



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

NUMBER 874470 — PJ05-W2 DTT

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':

**DEUTSCHES ZENTRUM FUER LUFT - UND RAUMFAHRT EV (DLR (AT-One))**, established in Linder Hoehe, KOELN 51147, Germany, represented for the purposes of signing the Agreement by Richter THOMAS

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

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

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

4. **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),

5. **VALSTYBES IMONE ORO NAVIGACIJA (ON (B4))**, established in RODUNIOS KEL 2, VILNIAUS 02188, Lithuania, VAT number: LT100604610,

6. **POLSKA AGENCJA ZEGLUGI POWIETRZNEJ (PANS A (B4))**, established in UL. WIEZOWA 8, WARSZAWA 02 147, Poland, VAT number: PL5222838321,

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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. **AUSTRO CONTROL OSTERREICHISCHE GESELLSCHAFT FUR ZIVILLUFTFAHRT MBH (ACG/COOPANS)**, established in WAGRAMER STRASSE 19, WIEN 1220, Austria, VAT number: ATU37259408,
8. **CROATIA CONTROL, CROATIAN AIR NAVIGATION SERVICES LTD (CCL/COOPANS)**, established in RUDOLFA FIZIRA 2, VELIKA GORICA 10410, Croatia, VAT number: HR33052761319,
9. **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),
10. **LUFTFARTSVERKET (LFV/COOPANS)**, established in HOSPITALSGATAN 30, NORRKOPING 602 27, Sweden, VAT number: SE202100079501,
11. **NAVIAIR (Naviair/COOPANS)**, established in NAVIAIR ALLE 1, KASTRUP 2770, Denmark, VAT number: DK26059763,
12. **DFS DEUTSCHE FLUGSICHERUNG GMBH (DFS)**, established in AM DFS CAMPUS 10, LANGEN 63225, Germany, VAT number: DE114110232,
13. **ENAIRE (ENAIRE)**, established in AVENIDA DE ARAGON S/N BLOQUE 330, PORTAL 2 PARQUE EMPRESARIAL LAS MERCEDES, MADRID 28022, Spain, VAT number: ESQ2822001J,
14. **ENAV SPA (ENAV)**, established in VIA SALARIA 716, ROMA 00138, Italy, VAT number: IT02152021008,
15. **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),
16. **ATOS BELGIUM (ATOS (FSP))**, established in DA VINCILAAN 5, ZAVENTEM 1930, Belgium, VAT number: BE0401848135, as 'beneficiary not receiving JU funding' (see Article 9),
17. **FREQUENTIS AG (FRQ (FSP))**, established in Innovationsstrasse 1, WIEN 1100, Austria, VAT number: ATU14715600,
18. **HUNGAROCONTROL MAGYAR LEGIFORGALMISZOLGALAT ZARTKORUEN MUKODO RESZVENYTARSASAG (HC (FSP))**, established in IGLO UTCA 33 35, BUDAPEST 1185, Hungary, VAT number: HU13851325,
19. **INDRA SISTEMAS SA (INDRA)**, established in AVENIDA DE BRUSELAS 35, ALCOBENDAS MADRID 28108, Spain, VAT number: ESA28599033,
20. **LEONARDO - SOCIETA PER AZIONI (LDO)**, established in PIAZZA MONTE GRAPPA 4, ROMA 00195, Italy, VAT number: IT00881841001,
21. **AIRTEL ATN LIMITED (AIRTEL (NATMIG))**, established in 2 HARBOUR SQUARE CROFTON ROAD, DUN LOAGHAIRE DUBLIN A96D6R0, Ireland, VAT number: IE8287698U, as 'beneficiary not receiving JU funding' (see Article 9),

