JU through the U-space Support Cell. Moreover, the materials developed (PODIUM Concept and Architecture, PODIUM validation Toolkit and others) under the EUROCONTROL leadership in PODIUM have also been shared with and widely used by other SESAR U-space demonstration projects.

### **European Network of U-space Demonstrators**

In 2018, the European Commission launched the European Network of U-space Demonstrators to support U-space projects and solutions. The network is a forum to share knowledge on how to keep drone operations safe, secure and green. It focusses on U-space: a system that connects all drones flying in the air and that makes all drones visible for authorities and citizens.

Led by the European Commission, EUROCONTROL is part of the Network’s Support Cell, which bundles together the regulatory competence of EASA, the

	<p>R&amp;D management expertise of the SJU and our air traffic management expertise.</p> <p>EUROCONTROL work closely with these organisations to develop concrete material to support U-space projects and the authorities that will approve the drone operations.</p> <p>The network focuses specifically on projects with a clear business case that build on mature technologies, but need some further operational and regulatory demonstrations before starting commercial operations.</p> <p>The network also supports the competent authorities in processing the numerous applications expected once commercial businesses starts. The network is open to all U-space projects that help opening the European drone services market. All SESAR U-space related projects and all projects within the European Innovative Programme (EIP), Smart Cities and Communities (SCC), Urban Air Mobility (UAM) initiative are automatically part of the Network.</p>
Entity Profile matching the task	<p>EUROCONTROL has more than 50 years of experience in ATM concept development and validation, on its own and at the core of a pan European network of collaborators. EUROCONTROL has researched countless concepts and has enabled the implementation of many, from Short Term Conflict Alert to Reduced Vertical Separation Minima.</p> <p>Over the years, EUROCONTROL has led and participated to many research project exploring innovative ATM concepts (free route, free flight, autonomous separation procedures, S2020 U-space CONOPS) and the related enabling technologies (both the ground and avionic segment, such as Airborne Separation Assurance Systems, ADS-B, ADS-C).</p> <p>EUROCONTROL employs skilled researchers; ATM concept experts, cognitive psychologists and engineers. As an intergovernmental agency, EUROCONTROL maintains an objective viewpoint, unswayed by commercial interest.</p> <p>EUROCONTROL contributes to several H2020/S2020 R&amp;D on-going projects on U-space (e.g. DACUS, BUBBLES, ICARUS, 5D-AeroSafe, Drone4Safety, Labyrinth etc.) and operates several simulators of different kinds to support ATM/U-space research and over the years has funded and steered the development of several of these; SAAM, NEST, RAAMS, ESCAPE, eDEP, ITWP and so on.</p>
Contribution	<p>EUROCONTROL will participate in Solution 2. EUROCONTROL will act as Contributor and provide expert support mainly to WP3.2/3.3/3.6 with particular attention to the definition of the U-space and ATM Services as well as to the Solution 2 Operational and Safety requirements. EUROCONTROL will also pro-actively support the definition of the PJ34-S2 Conclusion and collaboration with the relevant stakeholders.</p>

#### 4.1.1.15 FREQUENTIS AG

Organisation	15 FRQ (FSP)	Ground Industry
Description	<p>Frequentis AG, member of SESAR1 and SESAR 2020, 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, network infrastructure, SWIM, aeronautical information management, and airport traffic optimization. Important focus lies in the future communication infrastructure domain and new technologies for visualisation. Frequentis is a strong supporter of service oriented and open, standardised architecture. In SESAR 1 and SESAR 2020 Wave 1 and 2 we effectively demonstrated remarkable achievements towards the next generation ATM system architecture.</p> <p>Special attention is given to the users of ATM systems. Our expertise and tooling guarantees early indications of the future user acceptance. Frequentis is also involved in forward-thinking and innovative R&amp;D activities such as implementation of U-space solutions for the safer management of drones.</p> <p>Frequentis AG is member of the Frequentis SESAR Partners consortium together with the companies HUNGAROCNTRIL MAGYAR LEGIFORGALMI SZOLGALAT ZARTKORUEN MUKODO RESZVENYTARSASAG and Atos Belgium, founded in 2014 for the main purpose of joining SESAR 2020 activities. Frequentis SESAR Partners is member of the SESAR Joint Undertaking.</p> <p>The consortium is consisting of three companies has a variety of complementary capabilities. Having a long SESAR history within its framework, an ANSP whose expertise will result in early feedback loops together with IT and data management know how, Frequentis SESAR Partners believes in the high added value of its participation in SESAR 2020 wave 3 efforts.</p>	
Previous experience	<p>Since 2009 FREQUENTIS AG is member of the SESAR Joint Undertaking, participating in more than 20 projects since then.</p> <p>Previous relevant projects:</p> <p>SESAR 1 contribution to PJ08, PJ13, PJ14 in the area of</p> <ul style="list-style-type: none"> <li>Data model definition</li> <li>Service model definition</li> <li>Implementation of prototypes for validation exercises</li> <li>PJ13.02.02 Aeronautical Information Management – Digital Integrated Briefing</li> </ul> <p>SESAR 2020 W1: PJ15-10, PJ15-11</p> <p><u>Other relevant R&amp;D projects:</u></p> <ul style="list-style-type: none"> <li>• SJU GOF U-Space VLD (2018-2020)</li> </ul>	
Entity Profile matching the task	<p>Frequentis AG's profile matches the tasks in the proposal regarding the following skills, knowledge and capabilities in the areas:</p> <p>Technical:</p> <ul style="list-style-type: none"> <li>Data and service modelling</li> </ul>	

	<p>Software engineering, development and design System Integration (especially integrating USSP and ANSP in UTM environments)</p> <p>Requirements engineering Agile development</p> <p>Operational Detailed AIM expertise NOTAM management Flight planning AIXM management SWIM domain know-how and understanding FIMS/CIS operational expertise both in research (GOF USPACE VLD) and commercial projects</p> <p>Standardisation experience Validation expertise</p> <p>Frequentis AG will contribute with a CIS solution, U-space services and expertise in standardisation of interoperable SWIM information exchange services, which will be the basis for evolutionary developments in the project for validation.</p>
Contribution	<p>Frequentis AG will contribute to the solution related to integration of UTM to ATM based on SWIM principles in the frame of PJ34, solution 1.</p> <p>Frequentis AG will support requirements engineering, service specification, design processes and will support the developed concepts and service specifications with system components, mock-ups and demonstrators to validate existing products and their respective future development to meet the future UTM/ATM integration requirements.</p> <p>Frequentis AG will contribute to:</p> <ul style="list-style-type: none"> <li>• CIS provision (software as a service deployed in FRQ cloud environment) in at least two clusters</li> <li>• U-space service provision (related to surveillance and flight plan data as well as in the area of strategic and tactical deconfliction)</li> <li>• Support to Information Service Verification</li> <li>• Information Service Definition &amp; Specification</li> <li>• Information Service Development</li> <li>• Information Service Verification</li> </ul> <p>U-space Service prototyping where required for verification of information services</p>

4.1.1.16 HUNGAROCNTRL MAGYAR LEGIFORGALMISZOLGALAT ZARTKORUEN MUKODO  
RESZVENYTARSASAG

Organisation	16 HC (FSP)	Service Provider
Description	<p>Hungarocontrol Zrt. 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>Hungarocontrol Zrt. is member of the Frequentis SESAR Partners consortium together with the companies Atos Belgium SA/NV 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> <p>HC (FSP) has more than 50 years of experience in ATM and is committed to implementing and deploying state-of-the-art technology.</p> <p>HC has a well-established relationship with universities and scientific centers and is active in ATM R&amp;D&amp;I activities. HC has participated in SESAR 1 demonstration activities such as REACT-Plus and has also received EU co-funding from the SESAR JU for a Large Scale Demonstration project, Budapest 2.0.</p>	
Previous experience	<p>HungaroControl Zrt. has participated in SESAR 2020 Wave 1&amp; Wave 2 as a member of FSP Consortium in the following projects, solutions or VLDs:</p> <p>Wave 1</p> <p>PJ.03-A</p> <p>PJ.05-02</p> <p>PJ.05-03</p> <p>PJ.10-01B</p> <p>PJ.16-03</p> <p>PJ.16-04</p> <p>PJ.28 (as a linked third-party)</p> <p>SESAR Exploratory research - USIS project</p> <p>Wave 2</p> <p>PJ02-21</p> <p>PJ05-35&amp;97</p> <p>PJ10</p> <p>PJ13-115&amp;117</p> <p>PJ20</p>	

Entity matching the task	<p>Profile</p> <p>Air Navigation Service Providers including the profiles:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> ATM Operational expertise,</li> <li><input type="checkbox"/> ATM System expertise,</li> <li><input type="checkbox"/> Simulation expertise (Simulation HUB)</li> <li><input type="checkbox"/> En-Route and Approach Air Traffic Controllers,</li> <li><input type="checkbox"/> Human Factors expertise,</li> <li><input type="checkbox"/> Safety expertise</li> </ul> <p>Experience relevant to the project is the U-Space Initial Services (USIS) project, which aims to demonstrate the technical and operational feasibility of providing in a very short time frame U-Space services to UAV/RPAS operators and to authorities focusing on:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> UAV/RPAS/Pilot/Operator Registration Service</li> <li><input type="checkbox"/> Flight Wish/Mission Notification &amp; Authorization Service</li> <li><input type="checkbox"/> U-Space NOTAM Service (including dynamic NOTAM for VLL)</li> <li><input type="checkbox"/> UAV/RPAS Traffic Monitoring (including non-conformance vs regulation/authorized mission).</li> </ul> <p>HungaroControl Zrt. fully participated in all phases of USIS.</p>
Contribution	<p>HungaroControl Zrt. (as member of FSP) will contribute to the solution 1 in the frame of PJ34.</p> <p>The main contribution of HungaroControl Zrt., as ANSP, will be:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Support with ATCOs</li> <li><input type="checkbox"/> ATM system experts</li> <li><input type="checkbox"/> Airspace Design Specialists</li> <li><input type="checkbox"/> UAV/RPAS experts</li> <li><input type="checkbox"/> Human Factor expertise</li> <li><input type="checkbox"/> Safety expert</li> </ul>

#### 4.1.1.17 HONEYWELL AEROSPACE

Organisation	17 HONEYWELL	Airborne Industry
Description	<p>In 2015, Honeywell celebrated its 100 years of product innovation in the Aerospace market. Honeywell Aerospace is now manufacturer and Tier 1 supplier of all CNS avionics and cockpits to almost every aircraft manufacturer and airlines worldwide. Honeywell belongs to the global market leaders in all the product categories provided by the aviation industry community. Honeywell Aerospace provides integrated avionics, engines, electrical and mechanical systems, and service solutions to aircraft manufacturers, airlines, military, and space and airport operations. It serves aerospace customers all over the world and provides products for any type of aircraft (from small and</p>	

	<p>unmanned, over business jets and regional aircraft, to large long range aircraft like the Airbus 380).</p> <p>On the GA/R market, Honeywell's role is historically very important offering the whole spectrum of GA tailored avionics under its Bendix-King brand and being a supplier of majority rotorcraft OEMs. Since long time Honeywell is also actively involved in unmanned systems research - note that for instance Honeywell T-Hawk was the only unmanned system allowed to operate in Fukushima after the nuclear disaster in 2011. Honeywell was also involved in the first no-chase UAV flight in the US (June 2018).</p> <p>The Unmanned Aerial Systems (UAS)/Urban Air Mobility (UAM) organization within Honeywell develops and integrates innovative, safe and cost-effective technologies across the entire UAS/UAM ecosystem. Relevant news on UAM and developments can be followed at <a href="https://aerospace.honeywell.com/uam#whatittakes">https://aerospace.honeywell.com/uam#whatittakes</a>, and <a href="https://aerospace.honeywell.com/uam">https://aerospace.honeywell.com/uam</a>.</p> <p>The Honeywell Aerospace research activities are housed in its Advanced Technologies department. This is a global department, working with the best scientists and engineers in Europe, America and Asia. Their presence in the different regions allow the company to innovate in line with local market and customer requirements and trends. In Europe, the Advanced Technologies group has its presence in Toulouse (F), Prague (CZ), Brno (CZ), Yeovil (UK), Tewkesbury (UK), and Hamburg (D). These facilities are equipped with state of the art research and test laboratories enabling research, development, integration, verification and validation of various aircraft systems.</p>
Previous experience	<p><b>Relevant previous and ongoing projects:</b></p> <p>Honeywell's SESAR and SESAR2020 experience includes many projects including for instance:</p> <ul style="list-style-type: none"> <li>- SESAR 9.19 (SWIM Air-Ground) with a Honeywell leadership,</li> <li>- SESAR 9.44 (Flexible Communication Avionics)</li> <li>- SESAR2020 Wave 1 PJ.11-A1, A2, A4 (ACAS X variants for commercial aviation and RPAS, enhanced traffic situation awareness for GA (TSAA+)) with Honeywell lead of solutions PJ.11-A2 and A4.</li> <li>- SESAR2020 Wave 1 PJ.14-02-04 Future Communication Infrastructure</li> <li>- SESAR2020 Wave 2 PJ.13 (ERICA) addressing IFR RPAS.</li> </ul> <p>Beyond SESAR IR, Honeywell led within SESAR ER3 the project EMPHASIS (EMPowering Heterogeneous Aviation through cellular SignalS) aiming to increase safety and reliability of General Aviation/Rotorcrafts (GA/R) operations at low altitude as well as their interoperability with other airspace users, such as commercial aviation or emerging drone operations, through affordable Communication, Navigation and Surveillance (CNS) capabilities.</p>



	<p>Honeywell is also involved in H2020 MoNIFly project (Mobile Network Infrastructure for cooperative surveillance of low flying drones) addressing unmanned traffic management system based on mobile network infrastructure where Honeywell is responsible for communication network and on-board devices.</p> <p>Beyond the above, Honeywell is also involved in several ESA projects, as well as national projects with Technology Agency of the Czech Republic. Honeywell supports multiple standardization activities through active participation into ICAO, RTCA and EUROCAE forums.</p>
<p>Entity Profile matching the task</p>	<p>Honeywell has a strong expertise concerning communications including C2, surveillance sensors, flight/mission supporting services as well as flight guidance and control. Honeywell has been also intensively working on Detect &amp; Avoid systems for many years both in the US and in Europe.</p> <p>The Honeywell Aerospace facility located in Brno in the Czech Republic hosts close to 600 world class aerospace engineers and is equipped with the state of the art research and test laboratories including radio frequency research lab, Human Factors and avionic simulators and mock-ups as well as data link and other product test facilities. This extensive and innovative workforce would be a key enabler to perform the proposed activities.</p>
<p>Contribution</p>	<p>HONEYWELL will participate in solutions 1 (Collaborative U-space-ATM interface) and solution 2 (Collaborative ATM-U-space environment concept development).</p> <p>Within Solution 1 HONEYWELL will participate in all three activities focusing on definition of suitable SWIM candidate services and experimental validation of selected subset of them (through Cluster 2 validation exercise(s)). Beyond the expertise related to flight/mission support services, HONEYWELL will benefit from its knowledge of on-board systems (such as DAA, mission management, and CNS systems) across all types of low altitude airspace users to explore possible interactions between ATM and U-Space both from perspective of services providers and end users.</p> <p>Contribution to concept development in solution 2 will focus on possible safe use of U-Space services by all low altitude users such as (beyond drones) UAM, general aviation and rotorcraft – both within and outside a dedicated U-Space airspace. It is expected that the selected elements of the concept will be incorporated and evaluated in Solution 1 validation exercises.</p>

#### 4.1.1.18 LEONARDO - SOCIETA PER AZIONI

Organisation	18 LEONARDO	Ground Industry
Description	<p>LEONARDO is a global player in the high-tech sectors and a major operator worldwide in the Aerospace, Defence and Security sectors. LEONARDO is based in Italy, has over 45,000 employees, of whom about 36% abroad, and in 2017 recorded 11.5 billion euro in revenues and received orders in the amount of 11.5 billion. Luciano Carta is the President since May 2020 and Alessandro Profumo has been the CEO since 16 May 2017. LEONARDO 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 LEONARDO 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, LEONARDO 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>LEONARDO 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.</p> <p>The new LEONARDO 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"> <li>• Helicopters</li> <li>• Aeronautics</li> <li>• Aerostructures</li> <li>• Electronics Defence and Security Systems</li> <li>• Space</li> </ul> <p>LEONARDO operates through seven divisions that have inherited the activities of its 100% owned companies (AgustaWestland, Alenia Aermacchi, Selex ES, OTO Melara and WASS):</p> <ul style="list-style-type: none"> <li>• Helicopters</li> <li>• Aircraft</li> <li>• Aerostructures</li> <li>• Airborne &amp; Space Systems</li> <li>• Land &amp; Naval Defence Electronics</li> <li>• Defence Systems</li> <li>• Security &amp; Information Systems</li> </ul> <p>LEONARDO 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</p>	

	Thales as part of the Space Alliance, for satellite services and the manufacture of satellites and orbiting infrastructures, respectively.
Previous experience	<p>Leonardo is a member of the SESAR Joint Undertaking, participating in a great number of projects from SESAR1, like WP3, WP4, WP5, WP6, WP7, WP8, WP9, WP10, WP12, WP13, WP14, WP15, WP16 and WPB.</p> <p>In Wave 2, Leonardo contributes to PJ02W2-21, PJ04W2-29, PJ05W2-35, PJ05W2-97, PJ10W2-93, PJ10W2-96 (solution leader), PJ13W2-113/117, PJ18W2-53, PJ20 PJ.14 W2 and PJ.13 W2 as PM and it is involved in solutions PJ14W2-76 , PJ14W2-60 (Leader), PJ14W2-61, PJ14W2-77,PJW2-107, PJ14W2-100 (Leader) PJ14W2-79, PJ14W2-110, PJ14W2-81 and PJ14W2-84.</p> <p><u>Previous and ongoing projects</u></p> <p><u>SESAR 2020 W1 (PJ10.5):</u> The scope of PJ.10-05 solution was 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</p> <p><u>TERRA Project:</u>The TERRA project scope is to leverage existing state-of-the-art and potential new technologies, to develop elements of a ground-based U-Space architecture that will accommodate a large base of RPAS in a mixed mode (manned and unmanned) environment.</p> <p><u>RPASInAir Project:</u> The project intends to develop new aerospace and ICT solutions to enable an innovative land monitoring and control service which integrates data collected by RPAS equipped with innovative sensors when flying into not segregated airspace fused with data from other sources.</p> <p><u>SESAR 2020 W2 (PJ13 – ERICA):</u> In this project, Leonardo will continue to increase its experience and expertise in the domain of RPAS insertion into ATM. In particular, the possibility of integrating RPAs in a non-segregated Italian Terminal Maneuvering Area (TMA) will be explored.</p> <p><u>SESAR 2020 PJ17-01 “SWIM-TI Purple Profile for A/G Advisory Information Sharing”:</u> this technological solution contributes to one of the SESAR Key Features: ENABLING AVIATION INFRASTRUCTURE. The SWIM-TI is the interoperable (runtime) infrastructure (ground/ground and air/ground) over which SWIM services are provided and consumed. It is an enabler for technical interoperability between SWIM services consumers and providers.</p> <p><u>D-FLIGHT:</u> This project will develop a DTM system for the provisioning of U-Space services. The D-Flight system can be represented as a system of individual sub-systems, standardized by operational procedures, in which drones are operating more autonomously, and in which information is shared and exchanged with a high degree of decision-autonomy to achieve the safe, orderly and efficient use of the available, limited and shared airspace.</p>
Entity Profile matching the task	<p>Leonardo has relevant profiles and experts in order to support and manage all the activities needed to carry on the PJ.34 since it is working in this domain from long time ago, with an active participation to international working group (see also the “previous experience” paragraph) starting from these activities Leonardo can provide a large numbers of experts for the following categories:</p> <ul style="list-style-type: none"> <li>• ATC and UTM Control System experts</li> <li>• Surveillance experts</li> <li>• Cyber security experts.</li> </ul>

Contribution	<p>LEONARDO will participate in <b>SESAR-Wave3-03-2020 (PJ34 - AURA Project)</b> in the following solutions:</p> <p>In <b>PJ.34-W3-01 “Collaborative U-space ATM interface”</b> (namely <b>Solution 1</b>), Leonardo will lead the Technical Specification (TS/IRS) V2 together with the Cluster 4 management both as Cluster and Exercise Leader.</p> <p>In Solution 1 Leonardo will provide a Cluster (namely Cluster 4) between one ATM system and one UTM system (D-Flight)</p> <p>The two systems, through the Cluster, will share identification and tracking information, airspace information and procedural data and integrate a MET data service.</p> <p>All the services will be developed in standard SWIM format.</p> <p>Solution 1 will involve the following partners as Leonardo LTPs:</p> <ul style="list-style-type: none"> <li>- Leonardo Germany GmbH</li> <li>- Telespazio S.p.A. participating in Solution 1, as LTP of Leonardo</li> </ul> <p>In <b>PJ.34-W3-02 “Collaborative ATM U-Space Environment Concept Development”</b> (namely <b>Solution 2</b>).</p> <p>Solution 2 will involve the following partners as Leonardo LTPs:</p> <ul style="list-style-type: none"> <li>- Telespazio SpA (Leader of task WP3.3)</li> <li>- eGEOS SpA</li> </ul>
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#### 4.1.1.19 SINTEF AS

Organisation	19 SINTEF	Ground Industry
Description	<p>SINTEF is a part of North European ATM Industry Group (NATMIG) Consortium. The NATMIG consortium consists of Airtel ATN (SME - Ireland), Saab AB (multinational industrial concern - Sweden) and SINTEF AS (non-profit research organisation - Norway).</p> <p>SINTEF (<a href="http://www.sintef.no/">http://www.sintef.no/</a>) is the largest independent research organisation in Scandinavia and is a non-profit research organisation. We employ 2000 people most of whom are located in Trondheim and Oslo (Norway). More than 90% of our annual turnover derives from contract research for industry and the public sector in Norway and internationally, and we receive minimal state funding (around 6%). Contract research carried out by SINTEF covers all scientific and technical areas, and ranges from basic research through applied research to commercialisation of results into new products and business ideas, for both the domestic and international markets.</p> <p>Although SINTEF DIGITAL has gained competence in state-of-the-art ATM research for several decades, the increased focus through the SESAR 1 (32 projects) and SESAR 2020 involvement has substantially improved our technology and aligned it further to the needs of the aviation industry and airspace users. The activity in SESAR has also increased SINTEFs aeronautical research portfolio outside SESAR.</p> <p>SINTEF is a multidisciplinary research foundation, and can still bring added value to the ATM domain through our state-of-the-art research in other domains like Oil &amp; Gas, Space, Health &amp; Medicine, Constructions, Energy, Marine, Railway, Roads, Harbours, and Resilience etc.</p>	