22. **SAAB AKTIEBOLAG (SAAB (NATMIG))**, established in ., LINKOPING 581 88, Sweden, VAT number: SE556036079301,
23. **SINTEF AS (SINTEF (NATMIG))**, established in STRINDVEGEN 4, TRONDHEIM 7034, Norway, VAT number: NO919303808MVA,
24. **AEROPORTS DE PARIS SA (ADP (SEAC2020))**, established in 1 RUE DE FRANCE, TREMBLAY-EN-FRANCE 93290, France, VAT number: FR33552016628, as ‘beneficiary not receiving JU funding’ (see Article 9),
25. **AVINOR AS (AVINOR-SEAC2020)**, established in DRONNING EUFEMIAS GATE 6, OSLO 2061, Norway, as ‘beneficiary not receiving JU funding’ (see Article 9),
26. **HEATHROW AIRPORT LIMITED (HAL (SEAC2020))**, established in NELSON ROAD THE COMPASS CENTRE HOUNSLOW, LONDON TW6 2GW, United Kingdom, VAT number: GB927365404, as ‘beneficiary not receiving JU funding’ (see Article 9),
27. **FLUGHAFEN MUNCHEN GMBH (MUC (SEAC2020))**, established in NORDALLEE 25, MUNCHEN 85326, Germany, VAT number: DE129352365, as ‘beneficiary not receiving JU funding’ (see Article 9),
28. **SCHIPHOL NEDERLAND B.V. (SNBV (SEAC2020))**, established in EVERT VAN DE BEEKSTRAAT 202, LUCHTHAVEN SCHIPHOL 1118CP, Netherlands, VAT number: NL810336406B01, as ‘beneficiary not receiving JU funding’ (see Article 9),
29. **SWEDAVIA AB (SWED(SEAC2020))**, established in SWEDAVIA, STOCKHOLM ARLANDA 190 45, Sweden, VAT number: SE556797081801, as ‘beneficiary not receiving JU funding’ (see Article 9),
30. **FLUGHAFEN ZURICH AG (ZRH (SEAC2020))**, established in FLUGHAFEN KLOTEN, ZURICH 8058, Switzerland, VAT number: CHE101921104MWST, as ‘beneficiary not receiving JU funding’ (see Article 9),
31. **THALES LAS FRANCE SAS (THALES AIR SYS)**, established in AVENUE GAY LUSSAC 2, ELANCOURT 78990, France, VAT number: FR15319159877,

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 ‘**PJ05-W2 Digital Technologies for Tower**’ — ‘**PJ05-W2 DTT**’ (**‘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.

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

The duration of the action will be **37 months** as of 1 December 2019 (**‘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 6 150 284.22** (six million one hundred and fifty thousand two hundred and eighty four EURO and twenty two 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 13 615 237.74** (thirteen million six hundred and fifteen thousand two hundred and thirty seven EURO and seventy four 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:

{EUR 8 000

divided by

the number of annual productive hours (see below)},

multiplied by

the number of hours that the person has worked on the action during the year}.

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

- (a) the person works under 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>: Not applicable

**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

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<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.

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

**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;

<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.

- (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**

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.

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<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).

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:

- 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)
- 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)
- NEXTANT APPLICATIONS & INNOVATIVE SOLUTION SRL (NAIS), affiliated or linked to ENAV
- TECHNO SKY S.R.L. (TECHNO SKY), affiliated or linked to ENAV, if it has accepted joint and several liability with the beneficiary (see Annex 3a)
- IDS AIRNAV SRL (IDS AIRNAV), affiliated or linked to ENAV
- ALMA MATER STUDIORUM - UNIVERSITA DI BOLOGNA (UNIBO), affiliated or linked to ENAV, if it has accepted joint and several liability with the beneficiary (see Annex 3a)
- BUSINESS INTEGRATION PARTNERS SPA (BIP), affiliated or linked to ENAV
- DEEP BLUE SRL (DEEP BLUE), affiliated or linked to ENAV
- FREQUENTIS COMSOFT GMBH (FCO), affiliated or linked to FRQ (FSP)
- INDRA NAVIA AS (INDRA NAVIA), affiliated or linked to INDRA, if it has accepted joint and several liability with the beneficiary (see Annex 3a)
- AVINOR FLYSIKRING AS (AVINOR), affiliated or linked to INDRA
- SAAB KOCKUMS AKTIEBOLAG (Saab Kockums), affiliated or linked to SAAB (NATMIG)
- THALES DEUTSCHLAND GMBH (THALES-DE), affiliated or linked to THALES AIR SYS, if it has accepted joint and several liability with the beneficiary (see Annex 3a)

<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.

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 13
- RP2: from month 14 to month 25
- RP3: from month 26 to month 37

### 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 **3 690 170.53** (three million six hundred and ninety thousand one hundred and seventy EURO and fifty three 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 **307 514.21** (three hundred and seven thousand five hundred and fourteen EURO and twenty one eurocents), corresponding to 5% of the maximum grant amount (see Article 5.1), is retained by the JU from the pre-financing payment and transferred into the ‘**Guarantee Fund**’.

### **21.3 Interim payments — Amount — Calculation**

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

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

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

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

Step 1 — Application of the reimbursement rates

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

#### **21.3.1 Step 1 — Application of the reimbursement rates**

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

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

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

$$\begin{aligned} &\{90\% \text{ of the maximum grant amount (see Article 5.1)} \\ &\text{minus} \\ &\{\text{pre-financing and previous interim payments}\}\}. \end{aligned}$$

### **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:

$$\begin{aligned} & \{\text{final grant amount (see Article 5.3)} \\ & \text{minus} \\ & \{\text{pre-financing and interim payments (if any) made}\}. \end{aligned}$$

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) if the minimum number of beneficiaries set out in the call for proposals has acceded to the Agreement (see Article 56) and

(b) to beneficiaries that have acceded to the Agreement (see Article 56).

### 21.8 Bank account for payments

All payments will be made to the following bank account:

Name of bank: COMMERZBANK AG  
Full name of the account holder: DLR EV  
IBAN code: DE36370400440503304864

### 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 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’**).

<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.

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**

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**

<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 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**

Not applicable

### **25.6 Consequences of non-compliance**

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

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

## **SUBSECTION 3 RIGHTS AND OBLIGATIONS RELATED TO RESULTS**

### **ARTICLE 26 — OWNERSHIP OF RESULTS**

#### **26.1 Ownership by the beneficiary that generates the results**

Results are owned by the beneficiary that generates them.

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

#### **26.2 Joint ownership by several beneficiaries**

Two or more beneficiaries own results jointly if:

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

<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.



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 874470. 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 874470. 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 874470. 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**

#### **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**

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

<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).

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).

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:

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<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)



- **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.

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 874470. 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 874470. 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.

<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.

## 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).

### 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.

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<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).

## **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;

<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).

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

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

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

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

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

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

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

{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/research/participants/portal/desktop/en/projects/>

The JU will formally notify the coordinator and beneficiaries in advance any changes to this URL.

**Formal notifications on paper** (only after the payment of the balance) addressed **to the JU** must be sent to the 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.

### **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.

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<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).

An amendment **takes effect** on the date agreed by the parties or, in the absence of such an agreement, on the date on which the amendment enters into force.

## **ARTICLE 56 — ACCESSION TO THE AGREEMENT**

### **56.1 Accession of the beneficiaries mentioned in the Preamble**

The other beneficiaries must accede to the Agreement by signing the Accession Form (see Annex 3) in the electronic exchange system (see Article 52) within 30 days after its entry into force (see Article 58) and for beneficiaries for which the JU has requested joint and several liability of a linked third party, by also submitting — at accession — a declaration on joint and several liability (see Annex 3a) signed by the third party.

They will assume the rights and obligations under the Agreement with effect from the date of its entry into force (see Article 58).

If a beneficiary does not accede to the Agreement within the above deadline, the coordinator must — within 30 days — request an amendment to make any changes necessary to ensure proper implementation of the action. This does not affect the JU's right to terminate the Agreement (see Article 50).

### **56.2 Addition of new beneficiaries**

In justified cases, the beneficiaries may request the addition of a new beneficiary.