	<p>The SINTEF contribution to SESAR is focused around optimisation, (traffic sequencing, routing, taxiing, dynamic airspace, A-CDM), Human Computer Interface, system architecture and development, Digitalisation, Automation, 3D modelling, Safety, Resilience, Cyber Security and navigation (GBAS).</p> <p>SINTEF Optimization Group has a very high international level of competence within optimisation and simulation. For the past 20 years, its optimisation group has been developing optimisation methods, software prototypes, libraries and components, and it has built a strong international research network. Our main research focus is on applied optimization for industrial planning and scheduling tasks, such as Air Traffic Control. The optimization group at SINTEF has the appropriate expertise and knowledge of the mathematical and algorithmic tools mandatory to develop such optimization algorithms. This is certified also by a long record of prestigious publications, international awards and real-life implementations obtained by the group in routing and scheduling problems.</p>
Previous experience	<p><b>Publications:</b></p> <p>L. Lamorgese, C. Mannino, M. Piacentini, Optimal Train Dispatching by Benders'- like reformulation, Transportation Science to appear, 2015. Relevance: Introduces novel decomposition techniques to tackle conflict detection and resolution in automated route setting systems.</p> <p>C. Mannino, A. Mascis, Optimal Real-Time Traffic Control in Metro Stations, Operations Research, 57 (4), pp 1026-1039, 2009, EURO Excellence in Practice Award 2009. Relevance: Shows how branch-and-bound can be applied to automatic routing and conflict resolution systems.</p> <p>Sartor, Giorgio, Mannino, Carlo, Schittekat, Patrick. The Path&amp;Cycle formulation for the Hotspot Problem in Air Traffic Management. ODS 2018. Relevance: Development of fast algorithm to identify and resolve hotspots</p> <p><b>Previous and ongoing projects:</b></p> <p>Project SESAR Wave 1 PJ08: SINTEF is leading and participating to evaluation exercises validating acceptance of DAC (Dynamic Airspace Configuration) for ATCOs in simulated environment (Milano airspace).</p> <p>Project SESAR Wave 1 PJ09: SINTEF supports the collaborative framework concept in which measures to solve hotspots are decided more locally by ANSP in a cooperation with other stakeholders.</p> <p><b>Project NSB:</b> in this industrial optimisation and transport simulation project we improved our discrete event, agent-based simulator to handle large traffic flows in a dense transport network in order to suggest improvements to the transport.</p>
Entity Profile matching the task	<p>SINTEF has extensive optimising experience when it comes to mathematical routing and network optimisation for the industry (more than 20 years). The group is well recognized in the academic research community of optimisation. SINTEF has knowledge and an extensive toolset for rapid prototyping, that can be used to model new concepts and run evaluations on them. These tools, particularly the SIMADES agent based discrete event simulator, and the SINTEF ATC optimization library, have been used in numerous SESAR projects.</p>
Contribution	<p>SINTEF plans to run an exercise to assess algorithms that organize resilient urban networks in U-space to minimize the impact of disruptions. Using the experience of the development process and the results from the exercise, we will contribute to developing the concept, the operational and safety requirements, and the U-Space and ATM services.</p>



#### 4.1.1.20 NATS (EN ROUTE) PUBLIC LIMITED COMPANY

Organisation	20 NATS	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. NATS manages 11% of Europe's airspace and circa 25% of Europe's traffic. It is regulated by the UK Civil Aviation Authority (CAA) within the framework of the European Commission's (EC) 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"> <li>• En-route and Terminal Air Traffic Control (ATC) for all UK airspace under a 30 year operating licence to UK Government. In 2017, NATS handled over 2.5 million flights, carrying more than 200 million passengers safely through some of the busiest and most complex airspace in the world.</li> <li>• The design and management of airspace, engineering project and maintenance activities for ANS communications, navigation and surveillance systems, and IT and network management.</li> <li>• 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.</li> <li>• 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.</li> <li>• 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.</li> <li>• 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 (OJTI) and Incident Management.</li> <li>• Training of engineering staff.</li> </ul>	
Previous experience	<p><b>Operation Zenith</b> demonstrated how drones can be safely operated alongside conventional manned aircraft within a busy international airport (Manchester - EGCC) lying within controlled airspace. The demonstration activities, overseen by NATS Air Traffic Controllers in direct communication with the drone operator, successfully performed a series of on-airfield tasks whilst integrated with routine airport operations.</p> <p><b>CORUS (Concept of Operation for EuRoPeAn UTM Systems)</b> was a SESAR Exploratory Research project to develop and validate the initial concepts required to operate the proposed European U-Space. NATS was fully involved with the development of the use cases and scenarios used to define the foundation services and requirements. The project focused on building the operational architecture and associated requirements for the integration of UAS at very low levels, as well as the development of the required airspace volumes and rules.</p>	

	<p><b>Open Access UTM</b> was a UK Department of Transport research and development project led by the Transport Systems Catapult which the foundational operational architecture for safe airspace sharing between conventional airspace users and the BVLOS operation of unmanned vehicles. NATS R&amp;D developed the ConOps to integrate UTM Open Access services into the UK ATM ecosystem.</p> <p><b>PJ.10-05 IFR RPAS Integration</b> was a SESAR 2020 Wave 1 solution to advance the accommodation and integration of medium sized RPAS into en-route and terminal controlled airspace. NATS provided expert input and review on both fast and real-time simulations of RPAS across various regions of ECAC airspace.</p> <p><b>CLAIRE (CiviL Airspace Integration of RPAS in Europe)</b> was a live flight trial and simulated demonstration project using a military RPAS platform (Thales Watchkeeper - a fully remotely piloted aircraft system) The project investigated the ability of the platform to operate in different classes of airspace and all phases of flight including airfield operations (including ground).</p>
<p>Entity Profile matching the task</p>	<p>NATS has a wealth of experience in research around the integration of unmanned air systems (UAS) into UK airspace over a number of years, providing ANSP operational expertise to a range of projects within this domain. NATS has demonstrated its ability to develop operational concepts through the maturity lifecycle to implementation, e.g.</p> <ul style="list-style-type: none"> <li>-the development of experimental BVLOS drone operations in the context of North Sea offshore platforms; this work has helped develop procedures that may be used elsewhere to enable widescale BVLOS operations in both controlled and uncontrolled airspace.</li> <li>-the development of the Non-standard Flight Planning Notification, one of the first operational deployments of such a UTM service. This service gives the ANSP the ability to process and automate pre-flight notification requests from drones operators with regards to flights within controlled airspace, including within the Control Zones of six of the main UK airports.</li> <li>-the development and publication of drone-specific restricted airspace data files as part of its aeronautical information service obligation. This helps ensure that all stakeholders have the relevant information to facilitate equal and equitable access to airspace, for example provision of information regarding areas of operation where specific permissions might be required. The UK Flight Restriction Zones were introduced into UK law in March 2019.</li> </ul>
<p>Contribution</p>	<p><b>Solution PJ.34-W3-02 Collaborative ATM U-space Environment Concept Development</b></p> <p>NATS will contribute to the technical and conceptual development of the ATM-UTM interface by providing expert input and review. This work will be aligned to developments within previous projects, such as CORUS, as well as on-going projects within related domains, and will take note of the latest regulatory developments with regards to U-Space services (e.g. EASA Draft Opinion). NATS participation in PJ34-W3-02 will help develop those technical aspects specifically related to U-Space integration into ATM with a view to ensuring safe operations for all airspace users.</p>



NATS contribution to PJ34-W3-02 will include an assessment of automation and optimisation aspects of U-Space operational integration into the wider ATM environment. NATS will identify the various levels of U-Space automation that may be possible within current ATC procedures and how ATCO workload might be impacted by new entrants into the existing airspace ecosystem.

#### 4.1.1.21 THALES LAS FRANCE SAS

Organisation	21 THALES AIR SYS	Ground Industry
Description	<p>Thales AMS, from take-off to touchdown and everything in between.</p> <p>World leader in ATM, Thales , represented in SESAR 2020 by the Thales LAS France company and its Linked Third Parties, 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 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 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 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 focuses on international harmonization. Our product roadmaps are aligned with ICAO ASBU concepts, NextGen and SESAR.</p> <p>Thales has an important experience in approach and more globally in Tower systems developing and deploying systems across the world.</p>	
Previous experience	<p>Previous and on-going projects</p> <p><b>SESAR 1:</b> Thales has been involved in all SESAR 1 WorkPackages. Thales has been Co-Leader for :</p> <ul style="list-style-type: none"> <li>• WP10 (En-Route &amp; Approach ATC Systems)</li> <li>• WP 14 (SWIM technical architecture)</li> <li>• WP15 (Communication, Navigation, Surveillance)</li> </ul> <p><b>SESAR 2020 Wave 1:</b> THALES is a key contributor to the programme and is being involved in all S2020 Wave 1 projects.</p> <p>Thales is project coordinator for :</p> <ul style="list-style-type: none"> <li>• PJ16 (Controller Working Position / Human Machine Interface)</li> <li>• PJ17(SWIM Technical Infrastructure)</li> </ul> <p><b>4-FLIGHT:</b> Thales is delivering the future innovative Air Traffic Management system for France, 4-Flight. DSN will enjoy a new generation ATM system to respond to the increasing complexity and density of air traffic, integrating a</p>	

new advanced flight data processing system (CoFlight) with Thales's latest generation human machine interface (TopSky - Controller HMI)

and sophisticated new controller tools, to better detect conflicts, facilitate traffic analysis.

**COFLIGHT:** Coflight is a new advanced Flight Data Processing System (FDPS), jointly developed by DSN and ENAV and Skyguide ANSPs, together with industrial partners Thales and Leonardo. Designed to meet SESAR performance objectives, Coflight is a unique product, a fundamental enabler to achieve interoperability throughout Europe.

**COOPANS** (CO-Operation of Air Navigation Service providers) is a unique innovative partnership, between five major ANSPs together with Thales as industry provider. IAA/COOPANS, LFV/COOPANS, Naviar/COOPANS, ACG/COOPANS and Croatia Control have implemented an advanced and unified Air Traffic Control system thanks to harmonized functionalities and joint investments. With Thales TopSky - ATC system in operation, the five countries members benefit from a unified solution, through an open architecture which allows them to introduce the latest innovations via regular stepwise evolutions.

**OneSKY:** The OneSKY project for the Australian ANSP Airservices of Australia consists of merging civil and military airspace into one unique airspace managed by the same integrated system. It is the most complex 'system of system' project that THALES ATM has ever competed for, including TopSky - ATC solutions deployed in 15 interconnected civil and military ATC centres.

**MARSHALL:** The Marshall Project is a transformational infrastructure programme for UK MoD, seeking to ensure safe, efficient and sustainable Air Traffic Management (ATM) service for the UK Armed Forces. Thales provides a complete civil ATM capability for Military Airbases with:

- Efficient and secure solutions for Approach, Tower and Runway operations
- A totally harmonized solution for operations between civil and military ATC

#### **Civil-military data control**

**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.

**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 three (3) control towers of the largest Chinese airports.

		<p><b>U-space/UTM</b></p> <p>“<b>Défi Innovation</b>” : Thales is providing to DSNA and Authorities U-space services (subset of U1, U2 and U3 services) to two areas in France (Lille Airport, Rennes Airport)</p> <p><b>MODERNISATION INITIATIVES</b></p> <p><b>NextGen</b></p> <p>Thales has a unique position in the ATM Industry, participating to both SESAR and NextGen. NextGen is transforming the US National Airspace System (NAS) to meet future needs and avoid gridlock in the sky and at airports.</p> <p>Thales is a key contributor to NextGen</p> <p>Member of RTCA NextGen Advisory Committee</p> <p>Key technology provider for ADS-B program</p> <p>Enabling data comm with Thales automation platform</p> <p>Providing analysis work with the areas of safety and security</p> <p><b>ICAO ASBUs</b></p> <p>All Thales solutions are compliant with Block 0, and on the way to meet Block 1 requirements. Thales has the knowledge and expertise in the ASBUs together with the largest worldwide ATM installed base to advise our users about implementing them wherever they are.</p>
		<p><b>Entity Profile matching the task</b></p> <p>Thales AMS is involved in numerous standardization activities related to UAS/RPAS (ASTM, EUROCAE, etc.) for both air and ground equipments and support international activities such ICAO RPAS Panel.</p> <p>Thales AMS is a LAANC (FAA) approved supplier as well as the U-space service providers for two airports in France.</p> <p>Thales AMS is a key actor of SWIM development via SESAR.</p>
		<p><b>Contribution</b></p> <p>Thales AMS participates in all PJ34 solutions with a particular focus on Solution 01. In Solution 01 Thales will participate to the validation activities via two clusters targeting validation platform/environment deployment in two countries (France, Austria) as a CIS provider (Austria) and as a USSP (France). In both cases Thales AMS will provide the SWIM node.</p> <p>In Solution 02, Thales AMS will mainly contribute to translate the operational concept of operations into implementable technical requirements for Solution 01.</p>

#### 4.1.1.22 THALES AVS FRANCE SAS

<b>Organisation</b>	<b>22 THALES AVS</b>	<b>Airborne Industry</b>
<b>Description</b>	THALES AVS FRANCE SAS (short name THALES AVS) is one of the leading global suppliers of avionic solutions for the commercial and military	

	<p>aerospace markets. The company offers a wide range of functions and on-board electronic equipment for fixed wing and rotary wing aircraft. It provides its customers with all equipment, subsystems and systems in the areas of flight management, navigation, communication and surveillance.</p> <p>In the civilian area, its solutions address both helicopters and commercial aircraft and regional and business aircraft. Clients include AIRBUS, ATR, Boeing, Bombardier, Embraer, Eurocopter, Gulfstream, Sikorsky and Sukhoi, to name but a few.</p> <p>THALES AVS FRANCE SAS' product lines range from the provision of complete avionics suites to cockpit and head-up displays, flight management, flight guidance and flight control equipment, communication, navigation and surveillance systems, integrated modular avionics and integrated maintenance. Growing aircraft numbers make air traffic management more complex.</p> <p>THALES AVS FRANCE SAS solutions help to make the end-to-end system operations safer and more efficient. Expert on airborne real-time critical systems, and leader of major European projects shaping the future of aerospace operations, THALES AVS FRANCE SAS is a key player in the definition of industry standards and in bringing to market innovative solutions.</p> <p>THALES AVS FRANCE SAS is a key partner for the R&amp;D contributing to the definition and validation of the ATM operational improvements. It is fully involved in worldwide standardisation activities essential for European and worldwide ATM interoperability; inter alia ICAO, support to SES regulation, EUROCAE/RTCA, ARINC, EASA CNS/ATM, ASAS RFG and AEEC.</p> <p>THALES AVS FRANCE SAS is also a key participant in the Clean Sky JTI programme and as a result, will contribute to coordinating SESAR with Clean Sky to bring the best value for money.</p> <p>THALES AVS FRANCE SAS has a particular expertise for the UAS functions involving geo referencing, based on historical company background in the field of GNSS receivers, the company delivering civil and military receivers for aircraft and helicopters.</p> <p>More recently Thales AVS FRANCE SAS has started R&amp;D activities for civil UAS, including the participation to GeoSafe project. Based on assets from former company Gemalto, who merged into Thales Group in 2019, THALES AVS FRANCE SAS is developing a secure Digital Remote ID solution for civil drones, compatible with a tracking solution for operators and third parties.</p>
Previous experience	THALES AVS FRANCE SAS is a SESAR JU Member from the very beginning, and has been involved in many projects. Recently THALES has successfully led the SESAR JU project GEOSAFE
Entity Profile matching the task	Participation on different working groups, EUROCAE, RTCA, ICAO RPAS Panel, GUTMA
Contribution	Thales AVS FRANCE SAS will participate in PJ34 solution 1, contributing to the definition of technical requirements for U-Space services selected as candidates for implementing the collaborative ATM / U-Space interface. THALES AVS FRANCE SAS will enable end-to-end validation of the prototype interface solution, by providing and operating compatible UAS solution for simulations or live trials, with a particular focus on Geofencing and Tracking services

#### 4.1.1.23 LETOVE PREVADZKOVE SLUZBY SLOVENSKEJ REPUBLIKY, STATNY PODNIK

Organisation	23 LPS SR (B4)	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 500 (including 118 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 km<sup>2</sup> and provides ATC services at five designated Slovak international airports as well as within small parts of the Hungarian airspace.</p> <p>The European-wide trend in air traffic in the last decade, is also reflected in the evolution seen in the Slovak airspace. In recent years, a significant increase in traffic was seen in the FIR Bratislava. As far as provision of air traffic control is concerned, there were no delays which would exceed the determined limit of 0.5 minute per 1 flight.</p> <p>LPS SR is a part of B4 Consortium, Member of SESAR Joint Undertaking. 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.	

#### 4.1.1.24 CROATIA CONTROL, CROATIAN AIR NAVIGATION SERVICES LTD

Organisation	24 CCL/COOPANS	Service Provider
Description	<p>Croatia Control is a state-owned limited liability company.</p> <p>Location: The headquarter is located in Zagreb and subsidiaries are located in Pula, Rijeka, Lošinj, Split/Brač, Zadar, Dubrovnik and Osijek.</p> <p>Divisions: ATM Division, CNS/MET/AIM Division, Corporative Functions Division.</p> <p>Governance structure: An Assembly, a Supervisory Board and main Management. The Assembly consists of the Chairman - the Minister responsible for transport, Minister of Finance and the Minister of Defence. The Supervisory Board monitors the activities of the organization. Supervisory Board appoints the Director General.</p> <p>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"> <li>Air Traffic Services (ATS)</li> </ul>	

	<ul style="list-style-type: none"> <li>• Communication, Navigation and Surveillance Services (CNS)</li> <li>• Aeronautical Information Services (AIS)</li> <li>• Aeronautical Meteorological Services (MET)</li> </ul> <p>Croatia Control is a member of COOPANS Consortium consisting of 5 Air Navigation Service Providers: ACG/COOPANS, CCL/COOPANS, IAA/COOPANS, Naviair/COOPANS and LFV/COOPANS. 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 &amp; 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, design of concepts and in development, validation and implementation of Air Traffic Management tools.</p> <p>Croatia Control is certified ISO 9001, ISO 14001 and BS OHSAS 18001.</p>
Previous experience	<p>Croatia Control has many years of experience in ATM, ATFCM and ASM, as well in operational use of CPDLC, Mode S and automated system coordination tools in cross border FRA operations which are now an integrated part of the ATM-system Topsy and previously in EUROCAT-E.</p> <p>Croatia Control has participated in SESAR 2020 Wave 1 and is participating in SESAR Exploratory Research and SESAR 2020 Wave 2 projects as a member of COOPANS Consortium in the following projects, solutions or VLDs:</p> <p>SESAR 2020 Wave 1:</p> <p>PJ.01-01</p> <p>PJ.04-02</p> <p>PJ.05-02</p> <p>PJ.05-03</p> <p>PJ.06-01</p> <p>PJ.09-02</p> <p>PJ.10-02A</p> <p>PJ.10-02B</p> <p>PJ.10-05</p> <p>PJ.15-09</p> <p>PJ.16-03</p> <p>PJ.16-04</p> <p>PJ.18.02</p> <p>PJ.18.04</p> <p>PJ.18-06</p> <p>PJ.19-CI02</p> <p>PJ.19-CI05</p> <p>PJ.20</p> <p>PJ.24</p> <p>SESAR Exploratory Research:</p>



	FMP-Met SESAR 2020 Wave 2: PJ.05-35 PJ.05-97 PJ.09-44 PJ.10-93 PJ.10-96 PJ.18-53
Entity Profile matching the task	Not applicable, CCL/COOPANS initially will not participate directly in this action.
Contribution	Support to participating members of COOPANS Consortium if required.

#### 4.1.1.25 UDARAS EITLIOCHTA NA HEIREANN THE IRISH AVIATION AUTHORITY

Organisation	25 IAA/COOPANS	Service Provider
Description	<p>IAA/COOPANS 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, IAA/COOPANS has a Safety Regulation Directorate, as IAA/COOPANS oversees and regulates the implementation of standards for the Irish civil aviation industry.</p> <p>Governance structure: IAA/COOPANS has a Board of Directors having responsibility for the corporate governance.</p> <p>IAA/COOPANS is a member of COOPANS Consortium consisting of 5 Air Navigation Service Providers: ACG/COOPANS, CCL/COOPANS, IAA/COOPANS, Naviair/COOPANS and LFV/COOPANS. 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 &amp; Innovation by the establishment of the COOPANS Consortium.</p> <p>IAA/COOPANS 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>IAA/COOPANS 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 &amp; Approach ATM Systems (10.2.1, 10.3.8, 10.10.3), WP 16 R&amp;D Transversal Areas (16.4.3, 16.6.1), WP C Master Plan Maintenance (C3)</p> <p>IAA/COOPANS has participated in SESAR 2020 wave 1 in the following projects: PJ.10, PJ.16, PJ.17, PJ.25 and PJ.27</p> <p>IAA/COOPANS is currently participating in wave 2 projects PJ.10 and PJ.18</p>	



Entity matching the task	No third parties involved, IAA/COOPANS will not initially participate directly in this action
Contribution	Support to participating COOPANS members if required

#### 4.1.1.26 NAVIAIR

Organisation	26 NAVIAIR/COOPANS	Service Provider
Description	<p>Naviar/COOPANS is a state owned company, originally part of “Statens Luftfartsvæsen” (the Danish Civil Aviation Authority) founded in 1938. In 2001, the ANSP part of the Danish CAA was established as an independent company with the name of Naviar. Headquarters is located in Copenhagen (TWR/APP/En-route) and subdivisions are located in Roskilde, Billund, Århus, Rønne and Ålborg (TWR/APP) and in Vagar &amp; Nuuk (FIS/FIC). Naviar has four main divisions - Operations, Technical Maintenance, Finance, and HR, supported by Communications, UTM, and Safety Departments.</p> <p>Naviar is a member of a COOPANS SESAR Consortium consisting of 5 Air Navigation Service Providers: ACG/COOPANS, CCL/COOPANS, IAA/COOPANS, LFV/COOPANS, and Naviar/COOPANS. 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 programme based on the incremental development of a common ATM platform, and this part of the COOPANS cooperation now also includes Nav Portugal. 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, and this work is further expanded to Research &amp; Innovation by the establishment of the COOPANS SESAR Consortium.</p> <p>Naviar/COOPANS 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>	
Previous experience	<p><b>SESAR 1 experience:</b> Naviar/COOPANS has participated in SESAR via the NORACON consortium in the following WPs:</p> <ul style="list-style-type: none"> <li>• WP00 SESAR2020 preparation 00.14, 00.15</li> <li>• 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</li> <li>• WP6 Airport Operations: 6.8.4</li> <li>• WP7 Network Operations: 7.5.4</li> <li>• WP 8 Information Management: 08.1.3, 8.1.5, 8.1.9, 8.3.4, 8.3.10</li> <li>• WP 10 En-Route &amp; Approach ATM Systems: 10.2.1, 10.2.3, 10.3.1, 10.3.8, 10.9.4, 10.10.3</li> <li>• WP 14 SWIM Technical Architecture: 14.1.3, 14.4</li> <li>• WP 16 R&amp;D Transversal Areas: 16.2.3, 16.6.2</li> <li>• WP B Target Concept and Architecture Maintenance: B4.2, B4.3, B4.5</li> <li>• WP C Master Plan Maintenance: C2 &amp; C3</li> </ul> <p><b>SESAR 2020 experience:</b> Naviar/COOPANS as participated and contributed in several projects during Wave 1</p>	

	<ul style="list-style-type: none"> <li>• PJ.01-01 E-AMAN - Extended Arrival Management with overlapping AMAN operations and interaction with DCB</li> <li>• PJ.06-01 Free Route - Optimized traffic management to enable Free Routing in high and very high complexity environments</li> <li>• PJ.10-02A Separation Management - Improved Performance in the Provision of Separation</li> <li>• PJ.10-02B Separation Management - Advanced Separation Management</li> <li>• PJ.14-02-02 Future Satellite Communications Data Link</li> <li>• PJ.14-04-01 Surveillance Performance Monitoring (Task 1)</li> <li>• PJ.14-04-03 New use and evolution of Cooperative and Non-Cooperative Surveillance (Task 3)</li> <li>• PJ.15-9 Common Services, Virtual Centre data centre service</li> <li>• PJ.16-3 CWP Controller productivity - Workstation, Service Interface Definition &amp; Virtual Centre Concept</li> <li>• PJ.18-2 Trajectory Management Process</li> <li>• PJ.18-6 Performance Based Trajectory Prediction</li> <li>• PJ.19 CII/WP2 ATM Operations (SESAR CONOPS)</li> <li>• PJ.20 Master Plan Maintenance</li> <li>• PJ.25 E-AMAN VLD</li> <li>• PJ.27 Flight Object Interoperability VLD</li> <li>• PJ.31 Initial Trajectory Information Sharing VLD</li> </ul>
Entity Profile matching the task	No third parties involved, Naviar/COOPANS will not initially participate directly in this action
Contribution	Support to participating COOPANS members if required

#### 4.1.1.27 ATOS BELGIUM

Organisation	<b>27 ATOS (FSP)</b>
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 &amp; Systems Integration services, Managed Services, Cloud operations, Big Data &amp; 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 HUNGAROCNTRAL MAGYAR LEGIFORGALMI SZOLGALAT ZARTKORUEN MUKODO RESZVENYTARSASAG and Frequentis AG which was founded in 2014 for the main purpose of joining SESAR2020 activities. Frequentis SESAR Partners is member of the SESAR Joint Undertaking.</p>
Previous experience	Not applicable.
Entity Profile matching the task	Not applicable, ATOS (FSP) initially will not participate actively in this action.
Contribution	Support to participating members of Frequentis SESAR Partners if required.