For this purpose, the coordinator must submit a request for amendment in accordance with Article 55. It must include an Accession Form (see Annex 3) signed by the new beneficiary in the electronic exchange system (see Article 52).

New beneficiaries must assume the rights and obligations under the Agreement with effect from the date of their accession specified in the Accession Form (see Annex 3).

## **ARTICLE 57 — APPLICABLE LAW AND SETTLEMENT OF DISPUTES**

### **57.1 Applicable law**

The Agreement is governed by the applicable EU law, supplemented if necessary by the law of Belgium.

### **57.2 Dispute settlement**

If a dispute concerning the interpretation, application or validity of the Agreement cannot be settled amicably, the General Court — or, on appeal, the Court of Justice of the European Union — has sole jurisdiction. Such actions must be brought under Article 272 of the Treaty on the Functioning of the EU (TFEU).

As an exception, if such a dispute is between the JU and SINTEF AS, AVINOR AS, FLUGHAFEN ZÜRICH AG, 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.

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 — 874470 — PJ05-W2 DTT**

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# 1.1. The project summary

Project Number <sup>1</sup>	874470	Project Acronym <sup>2</sup>	PJ05-W2 DTT
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## One form per project

### General information

Project title <sup>3</sup>	PJ05-W2 Digital Technologies for Tower
Starting date <sup>4</sup>	01/12/2019
Duration in months <sup>5</sup>	37
Call (part) identifier <sup>6</sup>	H2020-SESAR-2019-1
Topic	SESAR-IR-VLD-WAVE2-05-2019 PJ.05 W2 Digital technologies for Tower
Fixed EC Keywords	
Free keywords	Remote Towers, Multiple, Remote Tower Center, HMI for Aerodrome Controller

### Abstract <sup>7</sup>

PJ.05-W2 Digital technologies for Tower - SESAR-IR-VLD-WAVE2-05-2019 deals with two Solutions: Solution 35: "Multiple Remote Tower and Remote Tower centre" and with solution 97: "HMI Interaction modes for Airport Tower". 14 SESAR members (in sum 31 legal beneficiaries) showed interest in these solutions. For solution 35 cost-effectiveness is the principal key performance area (KPA). It proposes the development of a remotely provided aerodrome air traffic service by a "multiple" and/or "center" setting. Those settings help to combine ATS services from various aerodromes in a centralized control room independent on airport location in order to make use of the valuable resource ATS provider more efficiently. In the end, the passengers will benefit from by a better passenger comfort in terms of shorter travel times and better point to point connections. PJ05 will bring the multiple/center concept to such a matured level ready for industrialization.

PJ05-Solution 97 aims to validate, in different Airport operating environments, innovative HMI modes and associated technologies. Those solutions are expected to positively contribute to the Safety and HP KPAs with reduced Controllers' head down time and workload, as well as increased situation awareness and controllers' productivity. The PJ05-W2 DTT attracted plenty of European organisations to participate: ANSPs, industries, R&D and airport stakeholder intends to provide their specific competences to broaden the operational needs and technological expertises. The PJ05 variety of partners and validation activities will help to adequately reflect the variety of operational needs and technical solutions which in the end of the project will consolidate into a harmonized and widely accepted SESAR2020 PJ05 solution. The complete 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 and external to SESAR2020 projects.

## 1.2. List of Beneficiaries

 Associated with document Ref. Ares(2019)7261330 - 25/11/2019

Project Number <sup>1</sup>	874470	Project Acronym <sup>2</sup>	PJ05-W2 DTT
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### List of Beneficiaries

No	Name	Short name	Country	Project entry month <sup>8</sup>	Project exit month
1	DEUTSCHES ZENTRUM FUER LUFT - UND RAUMFAHRT EV	DLR (AT-One)	Germany	1	37
2	STICHTING NATIONAAL LUCHT- EN RUIMTEVAARTLABORATORIUM	NLR (AT-One)	Netherlands	1	37
3	RIZENI LETOVEHO PROVOZU CESKE REPUBLIKY STATNI PODNIK	ANS CR (B4)	Czechia	1	37
4	LETOVE PREVADZKOVE SLUZBY SLOVENSKEJ REPUBLIKY, STATNY PODNIK	LPS SR (B4)	Slovakia	1	37
5	VALSTYBES IMONE ORO NAVIGACIJA	ON (B4)	Lithuania	1	37
6	POLSKA AGENCJA ZEGLUGI POWIETRZNEJ	PANSA (B4)	Poland	1	37
7	AUSTRO CONTROL OSTERREICHISCHE GESELLSCHAFT FUR ZIVILLUFTFAHRT MBH	ACG/COOPANS	Austria	1	37
8	CROATIA CONTROL, CROATIAN AIR NAVIGATION SERVICES LTD	CCL/COOPANS	Croatia	1	37
9	UDARAS EITLIOCHTA NA HEIREANN THE IRISH AVIATION AUTHORITY	IAA/COOPANS	Ireland	1	37
10	LUFTFARTSVERKET	LFV/COOPANS	Sweden	1	37
11	NAVIAR	Naviar/COOPANS	Denmark	1	37
12	DFS DEUTSCHE FLUGSICHERUNG GMBH	DFS	Germany	1	37
13	ENAI	ENAI	Spain	1	37
14	ENAV SPA	ENAV	Italy	1	37
15	EUROCONTROL - EUROPEAN ORGANISATION FOR THE SAFETY OF AIR NAVIGATION	EUROCONTROL	Belgium	1	37
16	ATOS BELGIUM	ATOS (FSP)	Belgium	1	37
17	FREQUENTIS AG	FRQ (FSP)	Austria	1	37
18	HUNGAROCONTROL MAGYAR LEGIFORGALMISZOLGALAT ZARTKORUEN MUKODO RESZVENYTARSASAG	HC (FSP)	Hungary	1	37
19	INDRA SISTEMAS SA	INDRA	Spain	1	37
20	LEONARDO - SOCIETA PER AZIONI	LDO	Italy	1	37
21	AIRTEL ATN LIMITED	AIRTEL (NATMIG)	Ireland	1	37
22	SAAB AKTIEBOLAG	SAAB (NATMIG)	Sweden	1	37

## 1.2. List of Beneficiaries

No	Name	Short name	Country	Project entry month <sup>8</sup>	Project exit month
23	SINTEF AS	SINTEF (NATMIG)	Norway	1	37
24	AEROPORTS DE PARIS SA	ADP (SEAC2020)	France	1	37
25	AVINOR AS	AVINOR-SEAC2020	Norway	1	37
26	HEATHROW AIRPORT LIMITED	HAL (SEAC2020)	United Kingdom	1	37
27	FLUGHAFEN MUNCHEN GMBH	MUC (SEAC2020)	Germany	1	37
28	SCHIPHOL NEDERLAND B.V.	SNBV (SEAC2020)	Netherlands	1	37
29	SWEDAVIA AB	SWED(SEAC2020)	Sweden	1	37
30	FLUGHAFEN ZURICH AG	ZRH (SEAC2020)	Switzerland	1	37
31	THALES LAS FRANCE SAS	THALES AIR SYS	France	1	37

## 1.3. Workplan Tables - Detailed Implementation

Associated with document Ref. Ares(2019)7261330 - 25/11/2019

### 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 - DLR (AT-One)	15.00	1	37
WP2	Sol35 - Multiple Remote Tower and Remote Tower Centre	10 - LFV/COOPANS	786.81	1	37
WP3	Sol97 - HMI Interactions mode for Airport Tower	14 - ENAV	573.51	1	37
WP4	Ethics requirements	1 - DLR (AT-One)	N/A	1	37
<b>Total</b>			1,375.32		