#### 4.1.1.28 AIRTEL ATN LIMITED

Organisation	28 AIRTEL
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 SINTEF AS (non-profit research organisation - Norway).</p> <p>AIRTEL ATN LTD is an SME which has an extensive line of ATN &amp; 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 ATN LTD 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 ATN LTD 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	Non active participation
Entity Profile matching the task	Non active participation
Contribution	Non active participation

#### 4.1.1.29 SAAB AKTIEBOLAG

Organisation	29 SAAB
Description	<p>SAAB AKTIEBOLAG is part of the North European ATM Industry Group (NATMIG) Consortium. The NATMIG consortium consists of Airtel ATN (SME - Ireland), Saab AB (multinational industrial concern - Sweden) and SINTEF AS (non-profit research organisation - Norway).</p> <p>While SAAB AKTIEBOLAG 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 AKTIEBOLAG'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 &amp; Avoid system or related ATM components.</p>

	SAAB AKTIEBOLAG is a global supplier in the ATM domain and Saab has a long history of developing and delivering ATM solutions. SAAB AKTIEBOLAG 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 AKTIEBOLAG 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 AKTIEBOLAG ATM systems guide 2 million aircraft movements each month via our airport surface safety systems.
Previous experience	SAAB has been a SESAR member from the start with the SESAR project experience:  SESAR 1 (WP05, WP06, WP10, WP12 and WP16): The main areas of contribution were in AMAN/DMAN, Remote Tower and safety.  SESAR 2020 W1 (PJ05): The main area of contribution is in Remote Tower SESAR 2020 W2 (PJ05): The main area of contribution is in Remote Tower SESAR 2020 W2 (PJ13): The main area of contribution is in RPAS
Entity matching the task	N/A
Contribution	N/A

#### 4.1.2 Main profiles/CV (they may be the same person for more than one role)

##### 4.1.2.1 Project Manager

**Patricia Hervías Vallejo (F).** MSc Aeronautical Engineer from Universidad Politécnica de Madrid. She has more than 6 years of experience in Indra focused on Air Traffic Management and UTM.

She has been involved in several SESAR1 projects (P10.4.1/P10.4.2), leading operational validations with several ANSPs, such as DFS, NATS and ENAIRE. She has also worked with international clients (Saudi Arabia, Emirates, Indonesia, South Korea, Israel) managing commercial proposals and defining and demonstrating new products.

Currently, she is Head of System Engineering in the UTM Department, in charge of defining Indra's UTM platform and she has participated actively in the definition and development of several U-space SESAR projects as DOMUS, SAFEDRONES and Bubbles.

##### 4.1.2.2 PJ.34-W3-01 Collaborative U-space-ATM interface Solution Leader

**Sorin Gavrilă (M).** He is graduated in Business Informatics with Master in Airports and Aviation Management and Master in Business Administration. He has worked in Indra ATM department for 10 years, focusing on system engineering with focus in coordination of the activities with the clients, including operational validations, testing and commissioning ATM systems for international clients and risk analysis and mitigation. His technical knowledge include accessibility and human factor aspects, cloud computing, SWIM and cybersecurity. He is member of the Indra UTM team and he is involved in other drones related projects as COMP4DRONES and Bubbles.

##### 4.1.2.3 PJ.34-W3-02 Collaborative ATM U-space Environment Concept Development Solution Leader

**Pablo Sánchez Escalonilla (M):** Technical Manager at CRIDA and an ATM systems research expert. He is Aeronautical Engineer with a degree from the Polytechnic University of Madrid.

With over 20 years of experience in ATM research, he has been involved in a wide range of research topics. He was involved in European ATM R&D projects such as Leonardo, Gate to Gate, SESAR Definition Phase,

Episode 3 and SESAR Development Phase. Within the RPAS field, he has been involved in DEMORPAS and ARIADNA live trials, projects addressing the integration of remotely piloted aircraft systems in non-segregated airspace. He is taking part on the exploratory research and development of U-space services. In particular, he is the project coordinator of IMPETUS consortium, aiming at ensuring commercial feasibility of the U-space Information Management needs. He is also coordinating the line of activity addressing the unmanned traffic management system within the Innovation Plan of the Spanish Ministry of Public Works and Transport (2017-2020).

## 4.2 Third parties involved in the project (including use of third party resources)

### 4.2.1 Linked to INDRA SISTEMAS SA – Company 1

Objective	
Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	N
N/A	
Does the participant envisage that part of its work is performed by linked third parties <sup>5</sup>	Y
<p><b>UPM (Universidad Politécnica de Madrid)</b> is the largest Spanish technological university and one of the largest in Europe, with more than 36.000 students (2.200 in Ph.D. Programs). With two recognized Campus of International Excellence, more than 2,900 researchers carry out their activity at UPM, grouped in 200 Research Groups, 55 Specialized Laboratories, 19 Research Centers and Institutes, all of them committed to transforming the scientific knowledge into advanced innovation and technologies for the industrial and services sector. UPM heads the Spanish Universities' participation in the Horizon 2020 Programme. Moreover, every year, UPM applies for around 40 patents demonstrating a high commitment to innovation. Regarding business creation, UPM has generated about 150 start-ups in the last ten years. With a strong support of the business sector, the University annually signs around 600 contracts with private companies.</p> <p>The Information Processing and Telecommunications Center (IPTC, <a href="http://www.iptc.upm.es">www.iptc.upm.es</a>) is the largest Research Center in UPM, and actually the first one in the UPM quality ranking, and one of the largest and most competitive in Spain and Europe in the field. It brings together the expertise and resources of around 180 researchers (and a number of master and Ph.D. students) working in the fields of Electronics, Communications, Networks, Computing and Software. UPM-IPTC has a sustained record of involvement in numerous competitive projects (around 100 active every year) and an extensive experience of collaboration through contracted research and technology transfer (around 60 active research contracts per year). This center has as one of its focal strategic areas the one of Information Systems for Air Traffic Management, including Surveillance, Traffic Management, Data Fusion, Communications and U-Space, with Research Groups with more than 35 years of experience in these fields providing decisive contributions to operational systems such as <b>Enaire-SACTA</b>, <b>Indra-ManagAir</b> (formerly Aircon), or <b>Eurocontrol-SASS-C</b>, as well as to the prototyping of <b>Indra-AirDrones</b>. They also contributed with NATS and Indra to the validation of <b>iTEC</b> trajectory prediction and MTC systems. The IPTC-UPM team will be led by Juan A. Besada, current member of SESAR2020 Scientific Committee.</p> <p><b>Projects:</b></p>	

<sup>5</sup> 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).



- **UTMOST: Unmanned Traffic Management and Operations Support Technologies.** Short description: Development of simulation and technologies for UAV traffic management in air space, as well as network-enabled cloud-based platforms to support different drone business cases (emergencies, infrastructure monitoring, etc.). Contractor/Funding entity: Ministerio de Economía, Industria y Competitividad (España). Duration: 2018-2020.
- **Development of a UTM Platform (Desarrollo de una Plataforma de “Unmanned Aircraft System (UAS) Traffic Management (UTM))”**  
Short Description: (Cloud-based) architecture design and prototyping of all the functionalities of an U2-U3 level Unmanned Aircraft Traffic Management System. Visualization tools for operation control and support. Contractor/Funding entity: Indra. Duration: 2018-2020.
- **Cloud4Drones.** Short Description: Drone-based video and imagery real-time communications and processing system for a remote controller to survey, detect and recognize infrastructures and anomalies over different installations. Contractor/Funding entity: EIT/European Commission. Duration: 2017-2018.
- **Drones 112.** Short Description: Development of a Drone-based platform for fast response in emergency situations. Contractor/Funding entity: EIT/European Commission. Duration: 2018-2019.
- **Modernization of the surveillance function of the AIRCON system (Modernización de las funciones de vigilancia monosensor del sistema AIRCON).** Short description: development and integration of state-of-the art multitracking algorithms for air space in the pre-existing AIRCON (now ManagAir) system. Contractor/Funding entity: INDRA. Duration: 2017-2019.

#### **Publications:**

- Guillermo Frontera, Ivan Campaña, Ana Bernardos, Juan Besada. Formal Intent-Based Trajectory Description Languages for Quadrotor Aircraft. IEEE Transactions on Aerospace and Electronic Systems. Vol 55, Issue 6 December 2019. Pp. 3330-3346 DOI: 10.1109/TAES.2019.2907396
- Juan A. Besada, Luca Bergesio, Iván Campaña, Diego Vaquero, Jaime López-Araquistain, Ana M. Bernardos, José R. Casar. Drone Mission Definition and Implementation for Automated Infrastructure Inspection using Airborne Sensors. Sensors. Vol. 18, issue 4. April 2018. DOI: 10.3390/s18041170
- Jaime López-Araquistain, Ángel J. Jarama, Juan A. Besada, Gonzalo de Miguel, José R. Casar. A new approach to map-assisted Bayesian tracking filtering. Information Fusion. Vol. 45. January 2019. pp. 79-95. DOI: 10.1016/j.inffus.2018.01.002
- Guillermo Frontera, Juan Besada, Javier López-Leones. Generation of Aircraft Intent based on a Micro-Strategy Search Tree. IEEE Transactions on Intelligent Transportation Systems. Vol: 18 issue 6. June 2017. pps 1405 – 1421. DOI: 10.1109/TITS.2016.2606368
- Ángel J. Jarama, Jaime López-Araquistain, Gonzalo de Miguel, Juan A. Besada. Complete Systematic Error Model of SSR for Sensor Registration in ATC Surveillance Networks. Sensors. Vol: 17 issue 10. September 2017. DOI: 0.3390/s17102171

IPTC-UPM will work alongside with Indra in SESAR 2020 Solution PJ.34-W3-01 and SESAR 2020 Solution PJ.34-W3-02.

Under Solution 01, IPTC-UPM will support Indra in the design and validation of the functional adaptations of both CIS and USSP within cluster 1, specifically for the services associated to: 1) Operation plan processing; and 2) Monitoring and traffic information. As a result, IPTC-UPM will also support Indra in the preparation of Solution PJ.34-W3-01 deliverables: SPR- INTEROP/OSD V2, TS/IRS V2, and VALR V2.

Under Solution PJ.34-W3-02, IPTC-UPM will contribute to activities related to the development of operational and safety requirements, both related to flight plan and to surveillance and tracking, and to associated validation exercises. Therefore, IPTC-UPM will also support Indra in the preparation of Solution PJ.34-W3-02 deliverables (SPR- INTEROP/OSD, Initial Validation report).

Indra Factoría Tecnológica S.L.U. is the unit responsible for providing digital knowledge and technologies across markets, , such as: ATM/UTM, Artificial intelligence. Cybersecurity, Industry 4.0, Geospace.

The Indra Factorías Tecnológicas S.L.U. ATM / UTM Unit are a team of professionals with years of experience working in the Air Traffic market, who know your needs and have the necessary training for the development of critical safety systems. We want to help the market in its technological transformation for the future.

Our objective is to help Indra ATM / UTM in the technological transformation necessary to address and solve problems in the systems of the future. And improve the automation of internal technological processes.

The expertise acquired over the years in the different projects in which we have collaborated, gives us the possibility of having an overall vision. We take advantage of this to identify common problems between the different projects. And therefore seek joint solutions in the future, through the reuse of components.

An example of transformation has been the identification of a common visual component for displaying geographic information, whose representation is quite common in different projects, not only in the ATM / UTM market but also in other markets such as Defense and Transportation.

To reduce the implementation time of the solution or product, we use several strategies. Among them we can find the following:

Use of building blocks with which we reduce costs and project planning times.

Performing prototyping with agile methodology to guide development to what is expected of the product.

Wrapping algorithms with traditional technologies exposing them as microservices.

Use of technologies analyzed and contrasted by the Indra Factoría Tecnológica S.L.U. unit.

The team's experience in different types of projects in the market, which gives them an expertise that speeds up the understanding of needs and development time.

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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N/A

Does the participant envisage that part of the work is performed by International Partners <sup>6</sup> (Article 14a of the General Model Grant Agreement)?	N
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N/A

#### 4.2.2 Linked to AIRBUS – Company 2

##### 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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<sup>6</sup> 'International Partner' is any legal entity established in a non-associated third country which is not eligible for funding under Article 10 of the Rules for Participation Regulation No 1290/2013.



N/A	
Does the participant envisage that part of its work is performed by linked third parties <sup>7</sup>	Y
<p>Yes, Airbus Operations SL, which is a linked third party of Airbus SAS as declared in the Airbus Proposal for Membership Accession (REF. SJU/LC/0122-CFP), will execute most of the technical activities in Airbus' proposed contribution to the project.</p> <p><b>Airbus Operations SL</b></p> <p>Airbus Operations SL (AOSL), headquartered in Getafe (Madrid, Spain), is the Spanish branch of Airbus Commercial Aircraft. AOSL designs and manufactures aerospace products including components and systems for commercial aircraft (for example the horizontal stabilisers for the entire range of Airbus commercial aircraft) and provides aviation-related services.</p> <p>Airbus Operations SL hosts the Airbus UTM team, which is responsible for the design and development of U-space concepts, architectures, service models, prototypes and related digital infrastructure, including collaborative interfaces between ATM and U-space.</p> <p>Airbus Operations SL is the hub of the UTM and U-space expertise across Airbus. The Airbus Operations SL team will execute Airbus' technical contribution to AURA, leveraging capabilities and experience from across different initiatives that Airbus UTM is carrying out globally, such as the following:</p> <ul style="list-style-type: none"> <li>• Airbus UTM is an FAA's certified provider of the LAANC service and provides complementary tools for mission planning, flight briefings and risk assessment.</li> <li>• Airbus UTM is developing a U-space service provider reference implementation, called RUSS, to enable rapid prototyping of digital traffic management concepts. The RUSS also allows for maturation of requirements in pseudo-operational environments, fast experimentation and prototyping of new services and concepts. This capability is already targeting industry demonstrations and other research activities as part of Airbus contribution to NASA Advanced Aerial Mobility National Challenge (where Airbus will demonstrate UAM traffic management services in robust NASA-designed airspace simulations) and to support the definition of UAS BVLOS services in Airbus UTM Lab in Singapore.</li> <li>• Airbus UTM (with other partners) is partnering with DSN to provide authorization services and an interface with ATM for initial U-space services in the Marseille area.</li> </ul> <p>Airbus Operations SL will contribute to the AURA validation exercises with a simulation and experimentation platform for UTM, based on the aforementioned RUSS, that will enable the fast prototyping of U-Space services, interface requirement assessment and architectural concepts experimentation. This platform will include a set of prototype UTM/U-Space services that will be tailored and enhanced to support the validation exercises that need to be carried out during the project.</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
N/A	

<sup>7</sup> 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).

Does the participant envisage that part of the work is performed by International Partners <sup>8</sup> (Article 14a of the General Model Grant Agreement)?	N
N/A	

#### 4.2.3 *Linked to DEUTSCHES ZENTRUM FUER LUFT - UND RAUMFAHRT EV – Company 3*

No third parties involved.

#### 4.2.4 *Linked to STICHTING NATIONAAL LUCHT- EN RUIMTEVAARTLABORATORIUM – Company 4*

No third parties involved.

#### 4.2.5 *Linked to RIZENI LETOVEHO PROVOZU CESKE REPUBLIKY STATNI PODNIK – Company 5*

Objective	
Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	N
N/A	
Does the participant envisage that part of its work is performed by linked third parties <sup>9</sup>	Y
<p>INTEGRA (ANS CR LTP):</p> <p>Integra is a privately owned consultant company with close to 30 years of experience providing consultancy services to the aviation and defence industries. Within aviation, Integra is specialized in the fields of Air Traffic Management (ATM), airports as well as regulatory and oversight functions. Integra has performed more than 500 consultancy projects for aviation organisations such as ANSPs, airports, national authorities and defence organisations in more than 30 different countries on five continents, as well as for a long list of international organisations like NATO, European Commission, EUROCONTROL, ICAO, World Bank and European Bank for Reconstruction and Development. Integra key assets are high profile consultants, many with a background from an ANSP, national authority, EU or other relevant institutions or defence organisations. Based on its experience, INTEGRA will contribute towards Solution PJ.34-W3-Sol.01 &amp; Sol.02 and participate to the following activities:</p> <ul style="list-style-type: none"> <li>• Expert reviews/comments of documents and deliverables</li> <li>• Expert reviews/comments of use cases, Validation plan, Validation exercises, Validation report</li> </ul>	
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

<sup>8</sup> 'International Partner' is any legal entity established in a non-associated third country which is not eligible for funding under Article 10 of the Rules for Participation Regulation No 1290/2013.

<sup>9</sup> 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).

N/A	
Does the participant envisage that part of the work is performed by International Partners <sup>10</sup> (Article 14a of the General Model Grant Agreement)?	N
N/A	

#### 4.2.6 *Linked to VALSTYBES IMONE ORO NAVIGACIJA – Company 6*

No third parties involved.

#### 4.2.7 *Linked to POLSKA AGENCJA ZEGLUGI POWIETRZNEJ – Company 7*

Objective	
Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	N
N/A	
Does the participant envisage that part of its work is performed by linked third parties <sup>11</sup>	Y/N
<p><b>DroneRadar Sp. z o.o.</b> (<a href="http://www.droneradar.eu">www.droneradar.eu</a>) is a fully owned subsidiary of dlapilota.pl Sp. z o.o. established in 2018 to take over from dlapilota.pl the further development of Unmanned Traffic Management and Drone Traffic Management software solutions developed by dlapilota.pl in the past. Dlapilota.pl was established in 2001 dedicated to bringing a professional information website and navigation aids to the polish General Aviation community at a time when those were not existent in Poland. The strategy, concepts and problems of Dlapilota.pl brought with them an incredible insight into the industry. This includes excellent access and relations with the Polish aviation community, it's organizations and the aviation authorities.</p> <p>In 2015, dlapilota.pl established itself firmly in the Unmanned Aerial Vehicle market by launching the DroneRadar Drone Awareness and Management System. DroneRadar DAMS is a non-restrictive, mobile, cloud based system platform that allows the precise registration and monitoring of drone operations via social sourced information. The system was based on simple concepts easily understood by amateurs but at the same time provides sophisticated functionality for Air Traffic Services and for professional users like military and governmental institutions. In 2018 Droneradar Sp. z o.o was formed and continued the development of the Droneradar system in co-operation with the Polish Air Navigation Services Agency. In 2020, PansaUTM, based on Droneradar DAMS concepts and solutions, was launched as the first certified UTM system in the world. Droneradar is actively developing PansaUTM and other software solutions for UAV flight management.</p> <p><b>Projects:</b></p> <ul style="list-style-type: none"> <li>5G!Drones – a H2020 ICT-2018-3 project, grant number 857031. 5G!Drones aim is to trial several UAV use-cases covering eMBB, URLLC, and mMTC 5G services, and to validate 5G KPIs for</li> </ul>	

<sup>10</sup> 'International Partner' is any legal entity established in a non-associated third country which is not eligible for funding under Article 10 of the Rules for Participation Regulation No 1290/2013.

<sup>11</sup> 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).

supporting such challenging use-cases. The project will drive the UAV verticals and 5G networks to a win-win position, on one hand by showing that 5G is able to guarantee UAV vertical KPIs, and on the other hand by demonstrating that 5G can support challenging use-cases that put pressure on network resources, such as low-latency and reliable communication, massive number of connections and high bandwidth requirements, simultaneously.

- ICARUS – a H2020-SESAR-2019-3 project awarded to the consortium in January 2020. ICARUS project proposes an innovative solution to the challenge of the Common Altitude Reference inside VLL airspaces with the definition of a new U-space service and its validation in a real operational environment.

#### **Publications:**

- Definition and development of PansaUTM, Poland's national UTM system which is operational since 2018 and certified in 2020.
- Development of Droneradar mobile application integrated with PansaUTM services.
- Definition and development of DTM software for airspace management entities.

DroneRadar Sp. z o.o. will work alongside with PANSA (B4) in SESAR 2020 Solution PJ.34-W3-01 and SESAR 2020 Solution PJ.34-W3-02.

Under Solution 01, DroneRadar Sp. z o.o. will deliver Controller Drone Data Link Communication (CDDL) which will be developed and validated as a means for 2-way non-verbal communication and its encapsulation within standalone module for CIS. CDDL will allow SWIM communication between ATC and drone pilots, through various CIS and USSP. DroneRadar Sp. z o.o. will support also PANSA (B4) in works on Solution 01 deliverables: SPR- INTEROP/OSED V2, TS/IRS V2, VALP V2 and VALR V2.

Under Solution 02, DroneRadar Sp. z o.o. will contribute to activities related to:

- Use-cases and high-level concept definition,
- U-space and ATM Services and environmental description,
- operational requirements for new U-space-ATM Collaborative Concept definition,
- definition of architecture enabling deployment of new U-space-ATM Collaborative Concept assessment of this new concept.

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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N/A

Does the participant envisage that part of the work is performed by International Partners <sup>12</sup> (Article 14a of the General Model Grant Agreement)?	Y/N
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N/A

#### **4.2.8 Linked to AUSTRO CONTROL OSTERREICHISCHE GESELLSCHAFT FÜR ZIVILLUFTFAHRT MBH – Company 8**

No third parties involved.

#### **4.2.9 Linked to LUFTFARTSVERKET – Company 9**

No third parties involved.

<sup>12</sup> 'International Partner' is any legal entity established in a non-associated third country which is not eligible for funding under Article 10 of the Rules for Participation Regulation No 1290/2013.

#### 4.2.10 *Linked to DFS DEUTSCHE FLUGSICHERUNG GMBH – Company 10*

No third parties involved.

#### 4.2.11 *Linked to DIRECTION DES SERVICES DE LA NAVIGATION AERIENNE – Company 11*

Objective	
Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	Y
<p>DSNA has in house expert engineers with the ability to develop new concepts and define specifications for new UTM/ATM/SWIM tools. But, in order to fulfil its prospective studies, DSNA needs additional expertise. Subcontracted activities will encompass the support and expertise in the domain of UTM and SWIM.</p> <p>DSNA subcontracts allow DSNA/DTI to buy these necessary required studies/services. These subcontracts are a framework for placing specific purchase orders and have been attributed in accordance to the French “Code des Marchés Public”</p>	
Does the participant envisage that part of its work is performed by linked third parties <sup>13</sup>	N
No	
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
No	
Does the participant envisage that part of the work is performed by International Partners <sup>14</sup> (Article 14a of the General Model Grant Agreement)?	N
No	

#### 4.2.12 *Linked to ENAIRE – Company 12*

Objective	
Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	N
N/A	
Does the participant envisage that part of its work is performed by linked third parties <sup>15</sup>	Y
INECO:	

<sup>13</sup> 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).