### 1.3.2. WT2 list of deliverables

<b>Deliverable Number<sup>14</sup></b>	<b>Deliverable Title</b>	<b>WP number<sup>9</sup></b>	<b>Lead beneficiary</b>	<b>Type<sup>15</sup></b>	<b>Dissemination level<sup>16</sup></b>	<b>Due Date (in months)<sup>17</sup></b>
D1.1	Project Management Plan	WP1	1 - DLR (AT-One)	Report	Confidential, only for members of the consortium (including the Commission Services)	2
D1.2	Management Progress Report 1	WP1	1 - DLR (AT-One)	Report	Confidential, only for members of the consortium (including the Commission Services)	11
D1.3	Management Progress Report 2	WP1	1 - DLR (AT-One)	Report	Confidential, only for members of the consortium (including the Commission Services)	23
D1.4	Final Project Report	WP1	1 - DLR (AT-One)	Report	Public	35
D2.1	PJ.05-35-V3 Data Pack	WP2	10 - LFV/COOPANS	Report	Public	35
D3.1	PJ.05-97-TRL4 Data Pack	WP3	14 - ENAV	Report	Public	35
D4.1	OEI - Requirement No. 3	WP4	1 - DLR (AT-One)	Ethics	Confidential, only for members of the consortium (including the Commission Services)	12

### 1.3.3. WT3 Work package descriptions

<b>Work package number</b> <sup>9</sup>	WP1	<b>Lead beneficiary</b> <sup>10</sup>	1 - DLR (AT-One)
<b>Work package title</b>	Project Management		
<b>Start month</b>	1	<b>End month</b>	37

#### 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: 1-37]

##### DLR (AT-One)

Project Management and Coordination (M1-M36). 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-M36). 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-M36). 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-M36). 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-M36). The coordinator provides input to the Programme Committee and its sub-committees meetings and supports discussions through the participating Members of the committee.

Communication & Dissemination activities according to §2.2.

Administration of the project according to the grant agreement.

#### Participation per Partner

Partner number and short name	WP1 effort
1 - DLR (AT-One)	15.00
<b>Total</b>	15.00

#### 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>
D1.1	Project Management Plan	1 - DLR (AT-One)	Report	Confidential, only for members of the consortium (including	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>
				the Commission Services)	
D1.2	Management Progress Report 1	1 - DLR (AT-One)	Report	Confidential, only for members of the consortium (including the Commission Services)	11
D1.3	Management Progress Report 2	1 - DLR (AT-One)	Report	Confidential, only for members of the consortium (including the Commission Services)	23
D1.4	Final Project Report	1 - DLR (AT-One)	Report	Public	35

### Description of deliverables

WP1 deliverables serve the purpose to report on the objectives, the current progress, the next steps to achieve and the final project results.

D1.1 : Project Management Plan [2]

Project Management Plan

D1.2 : Management Progress Report 1 [11]

Management Progress Report

D1.3 : Management Progress Report 2 [23]

Management Progress Report

D1.4 : Final Project Report [35]

Final Project Report

### Schedule of relevant Milestones

Milestone number <sup>18</sup>	Milestone title	Lead beneficiary	Due Date (in months)	Means of verification
MS4	Project Finalisation	1 - DLR (AT-One)	30	Main project objectives available to finalise the project within the project life time of 37 months

<b>Work package number</b> <sup>9</sup>	WP2	<b>Lead beneficiary</b> <sup>10</sup>	10 - LFV/COOPANS
<b>Work package title</b>	Sol35 - Multiple Remote Tower and Remote Tower Centre		
<b>Start month</b>	1	<b>End month</b>	37

### Objectives

Develop and validate concepts and systems covering the scope and objectives of SESAR Solution PJ.05-35 "Multiple Remote Tower and Remote Tower centre", addressing the following OI steps:

- o SDM-0210: 'Highly Flexible Allocation of Aerodromes to Remote Tower Modules'

Produce the associated deliverables to this SESAR solution and prototypes.

The objective is to achieve V3 maturity level at the end of wave 2.

The work package comprises of all activities related to this, i.e. develop the concept, provide the platform and prototypes, validate it and provide the V3 datapack

### Description of work and role of partners

**WP2 - Sol35 - Multiple Remote Tower and Remote Tower Centre** [Months: 1-37]  
**LFV/COOPANS**, DLR (AT-One), NLR (AT-One), ON (B4), PANSA (B4), ACG/COOPANS, CCL/COOPANS, Naviar/COOPANS, DFS, ENAIRE, ENAV, FRQ (FSP), HC (FSP), INDRA, LDO, SAAB (NATMIG), SINTEF (NATMIG), SWED(SEAC2020), THALES AIR SYS

Perform all necessary activities to achieve V3 maturity of solution PJ.05 solution 35 at the end of wave 2. This includes:

**T.02-35.00 Solution Management**  
Task Description Operational and technical coordination of the SESAR PJ.05 solution 35, management of related validation activities, timely delivery of V3 data pack.  
Deliverable (SGA Contractual) Solution PJ.05-35: V3 Data Pack  
Lead LFV/COOPANS  
Contributors DLR (AT-One), NLR (AT-One), ON (B4), PANSA (B4), LFV/COOPANS, ACG/COOPANS, CCL/COOPANS, NAVIAR/COOPANS, DFS, ENAV, FRQ (FSP) and HC (FSP), INDRA (with the support of Indra Navia, HC (FSP) and Avinor), SAAB (NATMIG), SINTEF (NATMIG), SWED(SEAC2020), LDO, THALES AIR SYS  
Contribution Description  
LFV/COOPANS LFV/COOPANS will act as leader for solution 35  
All All partners will provide the required input

**T.02-35.01 Concept Development**  
Task Description Development and update of V3 OSED/SPR/INTEROP for solution 35 at V3 maturity for SDM-0210. This activity will consist of the development of operational, safety, performance and interoperability requirements. Wave 1 version (V2) of OSED/SPR/INTEROP will be used as input to the validation plan (VALP). The V2 set of operational, safety, performance and interoperability requirements will then be updated based on the results of the V3 validation exercises.  
Deliverable (PMP): PJ.05-35 OSED-SPR-INTEROP (V3)  
Lead  
LFV/COOPANS will lead the overall task as well as OSED development  
ENAV will lead the overall task Human Performance  
INDRA will lead the overall task Safety Assessment  
Contributors ON (B4), PANSA (B4), DFS, LFV/COOPANS, ACG/COOPANS, CCL/COOPANS, Naviar/COOPANS, ENAIRE, ENAV, LDO, HC and FRQ (both FSP), INDRA (with the support of Indra Navia, HC (FSP) and Avinor), NLR, SAAB (NATMIG), THALES AIR SYS  
Contribution Description  
DFS DFS will provide input to OSED and SPR requirements based on the validation results and operational experience. LFV/COOPANS will lead work on OSED coordinating all inputs from partners with baseline of inputs from own validation activities and experience from trials. COOPANS partners will invite to trials and provide input to Safety and Human Performance Requirements for the SPR based on results from validations.  
ENAIRE ENAIRE will lead work on OSED part V, Performance Assessment Reports  
ON (B4) ON (B4) will provide input to OSED on Requirements, as derived from the validation results an operational experience.



ON (B4) will provide input on Safety and Performance Requirements as derived from the validation results an operational experience.

PANSA (B4) PANSA (B4) will provide input to OSED on Requirement and Use Cases as well as will support overall deliverable production.

ENAV will provide operational input to OSED and will contribute to the requirements definition, based on its operational experience and on previous R&D activities. ENAV will also participate in the consolidation and review process of OSED.

ENAV will support the solution team in the definition of safety and performance requirements, based on its operational experience and on previous R&D activities. ENAV will also participate in the consolidation and review process of SPR LDO LDO will define interoperability requirements in terms of provision of MET data.

HC (FSP) HC (FSP) will provide input to OSED on Requirements based on the validation results an operational experience.