<sup>14</sup> ‘International Partner’ is any legal entity established in a non-associated third country which is not eligible for funding under Article 10 of the Rules for Participation Regulation No 1290/2013.

<sup>15</sup> 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).

### A short description of Ineco

Ineco is a Spanish consultancy and engineering firm highly specialised in the transport industry, since its creation in 1968. Enaire owns a 45,85% stake in Ineco's shares. Ineco has participated in all SESAR (SESAR, SESAR 2020 W1 and SESAR 2020 W2) as Enaire's LTP with a total budget of circa 6,5 M€ and contribution to more than 30 projects. Ineco, as an engineering and consultant firm to the Spanish Ministry of Transport group, have taken part in the planning, design, implementation, set up and maintenance of Spain's main transport infrastructures. We offer comprehensive high quality solutions for every stage of project development, from the initial planning to full operation and maintenance.

Ineco's commitment responds to nowadays transportation challenges with compromise, efficiency and cutting-edge technology. The company is included in the lists of consultants of the African Development Bank, the World Bank, Inter-American Development Bank, European Union.

It is also certified ISO-9001 Quality Management System and ISO-14001 Environmental Management System, as a means of guiding the company towards improved performance.

Ineco's staff comprises more than 3,000 employees, with circa 700 railway and GNSS experts. Regarding the economic results, in 2019 the company's annual turnover exceeded 300 million €.

The firm's activities embrace all forms of transport and cover all RTD stages, from feasibility studies to work supervision and control, including facility and infrastructure maintenance. As an engineering firm, it covers many specialty areas such as architecture, civil, industrial, telecommunications, aeronautical and systems engineering.

As a consultancy company, Ineco carries out feasibility analyses, economic and financial, market, logistics and operation studies and formulates privatization, franchise and comprehensive transport plans.

Ineco has been the main consulting firm for the transport organizations in Spain (Enaire, Aena, Adif, RENFE, Ministry of Transport, etc.), where it has gathered a vast experience supporting project management, reengineering processes, implementation of management processes, and supporting change management.

Ineco has accumulated a great deal of experience in planning global and intermodal transport systems, which include railway, airports, air navigation, highways and shipping.

Over the last few years, the Company's international activities have progressively widened their scope throughout developing countries in Europe, Americas and the Middle East. Our international experience covers now over 60 countries worldwide, including Kuwait, Saudi Arabia, Oman, Egypt, Morocco, Algeria, Italy, Cape Verde, Panama, Jamaica and Mexico among others.

Since its inception, Ineco has become known for the expertise of its staff and quality of its work. The implementation of an ISO 9001 Standard Quality System in 1995, followed by ISO 9001:2000, certified by AENOR, the Spanish Standardization Association, and the particular attention the firm pays to its staff's training are evidence that quality is an on-going concern at Ineco.

Furthermore, Ineco is accredited by ENAC ("Entidad Nacional de Acreditación") company Inspection for Independent Safety Assessment of Rail Transportation in accordance with the criteria listed in the UNE-EN ISO / IEC 17020:2004.

During the last years Ineco has been participating in national projects of UAVs/RPAs This includes the National Plan for UAVs coordination on behalf of the Ministry of Transport, Mobility and Urban Agenda.

In the international field Ineco has become a regular collaborator in SESAR and SESAR 2020, specifically in the RPAS/Drone filed. It led TERRA (SESAR 2020 ER2) where the CNS infrastructure for allowing the VLL RPAS Traffic Control was assessed and participated to IMPETUS SESAR 2020 ER2), where new services to enable the RPAS operation were specified and tested. Ineco was also part of the Advisory Board of CORUS, the SESAR 2020 ER” in charge of developing the CONOPS for the VLL RPAS traffic control.

More recently, Ineco has participated to DOMUS, one of the European demonstrations of U1/U2 U-Space services. The demonstration was led by Enaire, and Ineco integrated the RPAS control system in our Smart City platform (Cityneco) allowing to test drone operation in urban areas. A first integration with general aviation was also demonstrated with ATC intervention.

Ineco also participates to SESAR 2020 (and previously to SESAR) in the Industrial Research Programme with presence in more than 20 projects since 2009.

Ineco has had an important presence also in other European R&D Programs since FP7, with participation in projects devoted specifically to the Air, rail and GNSS sectors, such as GRAIL-2 (INECO led the project), TRIOTRAIN, STANDARDS, Capacity4Rail or NGTC.

More recently, Ineco has participated to In2Rail (H2020), VITE (Shift2Rail Open Calls), STARS (H2020), OPTIMA (S2R OCs), ERSAT GGC (H2020-GSA) and Gate4Rail (Shift2Rail OCs), ACCEPTA (H2020/GSA, led by Ineco), FILGAPP (H2020/GSA, led by Ineco), TITAN (FP6), INTERACTION (FP7).

#### Relevant previous projects or activities connected to the subject of this proposal

TERRA - Technological European Research for RPAS in ATM (H2020-SESAR-2016-1: RPAS-04 - Ground-based technology). GA: 763831. 2017-2020. Role of Ineco: Coordinator.

TERRA Project addresses the research topic H2020-SESAR-2016-1 RPAS04: Ground-based technology, focusing on the performance requirements associated with the UTM concept, and identifying the technologies (existing and new) which could meet these requirements. TERRA proposes a technical architecture to support VLL RPAS operations, which are assumed to encompass interaction with VFR traffic.

The main project objectives are the following:

- Requirements identification: A set of operational and functional ground-based system requirements will be defined for three representative RPAS operational business cases, considering operator requirements but also potential impacts on stakeholders.
- Technological applicability: Analysis of applicability of existing CNS/ATM technologies which could be applied to UTM, identification and development of new technologies (e.g. machine learning classification of flight trajectories) and analysis of their applicability, considering in both cases the performance provided by these technologies with the requirements imposed upon their use.



- Architecture proposal and proof of concept: Identification of the most appropriate technologies, comparing their performance and applicability with the user requirements and definition of a technical architecture, which will be evaluated by means of a proof of concept demonstration.

To achieve these objectives, the Consortium consists of a range of companies bringing complementary expertise (research, operational, industrial) covering all the elements of ground-based technologies for UTM; additionally, an Advisory Board of stakeholders and developers has been formed to assist the consortium on the requirements identification and proposals validation. Finally, a proof of concept demonstration of the proposed architecture will be conducted, leveraging existing simulation platforms previously developed by members of the consortium. TERRA aims to safely facilitate up to 1 million VLL RPAS flights by 2025.

IMPETUS- Information Management Portal to Enable the inTegration of Unmanned Systems (H2020-SESAR-2016-1: RPAS-02 - Drone information management). GA 763807. 2017-2020. Role of Ineco: Project Partner.

IMPETUS researched on the application of the ‘micro-services’ paradigm as a flexible and cost efficient solution for lifecycle support of the expected high variety of drones and missions. Moreover, IMPETUS will explore how to design an Smart UTM Concept taking into consideration the ‘Function as a Service’ paradigm to develop a cloud-based server-less environment that will be characterized by its scalability to respond to multiple users with diverse business models, its mechanisms to assure the data quality and integrity, and its flexibility to facilitate the integration with manned traffic management systems.

IMPETUS consortium consists of key stakeholders that provide complementary views on the current and envisioned UTM and ATM information management processes. ALTITUDE ANGEL offers its current UTM capabilities to support recreational and commercial drone operations under VLS and its experience in previous engineering tests for B-VLS and autonomous tests. JEPPESEN, with the technological support of TU DARMSTADT, contributes with its expertise in Information Technology Services to ensure the quality of aeronautical safety-critical data. BOEING offers its expertise to analyse if SWIM standards can be used as the main bridge to exchange UTM and ATM information. INECO strengthens the consortium as certified company in the commercial use of drones for bridges inspection services and with its expertise on innovative Smart solutions based on IT technologies (Big Data and Business Intelligence among others). This experience is shared with CRIDA, which is the reference research centre in integration and analysis of multiple aeronautical data sources through advanced data analytics in order to support decision-making at ENAIRE, Air Navigation Service Provider in Spain. Finally, C-ASTRAL provides a wide view and extensive market experience for diverse drone related business models, with applications in surveying, border protection or surveillance operations among others.

DOMUS- DEMONSTRATION OF MULTIPLE U-SPACE SUPPLIERS (CEF 2018). GA SJU/LC/341-CTR. 2018-2020. Role of Ineco: Project Partner.

DOMUS Aims to illustrate the full set of core U2 services, as well the demonstration of specific U3 services, such as tactical de-confliction and collaboration with ATM. The demonstration involved three U-space service providers interacting with an ecosystem manager and several drone operators that will fly drones from different manufacturers. The planned operations took place in Andalucía in Spain during 2019.

CORUS- Concept of Operations for EuRopean UTM Systems (H2020-SESAR-2016-1: RPAS-01 - SESAR UTM Concept Definition) GA 763551. 2017-2019. Role of Ineco: Advisory Board member

The drone business sector is growing rapidly, but in Europe today is held back by the absence of a harmonized approach for the integration of drones into Very Low Level (VLL) airspace. The CORUS (Concept of Operation for European UTM Systems) project gathers experts from aviation (manned and drone), research and academia to develop a reference Concept of Operations (CONOPS) for UTM (UAS Traffic Management) in VLL airspace in Europe.

Building on the state-of-the-art, CORUS developed an operational concept enabling safe interaction between all airspace users in VLL considering contingencies and societal issues. The broad acceptance of the CORUS CONOPS is paramount. To this end CORUS established a “UTM community Network” drawing on a wide range of stakeholders, to guide and review the development through a series of workshops. A subset of the “UTM community Network” formed an Advisory Board to review draft documents and answer questions. Through these bodies coordination with other ongoing research and rulemaking initiatives from the European Commission, EUROCAE, EASA, JARUS and NASA’s UTM research project was ensured, as well as the regular interaction with the Work Area 2 projects of the same Call.

#### The main role and tasks allocated to Ineco in PJ34

Ineco will bring into the project its wide operational experience, specifically in previous U-space projects. Its main contributions will be focused in the concept definition, drafting operational and functional requirements (OSD/SPR), to guide the development of the architecture, and Human Factors evaluations. Ineco will also participate to Validations (in Solution 1 specifically in Cluster 1, led by INDRA, and supporting Enaire), proposing use cases and evaluating the interaction among CIS, USSPs and ATM.

#### **CRIDA:**

##### A short description of CRIDA

CRIDA (Centro de Referencia de Investigación, Desarrollo e Innovación ATM, A.I.E.) is a not-for-profit Research Entity established by ENAIRE (the Spanish ATM and Airport Services provider), the Technical University of Madrid "Universidad Politécnica de Madrid – UPM” and INECO.

CRIDA’s mission is to improve the efficiency and performance of the Spanish Air Traffic Management (ATM) system through the development of ideas and projects that provide quantifiable solutions based on system performance indicators, considering the Spanish system as an integral part of a global networked system. To achieve this goal CRIDA must analyse quantitative and systematically the benefits from the system, diagnose problems and identify their causes, propose and design innovative solution alternatives, identify and validate the best alternatives, and collaborate actively in the process of implementation of the selected solution. The analysis of the system is done in direct collaboration with ENAIRE (Spanish Air Navigation Service Provider), as its main partner, contributing to ENAIRE’s mission of providing air navigation services safely, efficiently and with the adequate levels of quality respect for the environment.

CRIDA is strongly focused on performing R&D+I; its partners and shareholders (ENAIRE, INECO and UPM) are tasked with the commercial exploitation of CRIDA’s results. This dichotomy allows CRIDA to focus on the pursuit of knowledge whilst maintaining a strong connection with real world problems.

CRIDA has identified as a research priority the development of operational concepts and supporting tool prototypes that enhance and make more efficient the operation of the air navigation system. As part of this priority, CRIDA research addresses how to improve planning and how to increase the automation of the system (aiming to increase the productivity of its actors). The research performed by CRIDA includes its participation in leading research and implementation programmes such as SESAR, in particular related to Human Factors research for ATM. The most recent of which is AUTOPACE, which dealt with the analysis of the effects of high autonomy on human factors.

The second strategic line of R&D in CRIDA consists in the study and validation of R&D+i solutions assessing their operational impact and quantifying the economic benefits derived from either or both the ATM system's performance improvements and/or the cost reduction associated with its implementation. To do this, CRIDA researches and develops innovative validation techniques and methodologies to respond to the needs of its partners, including a simulation laboratory that allows performing high-fidelity real-time simulations of future ATM environments

This strategic line ensures that the evaluation of new solutions is based on the same principles and methods as the system performance measurements to facilitate comparative analyses. It also offers the possibility of carrying out evaluations at both conceptual (based on the conceptual definition of the solution and without the need for any development) as pre-industrialization (based on prototypes) levels. Most of the activities performed in this area are included in the SESAR programme. In particular, CRIDA actively contributed in SESAR Exploratory Research and Demonstration projects related to the development of U-space, such as IMPETUS, TERRA, SAFEDRONE, DOMUS and DACUS. In addition, CRIDA is leading the strategic line included in the "National Innovation Plan for Transport and Infrastructures (2017-2020)" addressing the development of an unmanned traffic management platform to support drones' operations in Spain.

#### Relevant previous projects or activities connected to the subject of this proposal

***IMPETUS:*** The aim of IMPETUS is to ensure commercial feasibility of the U-space Information Management needs of drone operations in Very Low-Level airspace. IMPETUS will propose technologically and commercially feasible solutions for the delivery of information services to drone operators and other users. CRIDA leads an international consortium integrated by INECO, TU Darmstadt, Altitude Angel, Boeing, Jeppesen and C-Astral. IMPETUS is one of the first batch of SESAR U-space projects undertaking the development of U-space services and contributing to the safe integration of drones in all classes of airspace in Europe.

IMPETUS analyses the information management needs of drone operations in very low-level (VLL) airspace. The project also proposes technologically and commercially feasible solutions to address those needs.

The solution developed in IMPETUS builds upon existing Traffic Management information systems addressing key issues such as data quality assurance, data integration needs with the Air Traffic Management (ATM) systems and scalability of the drone information services to multiple users with diverse business models.

The IMPETUS approach is based on the analysis and identification of the needs of the future drone operators and service providers in order to define a conceptual model of drone information micro-services as well as a cloud-based architecture which will give answer to the identified needs.

This conceptual model and its selected architecture constitute the IMPETUS Solution fulfilling the requirements in terms of scalability, safety, efficiency and cost-effectiveness of the drone operations.

The technical and commercial feasibility of this solution will be demonstrated by means of laboratory-based experimental tests using a prototype of the IMPETUS Solution containing the required functionality to allow the integration of a set of micro-services which jointly provide enough evidence of the fulfilment of project's objectives.

AUTOPACE: SESAR Exploratory Research Project led by CRIDA to support a better understanding on how human cognition and ATC system live together in high automation environments. Human-automation interaction in highly automated environments presents serious performance drawbacks due to the risk of the “out of the loop” effect (OOTL) especially in case of automation fail or “fears of automation” when the ATCO is afraid of a system failure. Unforeseen operational conditions and malfunction of automation could lead to disorientation and panic behaviour. AUTOPACE researched on future ATCO Competences and new Training Strategies to mitigate those performance drawbacks supported by (a) the research of an ATCO psychological model to characterise the automation effects on ATCO cognitive system and its functioning and (b) a preliminary safety assessment of potential hazards for training strategies refinement.

TERRA: TERRA Project is focused on identifying ground-based technologies and the associated architecture required to support very low-level (VLL) drone operations. Accordingly, interaction with VFR aviation is within scope, but the analysed operations will take place mostly where there is little or no air traffic control (ATC), although certain coordination with these services will be needed.

The project baseline will be reaching U-space initial services (U2) including communications and navigation support to complex drone operations, flight planning, flight approval, tracking, airspace dynamic information, and procedural interfaces with air traffic control. However, the project will also consider some elements of U-space advanced services (U3) including assistance for conflict detection, taking into account a scenario with both autonomous UAS and RPAS operations; the proposed architecture will take advantage of Vehicle to Interface (V2I) Communications.

#### The main role and tasks allocated to CRIDA in PJ34

CRIDA will contribute in solution PJ34-W3-01 and PJ34-W3-02. Within solution 01, CRIDA will participate in the 3 activities than comprise the solution providing its expertise in previous ER U-Space projects to identify and define SWIM U-Space information exchange requirements with particular attention to the interface with ATM. Also, CRIDA will provide technical support to the validation activities committed within this solution.

In solution PJ34-W2-02, CRIDA will participate and lead in the development of U-Space-ATM Collaborative ConOps, with a particular focus on ensuring the safe, simultaneous operation of drones and manned aviation in the new environment.

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
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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 SESAR1 and in SESAR 2020 Wave 1 and Wave 2 activities and the results have become optimal in terms of efficiency and mutual collaboration.

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.

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 16,900 € (direct costs) for the work developed on ENAIRE’s premises (since there is no specific place in Annex 2 to indicate these costs).	
Does the participant envisage that part of the work is performed by International Partners <sup>16</sup> (Article 14a of the General Model Grant Agreement)?	N
N/A	

#### 4.2.13 Linked to ENAV SPA – Company 13

Objective	
Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	N
N	
Does the participant envisage that part of its work is performed by linked third parties <sup>17</sup>	Y
<p>ENAV contribution in the project is complemented by the following LTPs: D-Flight, Techno Sky S.r.L, NAIS</p> <p><b>Techno Sky</b> Techno Sky S.r.l. (Techno Sky) is an ENAV Group Company having the responsibility for the management and maintenance of systems and equipment used for Air Navigation Services in Italy as well as for the support to the ATM operational innovation and for all the relevant ENAV Group R&amp;D activities.</p> <p>As Enav’s mission critical systems integrator, Techno Sky controls the full value chain, i.e. Research and Development, System Engineering, Design, ATM Software Development, Weather System Development, Verification, Validation, Installation, Integration, Training, Logistics and Maintenance. In 2017 Techno Sky extended its background of knowledge and expertise on R&amp;D following the transfer of competences and experts coming from SICTA, the former ATM R&amp;D branch of ENAV Group.</p> <p>The acquisition of ATM R&amp;D experts is showing the Techno Sky constant commitment and focus on technological innovation, as a key factor for its continuous improvement and increased competitiveness on the market.</p> <p>In addition, by investing in the study and implementation of new and more effective products and applications, Techno Sky acts significantly within the value chain of the ENAV Group and contributes to the efficiency, regularity and safety of Air Traffic Management operations.</p>	

<sup>16</sup> ‘International Partner’ is any legal entity established in a non-associated third country which is not eligible for funding under Article 10 of the Rules for Participation Regulation No 1290/2013.

<sup>17</sup> 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).



Special care is devoted to the study of innovative systems to be used in the Company's core business. These studies and surveys are intended to improve innovative operational services supported by several simulators, platforms, tools and advanced methodologies.

Techno Sky, working in close cooperation with ENAV, has also gained an outstanding expertise in the development of innovative Air Traffic Management operations, in the development and validation of new concepts and procedures for the continuous improvement of performances, in assisting the supply industry to design and engineer new systems to safely support the Air Traffic Controllers in their highly demanding tasks.

Techno Sky, as ENAV Linked Third Party, is involved in ENAV ATM strategic planning, technical co-operation and service provision programs with international organizations (e.g. SESAR Joint Undertaking, SESAR Deployment Manager, EUROCONTROL, European Commission, etc.) and foreign countries, aiming at contributing to the advancement of ATM technology and processes and at improving all the linked services.

Techno Sky participation is quite significant from an ENAV perspective considering it brings an important piece of transversal technical, operational and management expertise.

Moreover, Techno Sky is currently extensively contributing to SESAR 2020 Programme as ENAV LTP by complementing ENAV activities and expertise in 14 W1 projects and 9 W2 projects including Industrial Research, Transversal activities and Very Large Demonstrations.

Based on the considerations and skills depicted above, ENAV and Techno Sky, as part of the ENAV Group, can be considered as a single entity.

Techno Sky will support and complement ENAV work in this Project with its technical and R&D expertise, specifically contributing to:

Solution 1, for the identification and definition of the use-cases and their Information Exchange Requirements;

Solution 2, for ATM/U-space architectural aspects definition/refinement.

### **D-Flight**

Established in February 2019, D-flight, the Italian Public Private Partnership constituted by ENAV, Leonardo and Telespazio for the development and deployment of U-space services. Through D-Flight, ENAV aims to bring together traditional air traffic with the specific needs of a new type of air traffic, allowing the use of drones for a growing number of services, while guaranteeing maximum safety standards at the same time. D-Flight staff includes operational and technical skills and expertise in UAS Traffic Management and ATM.

D-Flight already deployed services in Italy to support an initial Italian U-space implementation. Primary goal of D-Flight platform is to bridge authorities and operators to enable safe and secure drone operations into the airspace. D-Flight already developed U-space solutions that allow spacing among all drone operations in strategic manner (i.e. planning and strategic deconfliction) and monitoring of compliance of drone operation with authorized volume (tracking and monitoring). D-Flight platform is available on the market as a product that can be customized or ready to further developments to meet relevant and specific regulations or innovation.

Within this context, D-Flight will work with ENAV in Solutions 1 and 2.

In Solution 1, D-Flight will participate in the analysis of background work on interoperability and data exchanges from relevant SESAR U-space projects, and will contribute to the identification and definition of use-cases and SWIM U-Space functional and non-functional requirements and interface between ATM and UTM. Additionally, D-Flight will make available its pre-operational baseline for SWIM industrial partners and validation customisation in the frame of "Cluster 4" validation activities.

In Solution 2, D-Flight will support ENAV in ATM-U-space architectural aspects definition/refinement, use-cases elaboration and high-level definition of the concept, U-space and ATM Services and environment definition, requirements development.

## NAIS

Established at the end of 2006, NEXTANT Applications & Innovative Solutions (NAIS) is an Italian, private- owned, ICT Company, classified as SME according to the European Commission classification (2003/361/EC).The company's mission is to develop and propose, to the proper market sectors, innovative applications and services based on ICT technologies and Satellite Navigation, EO & Communication assets.

NAIS' main expertise in the Space & Defence market domains plays a strategic role in the development of innovative application based on ICT and enabling satellite technologies. NAIS executes the whole Technology Transfer Process from R&D Projects to product industrialization and commercialization

NAIS is based in Rome, and its HQ hosts the following facilities: R&D centre, 2° level Helpdesk, Customer support team, product & service provisioning team. Its Quality System is certified ISO 9001:2008. It operates in the following business segments: Space & Defence, Transport/Maritime, Information & Communication Technology, Aeronautical.

Innovative applications and services are available in the field of Smart-mobility (solution for both citizens and tourists, transportation support and information), Emergency (mission management and resource planning), Cultural Heritage (safeguard, fruition and prevention), Maritime (search & rescue, mission management and access to harbour and docks), Defence (air defence systems radar), and Aeronautics (Air Traffic Management systems, conventional and unconventional 2D & 3D operational displays, flight information systems and portable flight displays for VFR General Aviation aircraft), all based on Satellite technologies (Navigation (EGNOS/GALILEO), Communication, and Earth Observation), innovative HMI techniques based on Virtual and Augmented Reality techniques and Engineering / architectural aspects.

In addition, NAIS is already significantly participating in SESAR 2020 Programme as ENAV LTP and is supporting with its technical and management expertise the ENAV work in 5 W1 and 4 W2 Industrial Research projects with special focus on validation activities and KPA assessment. NAIS has also experience in U-space domain and successfully participated with ENAV in the DIODE Demonstration Project – “D-flight Internet Of Drones Environment”.

In the context of this project, NAIS, as ENAV LTP, will participate in Solutions 1 and 2 by supporting ENAV in the performance assessment related to human factor, environment, safety and [cyber-]security.

Any potential impact, brought by the implementation of the concept addressed by the solution, the introduction of new tools to allow the data exchange between ATM and UTM systems and the presentation of any relevant information to the ATCOs through a dedicated HMI will be evaluated in accordance with SESAR methodologies in order to provide qualitative and quantitative results for each of considered Key Performance Area. NAIS will also support the preparation and the execution of the validation exercise and the production of any relevant deliverables such as the Validation Plan and Validation Report.

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

N/A



Does the participant envisage that part of the work is performed by International Partners <sup>18</sup> (Article 14a of the General Model Grant Agreement)?	Y/N
N/A	

#### 4.2.14 *Linked to EUROCONTROL - EUROPEAN ORGANISATION FOR THE SAFETY OF AIR NAVIGATION – Company 14*

No third parties involved.

#### 4.2.15 *Linked to FREQUENTIS AG – Company 15*

Objective	
Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	Y
Robot Experts is planned to contribute with consultancy services, providing international expertise and experience regarding operational use cases and drone operations to support specification of information exchange services.	
Does the participant envisage that part of its work is performed by linked third parties <sup>19</sup>	Y
The affiliates / linked 3 <sup>rd</sup> parties to Frequentis AG, the Frequentis Romania S.R.L, Frequentis Comsoft GmbH and Frequentis Solutions s.r.o are contributing to this action.	
All Frequentis affiliates are integrated into the research and development process of Frequentis AG, hence its contribution is to be seen as a joint activity.	
<b>Frequentis Romania S.R.L.</b> is an affiliate of Frequentis AG and is specialised on software development, providing support for the mother company in the safety-critical domains of air traffic control, public safety, public transport and maritime. The company has contributed to SESAR projects in WP12 as well as in the AIM environment and will continue its contribution in the scope of related activities in SESAR 2020	
<b>Frequentis Comsoft GmbH</b> is an affiliate of Frequentis AG, supporting its mother company in the safety critical domains of air traffic control. The focus of Comsoft's contribution will be on the development and provision of certain modules required for the validation of integrated surface management.	
<b>Frequentis Solutions s.r.o.</b> (Slovakia) has a focus on complex integration projects combining multiple applications for the support of users in the safety critical environment. The linked third party will contribute with specialized expertise for integration tasks in the future communication context.	
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

<sup>18</sup> 'International Partner' is any legal entity established in a non-associated third country which is not eligible for funding under Article 10 of the Rules for Participation Regulation No 1290/2013.

<sup>19</sup> 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).

N/A
Does the participant envisage that part of the work is performed by International Partners (Article 14a of the General Model Grant Agreement)? N
N/A

**4.2.16 Linked to HUNGAROCONTROL MAGYAR LEGIFORGALMISZOLGALAT ZARTKORUEN MUKODO RESZVENYTARSASAG – Company 16**

Objective
Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted) N
N/A
Does the participant envisage that part of its work is performed by linked third parties <sup>20</sup> N
N/A
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
N/A
Does the participant envisage that part of the work is performed by International Partners <sup>21</sup> (Article 14a of the General Model Grant Agreement)? N
N/A

**4.2.17 Linked to HONEYWELL AEROSPACE – Company 17**

Objective
Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted) N
N/A
Does the participant envisage that part of its work is performed by linked third parties <sup>22</sup> Y

<sup>20</sup> 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).

<sup>21</sup> 'International Partner' is any legal entity established in a non-associated third country which is not eligible for funding under Article 10 of the Rules for Participation Regulation No 1290/2013.

<sup>22</sup> 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 project AURA we will contribute via the Honeywell Aerospace SAS site located in Toulouse (France), together with its Linked Third Party Honeywell International, s.r.o., with sites in Prague and Brno (Czech Republic). These facilities are equipped with state of the art research and test laboratories enabling research, development, integration, verification and validation of various aircraft systems.	
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
N/A	
Does the participant envisage that part of the work is performed by International Partners <sup>23</sup> (Article 14a of the General Model Grant Agreement)?	N
N/A	

#### 4.2.18 Linked to LEONARDO - SOCIETA PER AZIONI – Company 18

Objective	
Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	N
N/A	
Does the participant envisage that part of its work is performed by linked third parties <sup>24</sup>	Y
<p>For the PJ34-W3 AURA “ATM U-Space Interface”, Leonardo plans to involve the following partners as LTPs:</p> <ul style="list-style-type: none"> <li>• Leonardo Germany GmbH</li> <li>• Telespazio SpA</li> <li>• Egeos SpA</li> </ul> <p><b>Leonardo Germany GmbH:</b></p> <p>Formerly known as Selex ES GmbH or Gematronik Weather Radar Systems, is a German engineering company and is one of the top companies in the meteorological market.</p> <p>LEONARDO Germany GmbH is a 100% affiliated company of LEONARDO SPA. It is one of the leading companies in the meteorological market.</p> <p>In PJ34-W3-01 “Collaborative U-space ATM interface” (namely Solution 1), LEONARDO Germany will work on SWIM-based MET Information Exchange concerning the linking together of ATM and U-Space.</p> <p>In terms of concept, work will be based on three pillars, namely the evaluation of the reusability of already defined ATM MET Services, possible new MET services tailored to U-Space requirements and the investigation of opportunities to collect MET information in U-Space that might be valuable to ATM.</p>	

<sup>23</sup> ‘International Partner’ is any legal entity established in a non-associated third country which is not eligible for funding under Article 10 of the Rules for Participation Regulation No 1290/2013.

<sup>24</sup> 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 terms of validation, LEONARDO Germany GmbH will support cluster 4 with the provision of selected MET services.

More than 50 years of experience, reliability and a professional approach to challenges have contributed to the company's excellent reputation among experts in meteorology, the aviation sector and other related fields.

Worldwide, LEONARDO Germany GmbH has the leading position in the design, manufacturing and installation of weather radar systems and holistic adverse weather monitoring solutions for aviation applications comprising of radar, lidar and ground based wind shear systems (LLWAS).

Up to now, more than 500 systems have been successfully put into operation in 75 different countries all over the world.

Today, LEONARDO Germany GmbH focuses on providing customized systems, turn-key solutions for aviation applications and integrated information systems while at the same time being sensitive to individual customer needs.

### **Telespazio SpA:**

Telespazio, a joint venture between Leonardo (67%) and Thales (33%), is one of Europe's leaders and one of the world's main players in satellite solutions and services. The company has its headquarters in Rome, Italy, and is supported by a staff of approximately 2500 people.

Telespazio operates worldwide through numerous companies, and has a wide international network of space centres and teleports.

In particular, it is present: in France with Telespazio France; in Germany with Telespazio VEGA Deutschland, GAF and Spaceopal (a joint venture in which the German space agency DLR holds a 50% interest); in the United Kingdom with Telespazio VEGA UK; in Spain with Telespazio Iberica and in Romania with Rartel. Telespazio has a consolidated presence in South America with Telespazio Brasil and Telespazio Argentina. In Italy, the company is also present through e-GEOS (in which the Italian Space Agency holds a 20% interest).

Telespazio is a leading company in "key" sectors for public institutions, business operators and consumers, with activities ranging from the design and development of space systems to the management of launch services and in orbit satellite control; from Earth observation services, integrated communication, satellite navigation and localisation, to scientific programmes.

Telespazio relies 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, one of the world's largest civilian teleports - as well as from its qualified involvement in space programmes of great significance, including: Galileo, EGNOS, Copernicus, COSMO-SkyMed, SICRAL and Göktürk.

The company now covers the whole space market value chain through its three lines of business: Satellite Communications, Geo Information, Satellite Systems and Operations.

Telespazio responds to new demands in the market with innovative ideas and solutions. Today, more than ever, Telespazio is a true innovator, transforming what were once just possibilities into real services available to an increasingly wide audience worldwide.

In PJ34-W3 AURA "ATM U-Space Interface And Higher Airspace Operations", Telespazio will participate in the following Solutions:

- PJ34-W3-01 "Collaborative U-space ATM interface" (namely Solution 1)", as Leonardo LTP
- PJ.34-W3-02 "Collaborative ATM U-Space Environment Concept Development" (namely Solution 2), together with EGEOS SpA as Leonardo LTPs.

In the framework of Solution 2, Telespazio SpA, as LTP of Leonardo, will lead the activities of WP3.3 "Safety, Performance and Interoperability requirements". Telespazio will put its skills in the design, planning and supply of services, applicable to different domains, in order to define the operational,

safety, performance and interoperability requirements associated with the SESAR solution, with particular attention to the services enabled by the use of GNSS High precision and integrity, for dynamic geofencing and the development of DAA functions and the management of satellite and mobile communication for a seamless transition from VLOS to BVLOS, and safe operations in BVLOS.

### **eGEOS SpA:**

e-GEOS, an ASI (20%) / Telespazio (80%) company, is a leading international player in the Earth Observation and Geo-Spatial Information business.

e-GEOS is the global distributor for the COSMO-SkyMed data, the largest and most advanced Radar Satellite constellation available today.

e-GEOS offers a unique portfolio of application services, specially thanks to the superior monitoring capabilities of COSMO-SkyMed constellation. It has acquired a leading position within European Copernicus Program.

Covering the whole value chain, from data acquisition to the generation of analytics reports, e-GEOS, thanks to proprietary assets and algorithms, integrates data from all satellites with the IoT information gathered over different sources, creating a BigData lake where all the e-GEOS platforms are able to extract significant indicators dedicated to different markets.

This approach is one of the key assets of the new services and products offered by the company and it can be run both on premises and on cloud.

Through the AWARE platform is possible to access the e-GEOS interferometric measurements (thousands of measures over single sqKm) for, ground subsidence and landslides analysis, thematic mapping for city management, agronomy/ precision farming, cultural heritage, Inherent Defect Insurance (IDI) and forestry.

e-GEOS, provides Geo-information services such as monitoring for environmental protection, rush mapping in support to natural and man-made disaster (mapcy), specialized platform for defense and intelligence (braint), Near-Real-Time oil spill and vessel detection services for maritime surveillance platforms (SEonSE), precision agriculture services (agriGEO) for agro-insurance and farmers market segments.

CLEOS (CLOUD Earth Observation Services) is an e-GEOS platform for the provision of cloud-based geoinformation services. Currently, CLEOS services are focused on the access and exploitation of SAR and optical EO data, centralizing the access to a variety of missions and datasets. The User has also access to a number of information products (as an example DEM, land cover layers, ...) and processing services to fully exploit the potential of EO data.

In short, CLEOS users are enabled to:

- Search and retrieve multi-mission EO data, both commercial and open.
- Search and retrieve information products, both commercial and open.
- Trigger some predefined processing services using the data available on the platform and retrieve the results of the processing.
- Build new processing services on the platform, using building blocks and basic functionalities available on the developer's portal.

The AI Factory is a Virtual Lab and a development platform focused on the AI themes.

The AI Factory allows:

- centralized management of the AI Models lifecycle, including versioning and updates.
- centralized Training Dataset catalogue and build engine, flexible to manage different AI engines
- to publish AI Models as webservices, for being exploited in different context (e.g. Application Platforms, cartographic production, ...)

e-GEOS runs a multi-purpose 24h Emergency mapping Centre that is able to work in rush mode, supporting the customers with challenging ServiceLevel Agreement. Today this services is well used by both institutional and civilian customers: from the emergency mapping center, in which European Copernicus Program (EMS) represents one of the main success cases, to the IMINT reports for defence and intelligence in which Copernicus SEA (The Copernicus services in Support to EU External Action) is the latest example.

In support to its operational applications and activities, the Matera Space Centre represents a unique and advanced premise for acquisition, archiving and processing multi-mission satellite data, including COSMO-SkyMed, ESA Sentinels, Radarsat-2 and the new micro-satellite missions ICEYE and BLACKSKY missions.

The e-GEOS Space Center hosts the Matera User Ground Station (MUGS) for the European Data Relay System (EDRS). This innovative Ground Station is designed to receive process and distribute streams of data for the EDRS space segments, which will serve the EU's Earth Observation Programme Copernicus, supporting agriculture, urban area management, civil and nature protection.

The Matera Space Centre has been operational since 1994. It is located next to the Space Geodesy Centre of the Italian Space Agency (ASI), opened in 1983. Since 2009, the centre has been owned by e-GEOS. The Space Centre is dedicated to Earth observation activities and also provides operational services for the Space Geodesy Centre.

The Matera Space Centre acquires, processes, stores and distributes remotely-sensed data from the main Earth observation satellites, and also produces images, products and services in near real time for maritime surveillance.

In particular, the Centre contributes to the design, integration and testing of the Civil User Ground Segment (C-UGS) data of the Italian radar satellite constellation COSMO-SkyMed. It has provided operation and maintenance services since the launch of the first satellite in 2007.

Since 2012, the Matera Space Centre has been one of the four stations of the Core Ground Segment of the European Space Agency (ESA) to receive and process in real-time radar and optical data acquired by Copernicus (the European Earth observation programme) Sentinel satellites.

In PJ34-W3 AURA "ATM U-Space Interface", Egeos SpA will participate in the following Solution:

PJ.34-W3-02 "Collaborative ATM U-Space Environment Concept Development" (namely Solution 2), as Leonardo LTP.

In the framework of Solution 2, e-GEOS, as LTP of Leonardo, will focus its activities for WP3.3 "Safety, Performance and Interoperability requirements" on the geospatial contents and constraints impacting the requirements, leveraging on its experience on integrated solutions based on SDK and/or open source platforms dedicated to the ATM/ATC and UTM world exploiting its skill in providing technological solutions, as 3D Simulation Ready DataBase to enable obstacle management and identification, Aerodrome Mapping DataBase, Electronic Terrain and Obstacle DataBase.

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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N/A

Does the participant envisage that part of the work is performed by International Partners <sup>25</sup> (Article 14a of the General Model Grant Agreement)?	Y/N
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N/A

<sup>25</sup> 'International Partner' is any legal entity established in a non-associated third country which is not eligible for funding under Article 10 of the Rules for Participation Regulation No 1290/2013.



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#### 4.2.19 *Linked to SINTEF AS – Company 19*

No third parties involved.

#### 4.2.20 *Linked to NATS (EN ROUTE) PUBLIC LIMITED COMPANY – Company 20*

No third parties involved.

#### 4.2.21 *Linked to THALES LAS FRANCE SAS – Company 21*

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 Sys (Thales LAS France SAS) has a general policy to outsource a limited proportion of some of its non-critical activities. In accordance with this policy, Thales Air Sys intends to subcontract part of its work in certain non-core activities of this project, typically related to technical specifications, low-level software design &amp; coding, integration or verification tasks.</p> <p>Thales Air Sys 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 <sup>26</sup>	N
N/A	
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
N/A	
Does the participant envisage that part of the work is performed by International Partners <sup>27</sup> (Article 14a of the General Model Grant Agreement)?	N
N/A	

#### 4.2.22 *Linked to THALES AVS FRANCE SAS – Company 22*

No third parties involved.

<sup>26</sup> 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).

<sup>27</sup> 'International Partner' is any legal entity established in a non-associated third country which is not eligible for funding under Article 10 of the Rules for Participation Regulation No 1290/2013.



**4.2.23** *Linked to LETOVE PREVADZKOVE SLUZBY SLOVENSKEJ REPUBLIKY, STATNY PODNIK – Company 23*

N/A

**4.2.24** *Linked to CROATIA CONTROL, CROATIAN AIR NAVIGATION SERVICES LTD – Company 24*

N/A

**4.2.25** *Linked to UDARAS EITLIOCHTA NA HEIREANN THE IRISH AVIATION AUTHORITY – Company 25*

N/A

**4.2.26** *Linked to NAVIAIR – Company 26*

N/A

**4.2.27** *Linked to ATOS BELGIUM – Company 27*

N/A

**4.2.28** *Linked to AIRTEL ATN LIMITED – Company 28*

N/A

**4.2.29** *Linked to SAAB AKTIEBOLAG – Company 29*

N/A

## **5 Ethics and Security**

### **5.1 Ethics**

All participants of the AURA 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 WP05 will ensure compliance with ethics. This means that WP05 will verify that all documents from the AURA project are following European ethical rules and the ethical rules of the concerned country.

During project Kick-off Meeting, WP05 will conduct an information session in order to draw attention to, and inform partners of all relevant 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 about the potential ethical issues and handling relating to research activities in the AURA project.

#### **5.1.1 Humans**

In the project experimental studies will be conducted to gain knowledge about human-machine interaction. For these experimental studies healthy adults (no diseased adults), like Pilots or Air Traffic Controllers, will be recruited on a voluntary basis. Participants of these studies will be clearly informed of the research goals, the methodology of data protection and possible adverse events in a presentation of the research project and in interviews at the beginning of the study. According to the declaration of Helsinki, subjects are free to leave any test at any time without giving any reason and without raising any disadvantages – the project thereby complies with standard protocols surrounding a participant having the right to withdraw from the study. This will be ensured by a written agreement between the experimenter and the test subject (see questionnaire below).

## Participant Agreement Form SESAR 2020 Validation/Demonstration activities

**Full title of project/solution:**

**Full title of validation/demonstration activity and dates:**

**Name and contact details of project/solution leader:**

**Please Initial  
or  
Tick Here**

I am aware of the main aspects of the Validation/Demonstration Plan for the above SESAR 2020 activity.	
I confirm that I have had the opportunity to ask questions.	
I understand that my participation is voluntary.	
I understand that my answers to any questionnaire related to human factors aspects (evaluation of workload, situational awareness, human machine interface usability...) will remain anonymous.	
Should I not wish to answer any particular question(s), I am free to decline.	
I give permission for members of the research team to have access to my anonymised responses. I understand that my name will not be linked with the research materials, and I will not be identified or identifiable in the outputs that result from the research without my agreement.	
I agree to take part in the above validation/demonstration activity.	

\_\_\_\_\_  
Name of Participant                      Date                      Signature

\_\_\_\_\_  
Name of Project/Solution Leader                      Date                      Signature

*This form should be signed and dated by all parties after the participant receives a copy of the participant information sheet and any other written information provided to the participants. A copy of the signed and dated participant agreement form should be kept with the project's main documents which must be kept in a secure location.*

Section: Humans		YES	NO	Information to be provided	Documents to be provided
<b>Does your research involve human participants?</b>		X		Confirmation about obtained Informed consent of the participants.	
<b>If YES:</b>	Are they volunteers for social or human sciences research?		X	Participants are not volunteers from the public but Project/Members' employees	
	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.	
<b>Does your research also involve physical interventions on the study participants?</b>			X		

### 5.1.2 Protection of Personal Data

In advance and during the study 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. Furthermore, a strategy and methodology based on the Data Protection Directive will be developed and implemented to ensure the integrity and security of data during the project. During the recruitment of subjects for the study, some necessary personal information relevant to the study (e.g. experience of work, age, gender) will be stored electronically in computers on a hard drive. This data will not be stored in a cloud solution or portable hard drives or USB sticks. This data will be password protected and only accessible to authorised researchers.

During the study performance only necessary data will be acquired and stored electronically. This data will be password protected and only accessible to authorised researchers. All data will be stored in a strict anonymous way. Subjects are allocated a unique subject number instead of their first- or surname. The subject number will be assigned randomly at the beginning of the study. This procedure ensures that it will not be possible to somehow associate the data to individual persons. Thus, the data will not be used to judge or assess the professional capabilities of the recruited subjects. The data is purely a means to investigate general cognitive processes.

Section: Protection of Personal Data		YES	NO	Information to be provided	Documents to be provided
<b>Does your research involve personal data collection and/or processing?</b>		X			Free and fully Informed consent sheets (see section 2) of the persons concerned (data subjects) will be obtained

Section: Protection of Personal Data	YES	NO	Information to be provided	Documents to be provided
<b>If YES:</b> 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		
<b>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)?</b>		X		

### 5.1.3 Misuse

The AURA project is part of the SESAR 2020 Programme and as such will be supervised by the SESAR Joint Undertaking 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 possible 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 intend 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 intend to handle it.

## 5.2 Security

Section: Security	YES	NO	Information to be provided	Documents to be provided
<b>Are activities planned or results expected raising security issues?</b>		X		
<b>Are 'EU-classified information' as background or results foreseen?</b>		X		

## 6 Abbreviations

AFUA	Advance Flexible Use of Airspace
AI	Artificial Intelligence
ANSP	Air Navigation Service Provider
ATCO	Air Traffic COntroller
ATM	Air Traffic Management
AURA	ATM U-space InteRfAce
CIS	Common Information Service
DAC	Dynamic Airspace Configuration
EC	European Commission
EOC	Essential Operational Changes
EPMB	Extended Project Management Board
EU	European Union
GAT	General Air Traffic
H2020	HORIZON 2020 (research and innovation programme of the EU, 2014-2020)
IP	Internet Protocol
IR	Industrial Research project
PCIL	Project Content Integration Lead
PCIT	Project Content Integration Team
PEG	Programme Execution Guidance
PJ00-W3	Project No. 00 described in [2] corresponds to the Topic of the call
PJ00-W3-01	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
RTS	Real Time Simulation
SJU	SESAR Joint Undertaking
SL	Solution Leader
SPD	Single Programming Document
STM	Space Traffic Management
SWIM	System Wide Information Management
TA	Transversal Action
TBO	Trajectory Based Operations
UAM	Urban Air Mobility
UAS	Unmanned Aerial System
USSP	U-Space Service Provider
UTM	Unmanned Traffic Management
VLD	Very Large Demonstration
VLL	Very Low Level
WAN	Wide Area Network
WP	Work Package

ESTIMATED BUDGET FOR THE ACTION

	Estimated eligible <sup>1</sup> costs (per budget category)										JU 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 <sup>2</sup>	Total costs	Reimbursement rate %	Maximum JU contribution <sup>3</sup>	Maximum grant amount <sup>4</sup>	Information for indirect costs	Information for auditors	Other information:
	A.1 Employees (or equivalent)		A.4 SME owners without salary				D.1 Travel		D.5 Costs of internally invoiced goods and services					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 JU funding/ international partners
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												
Form of costs <sup>6</sup>	Actual	Unit <sup>7</sup>	Unit <sup>8</sup>		Actual	Actual	Actual	Unit <sup>9</sup>	Flat-rate <sup>10</sup>							
									25%							
	a	Total b	No hours	Total c	d	[e]	f	Total g	h = 0,25 x (a +b+c+f+g +[i1] <sup>13</sup> + [i2] <sup>13</sup> -n)	j = a+b+c+d +[e]/+f+g+h +[i1]/+[i2]	k	l	m	n	Yes/No	
1. INDRA	1 112 403.12	0.00	0.00	0.00	0.00	0.00	147 399.68	0.00	314 950.70	1 574 753.50	70.00	1 102 327.45	1 102 327.45	0.00	No	n/a
- UPM	280 012.80	0.00	0.00	0.00	0.00	0.00	7 987.20	0.00	72 000.00	360 000.00	70.00	252 000.00	252 000.00	0.00	No	n/a
- Indra FT	391 219.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	97 804.80	489 024.00	70.00	342 316.80	342 316.80	0.00	No	n/a
Total beneficiary	1 783 635.12	0.00			0.00	0.00	155 386.88	0.00	484 755.50	2 423 777.50		1 696 644.25	1 696 644.25	n/a	n/a	0.00
2. AIRBUS	36 000.00	0.00	0.00	0.00	0.00	0.00	2 950.00	0.00	9 737.50	48 687.50	70.00	34 081.25	34 081.25	0.00	No	n/a
- AOSL	648 500.00	0.00	0.00	0.00	0.00	0.00	9 200.00	0.00	164 425.00	822 125.00	70.00	575 487.50	575 487.50	0.00	No	n/a
Total beneficiary	684 500.00	0.00			0.00	0.00	12 150.00	0.00	174 162.50	870 812.50		609 568.75	609 568.75	n/a	n/a	0.00
3. DLR	277 200.00	0.00	0.00	0.00	0.00	0.00	8 000.00	0.00	71 300.00	356 500.00	70.00	249 550.00	249 550.00	0.00	No	n/a
4. NLR	181 247.00	0.00	0.00	0.00	0.00	0.00	18 750.00	27 980.00	56 994.25	284 971.25	70.00	199 479.88	199 479.88	0.00	No	n/a
5. ANS CR (B4)	60 000.00	0.00	0.00	0.00	0.00	0.00	15 000.00	0.00	18 750.00	93 750.00	70.00	65 625.00	65 625.00	0.00	No	n/a
- Integra	69 120.00	0.00	0.00	0.00	0.00	0.00	4 000.00	0.00	18 280.00	91 400.00	70.00	63 980.00	63 980.00	0.00	No	n/a
Total beneficiary	129 120.00	0.00	0.00	0.00	0.00	0.00	19 000.00	0.00	37 030.00	185 150.00		129 605.00	129 605.00	n/a	n/a	0.00
6. ON (B4)	42 000.00	0.00	0.00	0.00	0.00	0.00	5 500.00	0.00	11 875.00	59 375.00	70.00	41 562.50	41 562.50	0.00	No	n/a
7. PANSA (B4)	71 300.00	0.00	0.00	0.00	0.00	0.00	5 571.43	0.00	19 217.86	96 089.29	70.00	67 262.50	67 262.50	0.00	No	n/a
- DRR	158 100.00	0.00	0.00	0.00	0.00	0.00	5 570.00	0.00	40 917.50	204 587.50	70.00	143 211.25	143 211.25	0.00	No	n/a
Total beneficiary	229 400.00	0.00			0.00	0.00	11 141.43	0.00	60 135.36	300 676.79		210 473.75	210 473.75	n/a	n/a	0.00
8. ACG/ COOPANS	59 996.00	0.00	0.00	0.00	0.00	0.00	7 597.00	0.00	16 898.25	84 491.25	70.00	59 143.88	59 143.88	0.00	No	n/a
9. LFV/COOPANS	175 200.00	0.00	0.00	0.00	0.00	0.00	23 345.00	0.00	49 636.25	248 181.25	70.00	173 726.88	173 726.88	0.00	No	n/a
10. DFS	140 894.00	0.00	0.00	0.00	0.00	0.00	7 500.00	0.00	37 098.50	185 492.50	70.00	129 844.75	129 844.75	0.00	No	n/a
11. DSNA	245 440.00	0.00	0.00	0.00	133 333.00	0.00	0.00	0.00	61 360.00	440 133.00	70.00	308 093.10	308 093.10	0.00	No	n/a
12. ENAIRE	37 940.00	0.00	0.00	0.00	0.00	0.00	3 000.00	0.00	10 235.00	51 175.00	70.00	35 822.50	35 822.50	0.00	No	n/a
- CRIDA	249 600.00	0.00	0.00	0.00	0.00	0.00	17 472.00	0.00	66 768.00	333 840.00	70.00	233 688.00	233 688.00	0.00	No	n/a
- INECO	150 300.00	0.00	0.00	0.00	0.00	0.00	7 000.00	0.00	39 325.00	196 625.00	70.00	137 637.50	137 637.50	0.00	No	n/a
Total beneficiary	437 840.00	0.00			0.00	0.00	27 472.00	0.00	116 328.00	581 640.00		407 148.00	407 148.00	n/a	n/a	0.00
13. ENAV	111 758.00	0.00	0.00	0.00	0.00	0.00	11 000.00	0.00	30 689.50	153 447.50	70.00	107 413.25	107 413.25	0.00	No	n/a
- D-FLIGHT	110 000.00	0.00	0.00	0.00	0.00	0.00	10 000.00	0.00	30 000.00	150 000.00	70.00	105 000.00	105 000.00	0.00	No	n/a
- NAIS	66 000.00	0.00	0.00	0.00	0.00	0.00	6 000.00	0.00	18 000.00	90 000.00	70.00	63 000.00	63 000.00	0.00	No	n/a
- TECHNO SKY	18 000.00	0.00	0.00	0.00	0.00	0.00	2 000.00	0.00	5 000.00	25 000.00	70.00	17 500.00	17 500.00	0.00	No	n/a
Total beneficiary	305 758.00	0.00	0.00	0.00	0.00	0.00	29 000.00	0.00	83 689.50	418 447.50		292 913.25	292 913.25	n/a	n/a	0.00
14. EUROCONTROL <sup>14</sup>	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	268 451.25
15. FRQ (FSP)	207 606.55	0.00	0.00	0.00	20 000.00	0.00	27 300.00	0.00	58 726.64	313 633.19	70.00	219 543.23	219 543.23	0.00	No	n/a
- FRQ RO	67 858.87	0.00	0.00	0.00	0.00	0.00	0.00	0.00	16 964.72	84 823.59	70.00	59 376.51	59 376.51	0.00	No	n/a



ESTIMATED BUDGET FOR THE ACTION

	Estimated eligible <sup>1</sup> costs (per budget category)										JU contribution			Additional information		
	A. Direct personnel costs				B. Direct costs of subcontracting	<i>[C. Direct costs of fin. support]</i>	D. Other direct costs		E. Indirect costs <sup>2</sup>	Total costs	Reimbursement rate %	Maximum JU contribution <sup>3</sup>	Maximum grant amount <sup>4</sup>	Information for indirect costs	Information for auditors	Other information:
	A.1 Employees (or equivalent)		A.4 SME owners without salary				D.1 Travel	D.5 Costs of internally invoiced goods and services						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 JU funding/ international partners
Form of costs <sup>6</sup>	Actual	Unit <sup>7</sup>	Unit <sup>8</sup>		Actual	Actual	Actual	Unit <sup>9</sup>	Flat-rate <sup>10</sup>							
	a	Total b	No hours	Total c	d	<i>[e]</i>	f	Total g	$h = 0,25 \times (a + b + c + f + g + [i1]^{13} + [i2]^{13} - n)$	$j = a + b + c + d + [e] + f + g + h + [i1] + [i2]$	k	l	m	n	Yes/No	
- FCO	67 858.87	0.00	0.00	0.00	0.00	0.00	0.00	0.00	16 964.72	84 823.59	70.00	59 376.51	59 376.51	0.00	No	n/a
- FSO	135 717.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	33 929.44	169 647.19	70.00	118 753.03	118 753.03	0.00	No	n/a
Total beneficiary	479 042.04	0.00			20 000.00	0.00	27 300.00	0.00	126 585.52	652 927.56		457 049.28	457 049.28	n/a	n/a	0.00
16. HC (FSP)	187 428.00	0.00	0.00	0.00	0.00	0.00	14 000.00	0.00	50 357.00	251 785.00	70.00	176 249.50	176 249.50	0.00	No	n/a
17. HONEYWELL SAS	31 721.63	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7 930.41	39 652.04	70.00	27 756.43	27 756.43	0.00	No	n/a
- HIsro	0.00	441 918.37	0.00	0.00	0.00	0.00	27 012.54	0.00	117 232.73	586 163.64	70.00	410 314.55	410 314.55	0.00	No	n/a
Total beneficiary	31 721.63	441 918.37	0.00	0.00	0.00	0.00	27 012.54	0.00	125 163.14	625 815.68		438 070.98	438 070.98	n/a	n/a	0.00
18. LEONARDO	346 000.00	0.00	0.00	0.00	0.00	0.00	20 000.00	0.00	91 500.00	457 500.00	70.00	320 250.00	320 250.00	0.00	No	n/a
- LDO GMBH	324 000.00	0.00	0.00	0.00	0.00	0.00	19 000.00	0.00	85 750.00	428 750.00	70.00	300 125.00	300 125.00	0.00	No	n/a
- E-GEOS	108 564.00	0.00	0.00	0.00	0.00	0.00	10 000.00	0.00	29 641.00	148 205.00	70.00	103 743.50	103 743.50	0.00	No	n/a
- TPZ	295 565.00	0.00	0.00	0.00	0.00	0.00	27 000.00	0.00	80 641.25	403 206.25	70.00	282 244.38	282 244.38	0.00	No	n/a
Total beneficiary	1 074 129.00	0.00			0.00	0.00	76 000.00	0.00	287 532.25	1 437 661.25		1 006 362.88	1 006 362.88	n/a	n/a	0.00
19. SINTEF	0.00	241 425.00	0.00	0.00	0.00	0.00	30 000.00	0.00	67 856.25	339 281.25	70.00	237 496.88	237 496.88	0.00	No	n/a
20. NATS	82 040.00	0.00	0.00	0.00	0.00	0.00	9 960.00	0.00	23 000.00	115 000.00	70.00	80 500.00	80 500.00	0.00	No	n/a
21. THALES AIR SYS	850 184.00	0.00	0.00	0.00	120 000.00	0.00	36 424.00	0.00	221 652.00	1 228 260.00	70.00	859 782.00	859 782.00	0.00	No	n/a
22. THALES AVS	234 276.00	0.00	0.00	0.00	0.00	0.00	11 500.00	0.00	61 444.00	307 220.00	70.00	215 054.00	215 054.00	0.00	No	n/a
23. LPS SR (B4) <sup>14</sup>	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.00
24. CCL/ COOPANS <sup>14</sup>	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.00
25. IAA/ COOPANS <sup>14</sup>	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.00
26. NAVIAIR/ COOPANS <sup>14</sup>	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.00
27. ATOS (FSP) <sup>14</sup>	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.00
28. AIRTEL <sup>14</sup>	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.00
29. SAAB <sup>14</sup>	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.00
Total consortium	7 631 050.79	683 343.37		0.00	273 333.00	0.00	557 038.85	27 980.00	2 224 853.27	11 397 599.28		7 978 319.51	7 978 319.51			268 451.25

<sup>1</sup> See Article 6 for the eligibility conditions.

<sup>2</sup> Indirect costs already covered by an operating grant (received under any EU or Euratom funding programme; see Article 6.5.(b)) are ineligible under the GA. Therefore, a beneficiary/linked third party 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, unless it can demonstrate that the operating grant does not cover any costs of the action (see Article 6.2.E).

<sup>3</sup> This is the theoretical amount of JU 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 JU decided to grant for the action) (see Article 5.1).

<sup>4</sup> The 'maximum grant amount' is the maximum grant amount decided by the JU. It normally corresponds to the requested grant, but may be lower.

<sup>5</sup> 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.

<sup>6</sup> See Article 5 for the forms of costs.

ESTIMATED BUDGET FOR THE ACTION

<sup>7</sup> Unit : hours worked on the action; costs per unit (hourly rate) : calculated according to the beneficiary's usual accounting practice.

<sup>8</sup> See Annex 2a 'Additional information on the estimated budget' for the details (costs per hour (hourly rate)).

<sup>9</sup> Unit and costs per unit : calculated according to the beneficiary's usual accounting practices.

<sup>10</sup> 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).

<sup>11</sup> See Annex 2a 'Additional information on the estimated budget' for the details (units, costs per unit).

<sup>12</sup> See Annex 2a 'Additional information on the estimated budget' for the details (units, costs per unit, estimated number of units, etc).

<sup>13</sup> Only specific unit costs that do not include indirect costs.

<sup>14</sup> See Article 9 for beneficiaries not receiving JU funding.

<sup>15</sup> Only for linked third parties that receive JU funding.

## ANNEX 2a

### ADDITIONAL INFORMATION ON THE ESTIMATED BUDGET

- Instructions and footnotes in blue will not appear in the text generated by the IT system (since they are internal instructions only).
- For options [in square brackets]: the applicable option will be chosen by the IT system. Options not chosen will automatically not appear.
- For fields in [grey in square brackets] (even if they are part of an option as specified in the previous item): IT system will enter the appropriate data.

**⚠ Transitory period:** Until SyGMA fully supports Annex 2a, you must prepare it manually (using this template by choosing and deleting the options/entering the appropriate data).  
For the 'unit cost tables': either fill them out manually or use currently existing tables from Annex 1 or the proposal.  
The document can then be uploaded in SyGMA and attached to the grant agreement.

#### Unit cost for SME owners/natural beneficiaries without salary

##### **1. Costs for a [SME owner]/[beneficiary that is a natural person] not receiving a salary**

Units: hours worked on the action

Amount per unit ('hourly rate'): calculated according to the following formula:

{the monthly living allowance for researchers in MSCA-IF actions / 143 hours}  
multiplied by  
{country-specific correction coefficient of the country where the beneficiary is established}

The monthly living allowance and the country-specific correction coefficients are set out in the Work Programme (section 3 MSCA) in force at the time of the call:

- for calls *before* Work Programme 2018-2020:
  - for the monthly living allowance: **EUR 4 650**
  - for the country-specific correction coefficients: see Work Programme 2014-2015 and Work Programme 2016-2017 (available on the [Participant Portal Reference Documents](#) page)
- for calls *under* Work Programme 2018-2020:
  - for the monthly living allowance: **EUR 4 880**
  - for the country-specific correction coefficients: see Work Programme 2018-2020 (available on the [Participant Portal Reference Documents](#) page)

**[additional OPTION for beneficiaries/linked third parties that have opted to use the unit cost (in the proposal/with an amendment):** For the following beneficiaries/linked third parties, the amounts per unit (hourly rate) are fixed as follows:

- beneficiary/linked third party [short name]: EUR [insert amount]
  - beneficiary/linked third party [short name]: EUR [insert amount]
- [same for other beneficiaries/linked third parties, if necessary] ]

Estimated number of units: see Annex 2

## **Energy efficiency measures unit cost**

### **2. Costs for energy efficiency measures in buildings**

Unit: m<sup>2</sup> of eligible ‘conditioned’ (i.e. built or refurbished) floor area

Amount per unit\*: see (for each beneficiary/linked third party and BEST table) the ‘unit cost table’ attached

\* Amount calculated as follows:  
{EUR 0.1 x estimated total kWh saved per m<sup>2</sup> per year x 10}

Estimated number of units: see (for each beneficiary/linked third party and BEST table) the ‘unit cost table’ attached

Unit cost table (energy efficiency measures unit cost)<sup>1</sup>

Short name beneficiary/linked third party	BEST No	Amount per unit	Estimated No of units	Total unit cost (cost per unit x estimated no of units)

---

<sup>1</sup> Data from the ‘building energy specification table (BEST)’ that is part of the proposal and Annex 1.

## **Research infrastructure unit cost**

### **3. Access costs for providing trans-national access to research infrastructure**

Units<sup>2</sup>: see (for each access provider and installation) the ‘unit cost table’ attached

Amount per unit<sup>\*</sup>: see (for each access provider and installation) the ‘unit cost table’ attached

\* Amount calculated as follows:

$$\frac{\text{average annual total access cost to the installation (over past two years}^3\text{)}}{\text{average annual total quantity of access to the installation (over past two years}^4\text{)}}$$

Estimated number of units: see (for each access provider and installation) the ‘unit cost table’ attached

Unit cost table (access to research infrastructure unit cost)<sup>5</sup>

Short name access provider	Short name infrastru cture	Installation		Unit of access	Amount per unit	Estimated No of units	Total unit cost (cost per unit x estimated no of units)
		No	Short name				

## **Clinical studies unit cost**

### **4. Costs for clinical studies**

Units: patients/subjects that participate in the clinical study

Amount per unit<sup>\*</sup>: see (for each sequence (if any), clinical study and beneficiary/linked third party) the ‘unit cost table’ attached

\* Amount calculated, for the cost components of each task, as follows:

For **personnel costs**:

For personnel costs of doctors: ‘average hourly cost for doctors’, i.e.:

{certified or auditable total personnel costs for doctors for year N-1

{ 1720 \* number of full-time-equivalent for doctors for year N-1 }

multiplied by

estimated number of hours to be worked by doctors for the task (per participant)}

For personnel costs of other medical personnel: ‘average hourly cost for other medical personnel’, i.e.:

{certified or auditable total personnel costs for other medical personnel for year N-1

{ 1720 \* number of full-time-equivalent for other medical personnel for year N-1 }

<sup>2</sup> Unit of access (e.g. beam hours, weeks of access, sample analysis) fixed by the access provider in proposal.

<sup>3</sup> In exceptional and duly justified cases, the Commission/Agency may agree to a different reference period.

<sup>4</sup> In exceptional and duly justified cases, the Commission/Agency may agree to a different reference period.

<sup>5</sup> Data from the ‘table on estimated costs/quantity of access to be provided’ that is part of the proposal and Annex 1.

**H2020 Templates: Annex 2a (Additional information on the estimated budget)**

multiplied by  
estimated number of hours to be worked by other medical personnel for the task (per participant))

For personnel costs of technical personnel: 'average hourly cost for technical personnel', i.e.:

$$\frac{\{\text{certified or auditable total personnel costs for technical personnel for year N-1}\}}{\{1720 * \text{number of full-time-equivalent for technical personnel for year N-1}\}}$$

multiplied by  
estimated number of hours to be worked by technical personnel for the task (per participant))

'total personnel costs' means actual salaries + actual social security contributions + actual taxes and other costs included in the remuneration, provided they arise from national law or the employment contract/equivalent appointing act

For **consumables**:

For each cost item: 'average price of the consumable', i.e.:

$$\frac{\{\{\text{certified or auditable total costs of purchase of the consumable in year N-1}\}}{\text{total number of items purchased in year N-1}\}}$$

multiplied by  
estimated number of items to be used for the task (per participant))

'total costs of purchase of the consumable' means total value of the supply contracts (including related duties, taxes and charges such as non-deductible VAT) concluded by the beneficiary for the consumable delivered in year N-1, provided the contracts were awarded according to the principle of best value- for-money and without any conflict of interests

For **medical equipment**:

For each cost item: 'average cost of depreciation and directly related services per unit of use', i.e.:

$$\frac{\{\{\text{certified or auditable total depreciation costs in year N-1} + \text{certified or auditable total costs of purchase of services in year N-1 for the category of equipment concerned}\}}{\text{total capacity in year N-1}}$$

multiplied by  
estimated number of units of use of the equipment for the task (per participant))

'total depreciation costs' means total depreciation allowances as recorded in the beneficiary's accounts of year N-1 for the category of equipment concerned, provided the equipment was purchased according to the principle of best value for money and without any conflict of interests + total costs of renting or leasing contracts (including related duties, taxes and charges such as non-deductible VAT) in year N-1 for the category of equipment concerned, provided they do not exceed the depreciation costs of similar equipment and do not include finance fees

For **services**:

For each cost item: 'average cost of the service per study participant', i.e.:

$$\frac{\{\text{certified or auditable total costs of purchase of the service in year N-1}\}}{\text{total number of patients or subjects included in the clinical studies for which the service was delivered in year N-1}\}}$$

'total costs of purchase of the service' means total value of the contracts concluded by the beneficiary (including related duties, taxes and charges such as non-deductible VAT) for the specific service delivered in year N-1 for the conduct of clinical studies, provided the contracts were awarded according to the principle of best value for money and without any conflict of interests

For **indirect costs**:

$$\{\{\{\text{cost component 'personnel costs'} + \text{cost component 'consumables'} + \text{cost component 'medical equipment'}\}\}$$

minus

$$\{\text{costs of in-kind contributions provided by third parties which are not used on the beneficiary's premises} + \text{costs of providing financial support to third parties (if any)}\}$$

multiplied by

$$25\%$$

**H2020 Templates: Annex 2a (Additional information on the estimated budget)**

The estimation of the resources to be used must be done on the basis of the study protocol and must be the same for all beneficiaries/linked third parties/third parties involved.

The year N-1 to be used is the last closed financial year at the time of submission of the grant application.

Estimated number of units: see (for each clinical study and beneficiary/linked third party) the 'unit cost table' attached

Unit cost table: clinical studies unit cost<sup>6</sup>

Task, Direct cost categories	Resource per patient	Costs year N-1 Beneficiary 1 [short name]	Costs year N-1 Linked third party 1a [short name]	Costs year N-1 Beneficiary 2 [short name]	Costs year N-1 Linked third party 2a [short name]	Costs year N-1 Third party giving in-kind contributions 1 [short name]
<b>Sequence No. 1</b>						
<b>Task No. 1</b> Blood sample						
(a) <b>Personnel costs:</b> - Doctors	n/a					
- Other Medical Personnel	Phlebotomy (nurse), 10 minutes	8,33 EUR	11,59 EUR	10,30 EUR	11,00 EUR	9,49 EUR
- Technical Personnel	Sample Processing (lab technician), 15 minutes	9,51 EUR	15,68 EUR	14,60 EUR	15,23 EUR	10,78 EUR
(b) <b>Costs of consumables:</b>	Syringe	XX EUR	XX EUR	XX EUR	XX EUR	XX EUR
	Cannula	XX EUR	XX EUR	XX EUR	XX EUR	XX EUR
	Blood container	XX EUR	XX EUR	XX EUR	XX EUR	XX EUR
(c) <b>Costs of medical equipment:</b>	Use of -80° deep freezer, 60 days	XX EUR	XX EUR	XX EUR	XX EUR	XX EUR
	Use of centrifuge, 15 minutes	XX EUR	XX EUR	XX EUR	XX EUR	XX EUR
(d) <b>Costs of services</b>	Cleaning of XXX	XX EUR	XX EUR	XX EUR	XX EUR	XX EUR
(e) <b>Indirect costs (25% flat-rate)</b>		XX EUR	XX EUR	XX EUR	XX EUR	XX EUR
<b>Task No. 2</b>						
...						
<b>Amount per unit (unit cost sequence 1):</b>		XX EUR	XX EUR	XX EUR	XX EUR	XX EUR
<b>Sequence No. 2</b>						
<b>Task No. 1</b>						

<sup>6</sup> Same table as in proposal and Annex 1.



H2020 Templates: Annex 2a (Additional information on the estimated budget)

XXX						
(a) <b>Personnel costs:</b>						
- Doctors	XXX	XX EUR	XX EUR	XX EUR	XX EUR	XX EUR
- Other Medical Personnel	XXX	XX EUR	XX EUR	XX EUR	XX EUR	XX EUR
- Technical Personnel	XXX	XX EUR	XX EUR	XX EUR	XX EUR	XX EUR
(b) <b>Costs of consumables:</b>	XXX	XX EUR	XX EUR	XX EUR	XX EUR	XX EUR
	XXX	XX EUR	XX EUR	XX EUR	XX EUR	XX EUR
	XXX	XX EUR	XX EUR	XX EUR	XX EUR	XX EUR
(c) <b>Costs of medical equipment:</b>	XXX	XX EUR	XX EUR	XX EUR	XX EUR	XX EUR
	XXX	XX EUR	XX EUR	XX EUR	XX EUR	XX EUR
(d) <b>Costs of services</b>	XXX	XX EUR	XX EUR	XX EUR	XX EUR	XX EUR
(e) <b>Indirect costs</b> (25% flat-rate)		XX EUR	XX EUR	XX EUR	XX EUR	XX EUR
<b>Task No. 2</b>						
...						
<b>Amount per unit (unit cost sequence 2):</b>		XX EUR	XX EUR	XX EUR	XX EUR	XX EUR
...						
<b>Amount per unit (unit cost entire study):</b>		XX EUR	XX EUR	XX EUR	XX EUR	XX EUR

## ANNEX 3

### ACCESSION FORM FOR BENEFICIARIES

**AIRBUS (AIRBUS)**, established in 2 ROND POINT EMILE DEWOITINE, BLAGNAC 31700, 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** 101017521 ('the Agreement')

**between** INDRA SISTEMAS SA **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

**for the action entitled** 'PJ34-W3 AURA "ATM U-SPACE INTERFACE" (PJ34-W3 AURA)'.

**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 FÜR LUFT - UND RAUMFAHRT EV (DLR)**, established in LINDER HOHE, KOLN 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 ('3')

**in Grant Agreement No** 101017521 ('the Agreement')

**between** INDRA SISTEMAS SA **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

**for the action entitled** 'PJ34-W3 AURA "ATM U-SPACE INTERFACE" (PJ34-W3 AURA)'.

**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)**, 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 ('4')

**in Grant Agreement No** 101017521 ('the Agreement')

**between** INDRA SISTEMAS SA **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

**for the action entitled** 'PJ34-W3 AURA "ATM U-SPACE INTERFACE" (PJ34-W3 AURA)'.

**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))**, established in JENEC NAVIGACNI 787, JENEC 252 61, Czech Republic, VAT number: CZ699004742, ('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 101017521 ('the Agreement')**

**between INDRA SISTEMAS SA and the Single European Sky ATM Research Joint Undertaking ('the JU'),**

**for the action entitled 'PJ34-W3 AURA "ATM U-SPACE INTERFACE" (PJ34-W3 AURA)'.**

**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))**, established in BALIO KARVELIO G. 25, VILNIUS LT-02184, Lithuania, VAT number: LT100604610, ('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** 101017521 ('the Agreement')

**between** INDRA SISTEMAS SA **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

**for the action entitled** 'PJ34-W3 AURA "ATM U-SPACE INTERFACE" (PJ34-W3 AURA)'.

**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))**, 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 ('7')

**in Grant Agreement No** 101017521 ('the Agreement')

**between** INDRA SISTEMAS SA **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

**for the action entitled** 'PJ34-W3 AURA "ATM U-SPACE INTERFACE" (PJ34-W3 AURA)'.

**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)**, 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 ('8')

**in Grant Agreement No** 101017521 ('the Agreement')

**between** INDRA SISTEMAS SA **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

**for the action entitled** 'PJ34-W3 AURA "ATM U-SPACE INTERFACE" (PJ34-W3 AURA)'.

**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)**, 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 ('9')

**in Grant Agreement No** 101017521 ('the Agreement')

**between** INDRA SISTEMAS SA **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

**for the action entitled** 'PJ34-W3 AURA "ATM U-SPACE INTERFACE" (PJ34-W3 AURA)'.

**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

**DFS DEUTSCHE FLUGSICHERUNG GMBH (DFS)**, established in AM DFS CAMPUS 10, LANGEN 63225, Germany, VAT number: DE114110232, ('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** 101017521 ('the Agreement')

**between** INDRA SISTEMAS SA **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

**for the action entitled** 'PJ34-W3 AURA "ATM U-SPACE INTERFACE" (PJ34-W3 AURA)'.

**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)**, 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 ('11')

**in Grant Agreement No** 101017521 ('the Agreement')

**between** INDRA SISTEMAS SA **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

**for the action entitled** 'PJ34-W3 AURA "ATM U-SPACE INTERFACE" (PJ34-W3 AURA)'.

**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

**ENAIRE (ENAIRE)**, established in AVENIDA DE ARAGON S/N BLOQUE 330, PORTAL 2 PARQUE EMPRESARIAL LAS MERCEDES, MADRID 28022, Spain, VAT number: ESQ2822001J, ('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** 101017521 ('the Agreement')

**between** INDRA SISTEMAS SA **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

**for the action entitled** 'PJ34-W3 AURA "ATM U-SPACE INTERFACE" (PJ34-W3 AURA)'.

**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)**, 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 ('13')

**in Grant Agreement No** 101017521 ('the Agreement')

**between** INDRA SISTEMAS SA **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

**for the action entitled** 'PJ34-W3 AURA "ATM U-SPACE INTERFACE" (PJ34-W3 AURA)'.

**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)**, 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** 101017521 ('the Agreement')

**between** INDRA SISTEMAS SA **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

**for the action entitled** 'PJ34-W3 AURA "ATM U-SPACE INTERFACE" (PJ34-W3 AURA)'.

**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))**, 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 ('15')

**in Grant Agreement No** 101017521 ('the Agreement')

**between** INDRA SISTEMAS SA **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

**for the action entitled** 'PJ34-W3 AURA "ATM U-SPACE INTERFACE" (PJ34-W3 AURA)'.

**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 LEGIFORGALMISZOLGALAT ZARTKORUEN MUKODO RESZVENYTARSASAG (HC (FSP))**, 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 ('16')**

**in Grant Agreement No 101017521 ('the Agreement')**

**between INDRA SISTEMAS SA and the Single European Sky ATM Research Joint Undertaking ('the JU'),**

**for the action entitled 'PJ34-W3 AURA "ATM U-SPACE INTERFACE" (PJ34-W3 AURA)'.**

**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

**HONEYWELL AEROSPACE (HONEYWELL SAS)**, established in 4 AVENUE SAINT GRANIER, TOULOUSE 31300, France, VAT number: FR92340797919, ('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** 101017521 ('the Agreement')

**between** INDRA SISTEMAS SA **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

**for the action entitled** 'PJ34-W3 AURA "ATM U-SPACE INTERFACE" (PJ34-W3 AURA)'.

**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 - SOCIETA PER AZIONI (LEONARDO)**, 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 ('18')

**in Grant Agreement No** 101017521 ('the Agreement')

**between** INDRA SISTEMAS SA **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

**for the action entitled** 'PJ34-W3 AURA "ATM U-SPACE INTERFACE" (PJ34-W3 AURA)'.

**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

**SINTEF AS (SINTEF)**, established in STRINDVEGEN 4, TRONDHEIM 7034, Norway, VAT number: NO919303808MVA, ('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** 101017521 ('the Agreement')

**between** INDRA SISTEMAS SA **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

**for the action entitled** 'PJ34-W3 AURA "ATM U-SPACE INTERFACE" (PJ34-W3 AURA)'.

**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)**, 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 ('20')

**in Grant Agreement No** 101017521 ('the Agreement')

**between** INDRA SISTEMAS SA **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

**for the action entitled** 'PJ34-W3 AURA "ATM U-SPACE INTERFACE" (PJ34-W3 AURA)'.

**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 LAS FRANCE SAS (THALES AIR SYS)**, established in AVENUE GAY LUSSAC 2, ELANCOURT 78990, France, VAT number: FR15319159877, ('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** 101017521 ('the Agreement')

**between** INDRA SISTEMAS SA **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

**for the action entitled** 'PJ34-W3 AURA "ATM U-SPACE INTERFACE" (PJ34-W3 AURA)'.

**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 AVS FRANCE SAS (THALES AVS)**, established in 75-77 AVENUE MARCEL DASSAULT, MERIGNAC 33700, France, VAT number: FR65612039495, ('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** 101017521 ('the Agreement')

**between** INDRA SISTEMAS SA **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

**for the action entitled** 'PJ34-W3 AURA "ATM U-SPACE INTERFACE" (PJ34-W3 AURA)'.

**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))**, 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 ('23')

**in Grant Agreement No** 101017521 ('the Agreement')

**between** INDRA SISTEMAS SA **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

**for the action entitled** 'PJ34-W3 AURA "ATM U-SPACE INTERFACE" (PJ34-W3 AURA)'.

**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)**, 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 ('24')**

**in Grant Agreement No 101017521 ('the Agreement')**

**between INDRA SISTEMAS SA and the Single European Sky ATM Research Joint Undertaking ('the JU'),**

**for the action entitled 'PJ34-W3 AURA "ATM U-SPACE INTERFACE" (PJ34-W3 AURA)'.**

**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)**, 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 ('25')

**in Grant Agreement No** 101017521 ('the Agreement')

**between** INDRA SISTEMAS SA **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

**for the action entitled** 'PJ34-W3 AURA "ATM U-SPACE INTERFACE" (PJ34-W3 AURA)'.

**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)**, 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 ('26')

**in Grant Agreement No** 101017521 ('the Agreement')

**between** INDRA SISTEMAS SA **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

**for the action entitled** 'PJ34-W3 AURA "ATM U-SPACE INTERFACE" (PJ34-W3 AURA)'.

**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))**, 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 ('27')

**in Grant Agreement No** 101017521 ('the Agreement')

**between** INDRA SISTEMAS SA **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

**for the action entitled** 'PJ34-W3 AURA "ATM U-SPACE INTERFACE" (PJ34-W3 AURA)'.

**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)**, 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 ('28')

**in Grant Agreement No** 101017521 ('the Agreement')

**between** INDRA SISTEMAS SA **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

**for the action entitled** 'PJ34-W3 AURA "ATM U-SPACE INTERFACE" (PJ34-W3 AURA)'.

**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)**, established in .., LINKOPING 581 88, Sweden, VAT number: SE556036079301, ('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** 101017521 ('the Agreement')

**between** INDRA SISTEMAS SA **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

**for the action entitled** 'PJ34-W3 AURA "ATM U-SPACE INTERFACE" (PJ34-W3 AURA)'.

**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 OPERATIONS SL (AOSL)**, established in AVENIDA JOHN LENNON S/N, GETAFE 28906, Spain, VAT number: ESB82875055, ('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 (AIRBUS)**, established in 2 ROND POINT EMILE DEWOITINE, BLAGNAC 31700, France, VAT number: FR89383474814, ('the beneficiary'),

**hereby accepts joint and several liability with the beneficiary**

for any amount owed to the JU by the beneficiary under Grant Agreement No 101017521 (PJ34-W3 AURA), up to the maximum JU 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 JU, 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**

**INTEGRA CONSULT AS (Integra)**, established in TRORODVEJ 63B, VEDBAEK 2950, Denmark, VAT number: DK12622678, ('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 5 **RIZENI LETOVEHO PROVOZU CESKE REPUBLIKY STATNI PODNIK (ANS CR (B4))**, established in JENEC NAVIGACNI 787, JENEC 252 61, Czech Republic, VAT number: CZ699004742, ('the beneficiary'),

**hereby accepts joint and several liability with the beneficiary**

for any amount owed to the JU by the beneficiary under Grant Agreement No 101017521 (PJ34-W3 AURA), up to the maximum JU 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 JU, 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**

**DRONERADAR SP Z O.O. (DRR)**, established in KSIEZYCOWA 3/19, WARSAW 01934, Poland, VAT number: PL5223135685, ('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 7 **POLSKA AGENCJA ZEGLUGI POWIETRZNEJ (PANSa (B4))**, 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 JU by the beneficiary under Grant Agreement No 101017521 (PJ34-W3 AURA), up to the maximum JU 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 JU, immediately and at first demand.

For the linked third party  
[forename/surname/function]

Done in English at [place], on [date]

**DECLARATION ON JOINT AND SEVERAL LIABILITY OF  
LINKED THIRD PARTIES**

**CENTRO DE REFERENCIA INVESTIGACION DESARROLLO E INNOVACION ATM, A.I.E. (CRIDA)**, established in AVDA DE ARAGON 402 4 EDIFICIO ALLENDE, MADRID 28022, Spain, VAT number: ESV85383578, ('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 12 **ENAIRE (ENAIRE)**, established in AVENIDA DE ARAGON S/N BLOQUE 330, PORTAL 2 PARQUE EMPRESARIAL LAS MERCEDES, MADRID 28022, Spain, VAT number: ESQ2822001J, ('the beneficiary'),

**hereby accepts joint and several liability with the beneficiary**

for any amount owed to the JU by the beneficiary under Grant Agreement No 101017521 (PJ34-W3 AURA), up to the maximum JU 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 JU, 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**

**D-FLIGHT SPA (D-FLIGHT)**, established in VIA SALARIA 716, ROMA 00138, Italy, VAT number: IT14996981008, ('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 13 **ENAV SPA (ENAV)**, 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 JU by the beneficiary under Grant Agreement No 101017521 (PJ34-W3 AURA), up to the maximum JU 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 JU, 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**

**FREQUENTIS SOLUTIONS SRO (FSO)**, established in KARADZCOVA 7244/8, BRATISLAVA 821 08, Slovakia, VAT number: SK2024000825, ('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 **FREQUENTIS AG (FRQ (FSP))**, established in Innovationsstrasse 1, WIEN 1100, Austria, VAT number: ATU14715600, ('the beneficiary'),

**hereby accepts joint and several liability with the beneficiary**

for any amount owed to the JU by the beneficiary under Grant Agreement No 101017521 (PJ34-W3 AURA), up to the maximum JU 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 JU, 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**

**HONEYWELL INTERNATIONAL SRO (HIsro)**, established in V PARKU 2325/16 CHODOV, PRAHA 148 00, Czech Republic, VAT number: CZ27617793, ('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 17 **HONEYWELL AEROSPACE (HONEYWELL SAS)**, established in 4 AVENUE SAINT GRANIER, TOULOUSE 31300, France, VAT number: FR92340797919, ('the beneficiary'),

**hereby accepts joint and several liability with the beneficiary**

for any amount owed to the JU by the beneficiary under Grant Agreement No 101017521 (PJ34-W3 AURA), up to the maximum JU 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 JU, immediately and at first demand.

For the linked third party  
[forename/surname/function]

Done in English at [place], on [date]

FINANCIAL STATEMENT FOR *[BENEFICIARY [name]/ LINKED THIRD PARTY [name]]* FOR REPORTING PERIOD *[reporting period]*

	Eligible <sup>1</sup> 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 <sup>2</sup>	[F. Costs of ... ]		Total costs	Receipts	Reimburse ment rate %	Maximum EU contribution <sup>3</sup>	Requested EU contribution	Information for indirect costs :		
	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	[C.1 Financial support]	[C.2 Prizes]	D.1 Travel	D.2 Equipment	D.3 Other goods and services	[D.4 Costs of large research infrastructure]	D.5 Costs of internally invoiced goods and services	[F.1 Costs of ...]	[F.2 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
Form of costs <sup>4</sup>	Actual	Unit	Unit	Actual	Actual	Actual	Actual	Unit	Flat-rate <sup>5</sup>	Unit	[Unit][Lump sum]								
									25%										
	a	Total b	No hours	Total c	d	[e]	f	[g]	Total h	i=0,25 x (a+b+c+f+[g] + h+ [j 1] <sup>6</sup> +[j2] <sup>6</sup> -p)	No units	Total [j1]	Total [j2]	k = a+b+c+d+[e] +f+ [g] +h+ i + [j1] +[j2]	l	m	n	o	p
[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.

<sup>1</sup> See Article 6 for the eligibility conditions

<sup>2</sup> 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 indirect costs unless you can demonstrate that the operating grant does not cover any costs of the action.

<sup>3</sup> 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 be less,

<sup>4</sup> See Article 5 for the forms of costs

<sup>5</sup> 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)

<sup>6</sup> 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 UNDER THE HORIZON 2020 RESEARCH FRAMEWORK PROGRAMME

INDEPENDENT REPORT OF FACTUAL FINDINGS ON COSTS DECLARED UNDER A GRANT AGREEMENT FINANCED UNDER THE HORIZON 2020 RESEARCH FRAMEWORK PROGRAMME

**Terms of Reference for an Independent Report of Factual Findings on costs declared under a Grant Agreement financed by [Clean Sky 2] [Bio Based Industries][ECSEL][Fuel Cells and Hydrogen 2][Innovative Medicines Initiative 2][Single European Sky Air Traffic Management Research (SESAR)][Shift2Rail] 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 Financial Statement(s)<sup>1</sup> 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 European Commission (*‘the Commission’*).

The Agreement has been concluded under the Horizon 2020 Research and Innovation Framework Programme (H2020) between the Beneficiary and the *[Clean Sky 2][Bio Based Industries][ECSEL][Fuel Cells and Hydrogen 2][Innovative Medicines Initiative 2][Single European Sky Air Traffic Management Research (SESAR)][Shift2Rail]* 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**

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;

---

<sup>1</sup> By which costs under the Agreement are declared (see template ‘Model Financial Statements’ in Annex 4 to the Grant Agreement).

- 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.

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 with<sup>2</sup>:

- 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]

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<sup>2</sup> 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 [Clean Sky 2] [Bio Based Industries][ECSEL][Fuel  
Cells and Hydrogen 2][Innovative Medicines Initiative 2][Single European Sky Air Traffic  
Management Research (SESAR)][Shift2Rail] 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)<sup>3</sup> 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 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**

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<sup>3</sup> By which the Beneficiary declares costs under the Agreement (see template 'Model Financial Statement' in  
Annex 4 to the Agreement).





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.

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 European Commission ('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], 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 interest<sup>4</sup> 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]

<sup>4</sup> 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.

Grant Agreement number: [insert number] [insert acronym] [insert call identifier]  Associated with document Ref. Ares(2020)7606929 - 15/12/2020

[name and function of an authorised representative]

[dd Month yyyy]

Signature of the Auditor

**Agreed-upon procedures to be performed and standard factual findings to be confirmed by the Auditor**

The European Commission ('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	<b>ACTUAL PERSONNEL COSTS AND UNIT COSTS CALCULATED BY THE BENEFICIARY IN ACCORDANCE WITH ITS USUAL COST ACCOUNTING PRACTICE</b>		
	<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><b>PERSONNEL COSTS</b></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"> <li>○ 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;</li> <li>○ the payslips of the employees included in the sample;</li> <li>○ reconciliation of the personnel costs declared in the Financial Statement(s) with the accounting system (project accounting and general ledger) and payroll system;</li> <li>○ information concerning the employment status and employment conditions of personnel included in the sample, in particular their employment contracts or equivalent;</li> <li>○ the Beneficiary's usual policy regarding payroll matters (e.g. salary policy, overtime policy, variable pay);</li> <li>○ applicable national law on taxes, labour and social security and</li> <li>○ any other document that supports the personnel costs declared.</li> </ul> <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>	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.	
		2) Personnel costs were recorded in the Beneficiary's accounts/payroll system.	
		3) Costs were adequately supported and reconciled with the accounts and payroll records.	
		4) Personnel costs did not contain any ineligible elements.	
		5) There were no discrepancies between the personnel costs charged to the action and the costs recalculated by the Auditor.	
	<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"> <li>○ reviewed relevant documents provided by the Beneficiary (legal form, legal/statutory</li> </ul>	6) The Beneficiary paying "additional remuneration" was a non-profit legal entity.	

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, the Beneficiary's usual remuneration practice for projects funded under national funding schemes ...);</p> <ul style="list-style-type: none"> <li>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, usual remuneration paid for projects funded by national schemes) 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').</li> </ul> <p><i>'ADDITIONAL REMUNERATION' MEANS ANY PART OF THE REMUNERATION WHICH EXCEEDS WHAT THE PERSON WOULD BE PAID FOR TIME WORKED IN PROJECTS FUNDED BY NATIONAL SCHEMES.</i></p> <p><i>IF ANY PART OF THE REMUNERATION PAID TO THE EMPLOYEE IS QUALIFIED AS "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>	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.	
		8) The criteria used to calculate the additional remuneration were objective and generally applied by the Beneficiary regardless of the source of funding used.	
		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><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>	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	

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"> <li>obtained a description of the Beneficiary's usual cost accounting practice to calculate unit costs;</li> <li>reviewed whether the Beneficiary's usual cost accounting practice was applied for the Financial Statements subject of the present CFS;</li> <li>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;</li> <li>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;</li> <li>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.</li> </ul>	used in all H2020 actions.	
		11) The employees were charged under the correct category.	
		12) Total personnel costs used in calculating the unit costs were consistent with the expenses recorded in the statutory accounts.	
		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><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 14-17 listed in the next column the Auditor reviewed following information/documents provided by the Beneficiary:</p> <ul style="list-style-type: none"> <li>the contracts, especially the cost, contract duration, work description, place of work, ownership of the results and reporting obligations to the Beneficiary;</li> <li>the employment conditions of staff in the same category to compare costs and;</li> <li>any other document that supports the costs declared and its registration (e.g. invoices, accounting records, etc.).</li> </ul>	14) The natural persons worked under conditions similar to those of an employee, in particular regarding the way the work is organised, the tasks that are performed and the premises where they are performed.	
		15) The results of work carried out belong to the Beneficiary, or, if not, the Beneficiary has obtained all necessary rights to fulfil its obligations as if those	



Ref	Procedures	Standard factual finding	Result (C / E / N.A.)
		results were generated by itself.	
		16) Their costs were not significantly different from those for staff who performed similar tasks under an employment contract with the Beneficiary.	
		17) The costs were supported by audit evidence and registered in the accounts.	
	<u>For personnel seconded by a third party and included in the sample (not subcontractors)</u> To confirm standard factual findings 18-21 listed in the next column, the Auditor reviewed following information/documents provided by the Beneficiary: <ul style="list-style-type: none"> <li>○ their secondment contract(s) notably regarding costs, duration, work description, place of work and ownership of the results;</li> <li>○ 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;</li> <li>○ 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;</li> </ul>	18) Seconded personnel reported to the Beneficiary and worked on the Beneficiary's premises (unless otherwise agreed with the Beneficiary).	
		19) The results of work carried out belong to the Beneficiary, or, if not, the Beneficiary has obtained all necessary rights to fulfil its obligations as if those results were generated by itself.	
		<i>If personnel is seconded against payment:</i> 20) The costs declared were supported with documentation and recorded in the Beneficiary's accounts. The	

Ref	Procedures	Standard factual finding	Result (C / E / N.A.)
	<ul style="list-style-type: none"> <li>any other document that supports the costs declared (e.g. invoices, etc.).</li> </ul>	third party did not include any profit.	
		<i>If personnel is seconded free of charge:</i> 21) The costs declared did not exceed the third party's cost as recorded in the accounts of the third party and were supported with documentation.	
A.2	<b>PRODUCTIVE HOURS</b>  To confirm standard factual findings 22-27 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: <ul style="list-style-type: none"> <li>the annual productive hours applied were calculated in accordance with one of the methods described below,</li> <li>the full-time equivalent (FTEs) ratios for employees not working full-time were correctly calculated.</li> </ul> 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.  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	22) The Beneficiary applied method [ <i>choose one option and delete the others</i> ] [A: 1720 hours] [B: the 'total number of hours worked'] [C: 'standard annual productive hours' used correspond to usual accounting practices]	
		23) Productive hours were calculated annually.	
		24) For employees not working full-time the full-time equivalent (FTE) ratio was correctly applied.	

Ref	Procedures	Standard factual finding	Result (C / E / N.A.)
	<p>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 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 'STANDARD 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 B.</i></p> <p>25) The calculation of the number of 'annual workable hours', overtime and absences was verifiable based on the documents provided by the Beneficiary.</p> <p>25.1) The Beneficiary calculates the hourly rates per full financial year following procedure A.3 (method B is not allowed for beneficiaries calculating hourly rates per month).</p>	
		<p><i>If the Beneficiary applied method C.</i></p> <p>26) The calculation of the number of 'standard annual workable hours' was verifiable based on the documents provided by the Beneficiary.</p>	

Ref	Procedures	Standard factual finding	Result (C / E / N.A.)
		27) 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'.	
A.3	<p><b>HOURLY PERSONNEL RATES</b></p> <p><u>I) 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> <ul style="list-style-type: none"> <li>○ reviewed the documentation provided by the Beneficiary, including manuals and internal guidelines that explain how to calculate hourly rates;</li> <li>○ 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.</li> </ul> <p><u>II) For individual hourly rates:</u></p> <p>The Auditor:</p> <ul style="list-style-type: none"> <li>○ reviewed the documentation provided by the Beneficiary, including manuals and internal guidelines that explain how to calculate hourly rates;</li> <li>○ recalculated the hourly rates of staff included in the sample (recalculation of all hourly</li> </ul>	<p>28) The Beneficiary applied [<i>choose one option and delete the other</i>]:</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> <p><i>For option I concerning unit costs and if the Beneficiary applies the methodology approved by the Commission (CoMUC):</i></p> <p>29) 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</p>	

Ref	Procedures	Standard factual finding	Result (C / E / N.A.)
	<p>rates if the Beneficiary uses annual rates, recalculation of three months selected randomly for every year and person if the Beneficiary uses monthly rates) following the results of the procedures carried out in A.1 and A.2;</p> <ul style="list-style-type: none"> <li>○ (only in case of monthly rates) confirmed that the time spent on parental leave is not deducted, and that, if parts of the basic remuneration are generated over a period longer than a month, the Beneficiary has included only the share which is generated in the month.</li> </ul> <p><u>“UNIT COSTS CALCULATED BY THE BENEFICIARY IN ACCORDANCE WITH ITS USUAL COST ACCOUNTING PRACTICES”:</u>  <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>  <u>HOURLY RATE FOR INDIVIDUAL ACTUAL PERSONAL COSTS:</u>  <i>IT IS CALCULATED FOLLOWING ONE OF THE TWO OPTIONS BELOW:</i></p> <p><i>A) [OPTION BY DEFAULT] BY DIVIDING THE ACTUAL ANNUAL 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 (FULL FINANCIAL YEAR HOURLY RATE);</i></p> <p><i>B) BY DIVIDING THE ACTUAL MONTHLY AMOUNT OF PERSONNEL COSTS OF AN EMPLOYEE VERIFIED IN LINE WITH PROCEDURE A.1 BY 1/12 OF THE NUMBER OF ANNUAL PRODUCTIVE HOURS VERIFIED IN LINE WITH PROCEDURE A.2.(MONTHLY HOURLY RATE).</i></p>	activities irrespective of the source of funding.	
		<p><i>For option I concerning unit costs and if the Beneficiary applies a methodology not approved by the Commission:</i></p> <p>30) 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>31) The individual rates re-calculated by the Auditor were the same as the rates applied by the Beneficiary.</p> <p>31.1) The Beneficiary used only one option (per full financial year or per month) throughout each financial year examined.</p> <p>31.2) The hourly rates do not include additional remuneration.</p>	

Ref	Procedures	Standard factual finding	Result (C / E / N.A.)
A.4	<b>TIME RECORDING SYSTEM</b> 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: <ul style="list-style-type: none"> <li>○ description of the time recording system provided by the Beneficiary (registration, authorisation, processing in the HR-system);</li> <li>○ its actual implementation;</li> <li>○ time records were signed at least monthly by the employees (on paper or electronically) and authorised by the project manager or another manager;</li> <li>○ the hours declared were worked within the project period;</li> <li>○ 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) ;</li> <li>○ the hours charged to the action matched those in the time recording system.</li> </ul>	32) All persons recorded their time dedicated to the action on a <b>daily/ weekly/ monthly</b> basis using a <b>paper/computer-based</b> system. <i>(delete the answers that are not applicable)</i>	
		33) Their time-records were authorised at least monthly by the project manager or other superior.	
		34) Hours declared were worked within the project period and were consistent with the presences/absences recorded in HR-records.	
		35) There were no discrepancies between the number of hours charged to the action and the number of hours recorded.	
	<u>If the persons are working exclusively for the action and without time records</u> 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.	36) The exclusive dedication is supported by a declaration signed by the Beneficiary and by any other evidence gathered.	

Ref	Procedures	Standard factual finding	Result (C / E / N.A.)
<b>B</b>	<b>COSTS OF SUBCONTRACTING</b>		
<b>B.1</b>	<p><b>The Auditor obtained the detail/breakdown of subcontracting costs and sampled cost items selected randomly</b> (<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>To confirm standard factual findings 37-41 listed in the next column, the Auditor reviewed the following for the items included in the sample:</p> <ul style="list-style-type: none"> <li>the use of subcontractors was foreseen in Annex 1;</li> <li>subcontracting costs were declared in the subcontracting category of the Financial Statement;</li> <li>supporting documents on the selection and award procedure were followed;</li> <li>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).</li> </ul> <p>In particular,</p> <ol style="list-style-type: none"> <li>if the Beneficiary acted as a contracting authority within the meaning of Directive 2004/18/EC (or 2014/24/EU) or of Directive 2004/17/EC (or 2014/25/EU), 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.</li> <li>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..</li> </ol>	<p>37) The use of claimed subcontracting costs was foreseen in Annex 1 and costs were declared in the Financial Statements under the subcontracting category.</p> <p>38) 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>39) The subcontracts were not awarded to other Beneficiaries</p>	



Ref	Procedures	Standard factual finding	Result (C / E / N.A.)
	For the items included in the sample the Auditor also verified that: <ul style="list-style-type: none"> <li>○ the subcontracts were not awarded to other Beneficiaries in the consortium;</li> <li>○ there were signed agreements between the Beneficiary and the subcontractor;</li> <li>○ there was evidence that the services were provided by subcontractor;</li> </ul>	of the consortium.	
		40) All subcontracts were supported by signed agreements between the Beneficiary and the subcontractor.	
		41) There was evidence that the services were provided by the subcontractors.	
<b>C</b>	<b>COSTS OF PROVIDING FINANCIAL SUPPORT TO THIRD PARTIES</b>		
<b>C.1</b>	<p><b>The Auditor obtained the detail/breakdown of the costs of providing financial support to third parties and sampled [ ] cost items selected randomly</b> <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"> <li>a) the maximum amount of financial support for each third party did not exceed EUR 60 000, unless explicitly mentioned in Annex 1;</li> <li>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.</li> </ul>	42) All minimum conditions were met	

D	OTHER ACTUAL DIRECT COSTS		
D.1	<b>COSTS OF TRAVEL AND RELATED SUBSISTENCE ALLOWANCES</b>  <b>The Auditor sampled [ ] cost items selected randomly</b> <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>  The Auditor inspected the sample and verified that: <ul style="list-style-type: none"> <li>○ 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;</li> <li>○ 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;</li> <li>○ no ineligible costs or excessive or reckless expenditure was declared (see Article 6.5 MGA).</li> </ul>	43) Costs were incurred, approved and reimbursed in line with the Beneficiary's usual policy for travels.	
		44) There was a link between the trip and the action.	
		45) The supporting documents were consistent with each other regarding subject of the trip, dates, duration and reconciled with time records and accounting.	
		46) No ineligible costs or excessive or reckless expenditure was declared.	
D.2	<b>DEPRECIATION COSTS FOR EQUIPMENT, INFRASTRUCTURE OR OTHER ASSETS</b>  <b>The Auditor sampled [ ] cost items selected randomly</b> <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>  For “equipment, infrastructure or other assets” [from now on called “asset(s)”] selected in the sample the Auditor verified that: <ul style="list-style-type: none"> <li>○ the assets were acquired in conformity with the Beneficiary's internal guidelines and procedures;</li> <li>○ they were correctly allocated to the action (with supporting documents such as delivery</li> </ul>	47) Procurement rules, principles and guides were followed.	
		48) There was a link between the grant agreement and the asset charged to the action.	
		49) 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"> <li>○ they were entered in the accounting system;</li> <li>○ the extent to which the assets were used for the action (as a percentage) was supported by reliable documentation (e.g. usage overview table);</li> </ul> <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>	<p>50) 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.</p>	
		<p>51) The amount charged corresponded to the actual usage for the action.</p>	
		<p>52) No ineligible costs or excessive or reckless expenditure were declared.</p>	
<b>D.3</b>	<p><b>COSTS OF OTHER GOODS AND SERVICES</b></p> <p><b>The Auditor sampled [ ] cost items selected randomly</b> (<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"> <li>○ the contracts did not cover tasks described in Annex 1;</li> <li>○ 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);</li> <li>○ the goods were not placed in the inventory of durable equipment;</li> <li>○ the costs charged to the action were accounted in line with the Beneficiary's usual accounting practices;</li> <li>○ no ineligible costs or excessive or reckless expenditure were declared (see Article 6 GA).</li> </ul> <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"> <li>○ if Beneficiary acted as a contracting authority within the meaning of Directive</li> </ul>	<p>53) Contracts for works or services did not cover tasks described in Annex 1.</p>	
		<p>54) Costs were allocated to the correct action and the goods were not placed in the inventory of durable equipment.</p>	
		<p>55) The costs were charged in line with the Beneficiary's accounting policy and were adequately supported.</p>	
		<p>56) 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>	

	<p>2004/18/EC (or 2014/24/EU) or of Directive 2004/17/EC (or 2014/25/EU), 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"> <li>○ 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.</li> </ul> <p>For the items included in the sample the Auditor also verified that:</p> <ul style="list-style-type: none"> <li>○ 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);</li> </ul> <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>57) 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>	
<b>D.4</b>	<p><b>AGGREGATED CAPITALISED AND OPERATING COSTS OF RESEARCH INFRASTRUCTURE</b></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 58-59 on the next column),</i></p>	<p>58) 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><b><i>In the cases that a positive ex-ante assessment has NOT been issued (see the standard factual findings 60 on the next column),</i></b></p> <p>The Auditor verified that no costs of Large Research Infrastructure have been charged as direct costs in any costs category;</p> <p><b><i>In the cases that a draft ex-ante assessment report has been issued with recommendation for further changes (see the standard factual findings 60 on the next column),</i></b></p> <ul style="list-style-type: none"> <li>• 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.</li> </ul>	59) Any difference between the methodology applied and the one positively assessed was extensively described and adjusted accordingly.	
		60) The direct costs declared were free from any indirect costs items related to the Large Research Infrastructure.	
<b>D.5</b>	<p><b>Costs of internally invoiced goods and services</b></p> <p><b>The Auditor sampled cost items selected randomly</b> (<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>To confirm standard factual findings 61-65 listed in the next column, the Auditor:</p> <ul style="list-style-type: none"> <li>○ obtained a description of the Beneficiary's usual cost accounting practice to calculate costs of internally invoiced goods and services (unit costs);</li> <li>○ reviewed whether the Beneficiary's usual cost accounting practice was applied for the Financial Statements subject of the present CFS;</li> <li>○ ensured that the methodology to calculate unit costs is being used in a consistent manner, based on objective criteria, regardless of the source of funding;</li> <li>○ verified that any ineligible items or any costs claimed under other budget categories, in particular indirect costs, have not been taken into account when calculating the costs of internally invoiced goods and services (see Article 6 GA);</li> <li>○ verified whether actual costs of internally invoiced goods and services were adjusted on</li> </ul>	<p>61) The costs of internally invoiced goods and services included in the Financial Statement were calculated in accordance with the Beneficiary's usual cost accounting practice.</p> <p>62) The cost accounting practices used to calculate the costs of internally invoiced goods and services were applied by the Beneficiary in a consistent manner based on objective criteria regardless of the source of funding.</p> <p>63) The unit cost is calculated using the actual costs for the good or service recorded in the Beneficiary's accounts, excluding any ineligible cost or</p>	

	<p>the basis of budgeted or estimated elements and, if so, verified whether those elements used are actually relevant for the calculation, and correspond to objective and verifiable information.</p> <ul style="list-style-type: none"> <li>○ verified that any costs of items which are not directly linked to the production of the invoiced goods or service (e.g. supporting services like cleaning, general accountancy, administrative support, etc. not directly used for production of the good or service) have not been taken into account when calculating the costs of internally invoiced goods and services.</li> <li>○ verified that any costs of items used for calculating the costs internally invoiced goods and services are supported by audit evidence and registered in the accounts.</li> <li>○</li> </ul>	<p>costs included in other budget categories.</p> <p>64) The unit cost excludes any costs of items which are not directly linked to the production of the invoiced goods or service.</p> <p>65) The costs items used for calculating the actual costs of internally invoiced goods and services were relevant, reasonable and correspond to objective and verifiable information.</p>	
<b>E</b>	<b>USE OF EXCHANGE RATES</b>		
<b>E.1</b>	<p>a) For Beneficiaries with accounts established in a currency other than euros</p> <p><b>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</b> (<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 RECORDED IN THE ACCOUNTS IN A CURRENCY OTHER THAN EURO 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 (<a href="https://www.ecb.int/stats/exchange/eurofxref/html/index.en.html">https://www.ecb.int/stats/exchange/eurofxref/html/index.en.html</a>), 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 (<a href="http://ec.europa.eu/budget/contracts_grants/info_contracts/inforeuro/inforeuro_en.cfm">http://ec.europa.eu/budget/contracts_grants/info_contracts/inforeuro/inforeuro_en.cfm</a>),</i></p>	<p>66) 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>	

	<i>DETERMINED OVER THE CORRESPONDING REPORTING PERIOD.</i>		
	<p><u>b) For Beneficiaries with accounts established in euros</u></p> <p><b>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</b> (<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>	67) The Beneficiary applied its usual accounting practices.	

[legal name of the audit firm]

[name and function of an authorised representative]

[dd Month yyyy]

&lt;Signature of the Auditor&gt;



## 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 UNDER THE HORIZON 2020 RESEARCH AND INNOVATION FRAMEWORK PROGRAMME

INDEPENDENT REPORT OF FACTUAL FINDINGS ON THE METHODOLOGY CONCERNING GRANT AGREEMENTS FINANCED UNDER THE HORIZON 2020 RESEARCH AND INNOVATION FRAMEWORK PROGRAMME

**Terms of reference for an audit engagement for a methodology certificate  
in connection with one or more grant agreements financed  
by [Clean Sky 2] [Bio Based Industries][ECSEL][Fuel Cells and Hydrogen 2][Innovative  
Medicines Initiative 2][Single European Sky Air Traffic Management Research  
(SESAR)][Shift2Rail] 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 *[Clean Sky 2][Bio Based Industries][ECSEL][Fuel Cells and Hydrogen 2][Innovative Medicines Initiative 2][Single European Sky Air Traffic Management Research (SESAR)][Shift2Rail]* 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 European Commission (*‘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 with<sup>1</sup>:

- 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 declared 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

[legal name of the [Beneficiary] [Linked Third Party]]  
[name & title of authorised representative]  
[dd Month yyyy]  
Signature of the [Beneficiary] [Linked Third Party]

---

<sup>1</sup> 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 *[Clean Sky 2] [Bio Based Industries] [ECSEL] [Fuel Cells and Hydrogen  
2] [Innovative Medicines Initiative 2] [Single European Sky Air Traffic Management Research  
(SESAR)] [Shift2Rail] 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 European Commission ('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 Statement<sup>1</sup> 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:

<sup>1</sup> Financial Statement in this context refers solely to Annex 4 of the Agreement by which the Beneficiary declares costs under the Agreement.

1. Brief description of the methodology for calculating personnel costs, productive hours and hourly rates;
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 by 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 interest<sup>2</sup> 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

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<sup>2</sup> 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 European Commission ('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
<b>A. Use of the Methodology</b>  I. The cost accounting practice described below has been in use since [dd Month yyyy].  II. The next planned alteration to the methodology used by the Beneficiary will be from [dd Month yyyy].	<b>Procedure:</b>  ✓ The Auditor checked these dates against the documentation the Beneficiary has provided.  <b>Factual finding:</b>  1. The dates provided by the Beneficiary were consistent with the documentation.
<b>B. Description of the Methodology</b>  III. The methodology to calculate unit costs is being used in a consistent manner and is reflected in the relevant procedures.  <i>[Please describe the methodology your entity uses to calculate <u>personnel</u> costs, productive hours and hourly rates, present your description to the Auditor and annex it to this certificate]</i>  <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>	<b>Procedure:</b>  ✓ The Auditor reviewed the description, the relevant manuals and/or internal guidance documents describing the methodology.  <b>Factual finding:</b>  2. The brief description was consistent with the relevant manuals, internal guidance and/or other documentary evidence the Auditor has reviewed.  3. The methodology was generally applied by the Beneficiary as part of its usual costs accounting practices.
<b>C. Personnel costs</b>	<b>Procedure:</b>

<b><i>Please explain any discrepancies in the body of the Report.</i></b>	
<b>Statements to be made by Beneficiary</b>	<b>Procedures to be carried out and Findings to be confirmed by the Auditor</b>
<u>General</u>	
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><i>The Auditor draws a sample of employees to carry out the procedures indicated in this section C and the following sections D to F.</i>  <i>[The Auditor has drawn a random sample of 10 employees assigned to Horizon 2020 action(s). If fewer than 10 employees are assigned to the Horizon 2020 action(s), the Auditor has selected all employees assigned to the Horizon 2020 action(s), complemented by other employees irrespective of their assignments until he has reached 10 employees.].</i> For this sample:</p> <ul style="list-style-type: none"> <li>✓ 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;</li> <li>✓ in particular, the Auditor reviewed the employment contracts of the employees in the sample to verify that: <ul style="list-style-type: none"> <li>i. they were employed directly by the Beneficiary in accordance with applicable national legislation;</li> <li>ii. they were working under the sole technical supervision and responsibility of the latter;</li> <li>iii. they were remunerated in accordance with the Beneficiary's usual practices;</li> <li>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;</li> </ul> </li> <li>✓ 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;</li> <li>✓ 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.</li> <li>✓ 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;</li> </ul>
V. Employees are hired directly by the Beneficiary in accordance with national law, and work under its sole supervision and responsibility;	
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);	
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;	
VIII. Personnel costs are based on the payroll system and accounting system.	
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>	
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.	
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 or Euratom budget in the same period, unless the Beneficiary can demonstrate that the operating grant does not cover any costs of the action).	

<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><u>If additional remuneration as referred to in the grant agreement(s) is paid</u></p> <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><b>Factual finding:</b></p> <ol style="list-style-type: none"> <li>All the components of the remuneration that have been claimed as personnel costs are supported by underlying documentation.</li> <li>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.</li> <li>Their employment contracts were in line with the Beneficiary's usual policy;</li> <li>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.);</li> <li>The totals used to calculate the personnel unit costs are consistent with those registered in the payroll and accounting records;</li> <li>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).</li> <li>Personnel costs contained no ineligible elements;</li> <li>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 action full-time during the year or did not work</li> </ol>

<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
	exclusively on the action).
<p><b>D. Productive hours</b></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.</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><b>Procedure (same sample basis as for Section C: Personnel costs):</b></p> <ul style="list-style-type: none"> <li>✓ The Auditor verified that the number of productive hours applied is in accordance with method A, B or C.</li> <li>✓ The Auditor checked that the number of productive hours per full-time employee is correct.</li> <li>✓ 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.</li> <li>✓ 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.</li> </ul> <p><b>Factual finding:</b></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.</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> <p><u>If method C is applied</u></p> <p>16. The calculation of the number of productive hours per year corresponded</p>

<b>Please explain any discrepancies in the body of the Report.</b>	
<b>Statements to be made by Beneficiary</b>	<b>Procedures to be carried out and Findings to be confirmed by the Auditor</b>
<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>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><b>E. Hourly rates</b></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><b>Procedure</b></p> <ul style="list-style-type: none"> <li>✓ The Auditor has obtained a list of all personnel rates calculated by the Beneficiary in accordance with the methodology used.</li> <li>✓ The Auditor has obtained a list of all the relevant employees, based on which the personnel rate(s) are calculated.</li> </ul> <p>For 10 employees selected at random (same sample basis as Section C: Personnel costs):</p> <ul style="list-style-type: none"> <li>✓ The Auditor recalculated the hourly rates.</li> <li>✓ 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.</li> </ul> <p><b>Factual finding:</b></p> <p>19. No differences arose from the recalculation of the hourly rate for the employees included in the sample.</p>
<p><b>F. Time recording</b></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 <b>daily/weekly/monthly</b> basis <i>[delete as appropriate]</i> using a <b>paper/computer-based system</b> <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</p>	<p><b>Procedure</b></p> <ul style="list-style-type: none"> <li>✓ The Auditor reviewed the brief description, all relevant manuals and/or internal guidance describing the methodology used to record time.</li> </ul> <p>The Auditor reviewed the time records of the random sample of 10 employees referred to under Section C: Personnel costs, and verified in particular:</p>

<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>arrangements in place 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"> <li>i. recording the same hours twice,</li> <li>ii. recording working hours during absence periods (e.g. holidays, sick leave),</li> <li>iii. recording more than the number of productive hours per year used to calculate the hourly rates, and</li> <li>iv. recording hours worked outside the action period.</li> </ul> <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 certificate<sup>1</sup>].</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"> <li>✓ that time records were available for all persons with not exclusive assignment to the action;</li> <li>✓ 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;</li> <li>✓ that time records were signed and approved in due time and that all minimum requirements were fulfilled;</li> <li>✓ that the persons worked for the action in the periods claimed;</li> <li>✓ that no more hours were claimed than the productive hours used to calculate the hourly personnel rates;</li> <li>✓ 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;</li> <li>✓ 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.</li> </ul> <p><b>Factual finding:</b></p> <p>20. The brief description, manuals and/or internal guidance on time recording provided by the Beneficiary were consistent with management</p>

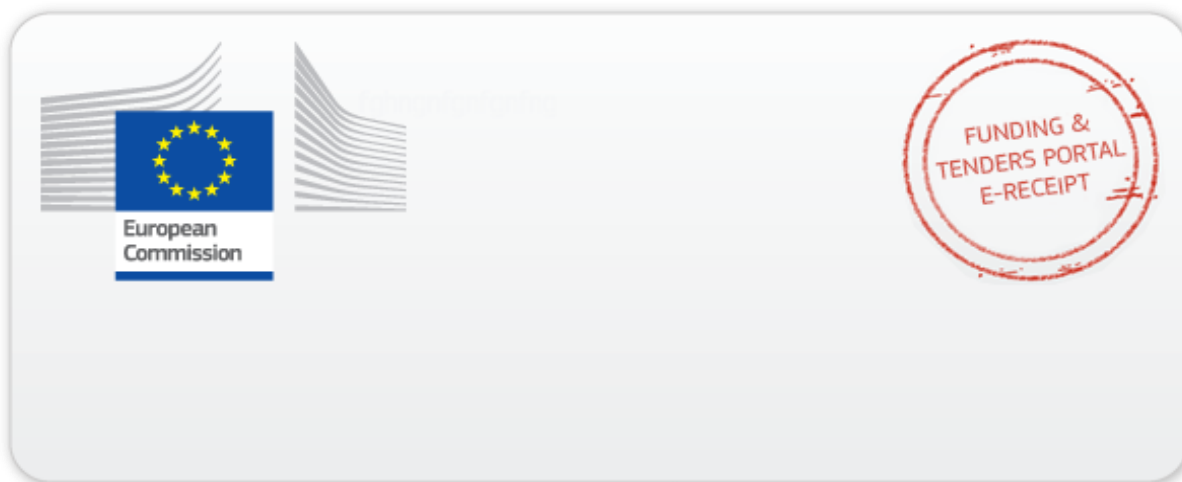
<sup>1</sup> The description of the time recording system must state among others information on the content of the time records, its coverage (full or action time-recording, for all personnel or only for personnel involved in H2020 actions), its degree of detail (whether there is a reference to the 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>

*[official name of the [Beneficiary] [Linked Third Party]]*  
*[name and title of authorised representative]*  
*[dd Month yyyy]*  
*<Signature of the [Beneficiary] [Linked Third Party]>*

*[official name of the Auditor]*  
*[name and title of authorised representative]*  
*[dd Month yyyy]*  
*<Signature of the Auditor>*





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