HC (FSP) will provide input on Safety and Performance Requirements based on the validation results an operational experience

INDRA INDRA (with the support of Indra Navia, HC (FSP) and Avinor) will contribute to OSED and SPR based on validation results and operational experience.

INDRA (with the support of Indra Navia, HC (FSP) and Avinor) will provide inputs to the INTEROP.

SAAB (NATMIG) SAAB (NATMIG) will contribute to INTEROP.

THALES AIR SYS Thales will contribute as ground manufacturer to INTEROP with respect to basic ground surveillance.

LDO will contribute to the OSED and SPR via UKSATSE ANSP support, and directly to INTEROP.

#### T.02-35.02 Technical Specification

Task Description The TS-IRS at V3 maturity will be developed for solution 35. This activity will consist in the development of technical requirements. The task will update the initial set of V2 technical requirements which were derived in wave 1 based on the results of the V3 validation exercises and on the V3 OSED/SPR/INTEROP

Deliverable (PMP): PJ.05-35 TS-IRS (V3)

Lead SAAB (NATMIG)

Contributors INDRA (with the support of Indra Navia, HC (FSP) and Avinor), FRQ (FSP), SAAB (NATMIG), SINTEF (NATMIG), LDO, THALES AIR SYS

Contribution Description

LDO LDO will describe the MET system necessary to support RTO with a flexible allocation of airports to RTMs.

FRQ (FSP) FRQ (FSP) will contribute with technical requirements and INTEROP

INDRA INDRA (with the support of Indra Navia, HC (FSP) and Avinor) will contribute to the Technical Specification.

SAAB (NATMIG)

SINTEF (NATMIG) SAAB (NATMIG) will coordinate work split and contribute to the technical specification.

SINTEF (NATMIG) will contribute to the technical specification based on wave 1 results.

THALES AIR SYS Thales will contribute as ground manufacturer to Technical Specification with respect to basic ground surveillance.

#### T.02-35.03 Cost Benefit Analysis

Task Description The CBA at V3 maturity will be developed for solution 35. The CBA will consider the results of the validation exercises in order to assess the performance with respect to the addressed KPA (but especially considering the cost-efficiency)

Deliverable (PMP): PJ.05-35 CBA (V3)

Lead ENAV

Contributors LFV/COOPANS, DFS, ON (B4), ENAIRE, ENAV

Contribution Description

ON (B4) ON (B4) will provide inputs to the CBA according to the validation results gathered from deployed test platform.

LFV/COOPANS LFV/COOPANS will contribute with benefit mechanisms to the CBA.

DFS DFS will contribute with benefit mechanisms to the CBA.

ENAIRE ENAIRE will contribute with benefit mechanisms to the CBA.

ENAV will contribute to the CBA deliverable identifying costs and associated benefits

#### T.02-35.04 Validation Plan

Task Description Development of a consolidated V3 validation plan providing the context of validation and the validation approach (including validation objectives, benefit mechanisms, scenarios, assumptions, requirements, list of

exercises). In addition to this a detailed plan per exercise will be developed providing additional specific information on exercise setup and planning.

Deliverable (PMP): PJ.05-35 V3 Validation Plan

Lead

LFV/COOPANS will lead overall task as well as detailed Validation Plan for COOPANS partners Validation

DFS will lead detailed Validation Plan for COOPANS Validation

INDRA (with the support of Indra Navia, HC (FSP) and Avinor) will lead detailed Validation Plan for INDRA Validation

DLR (AT-One) will lead detailed Validation Plan for DLR (AT-One) Validation

ENAV will lead detail Validation Plan for its Validation planned in 2021

Contributors DLR (AT-One), ON (B4), PANSA (B4), LFV/COOPANS, NAVIAIR/COOPANS, CCL/COOPANS, ACG/COOPANS, DFS, FRQ (FSP), INDRA (with the support of Indra Navia, HC(FSP) and Avinor), SAAB (NATMIG), SINTEF (NATMIG), LDO, THALES AIR SYS, ENAV, HC (FSP)

Contribution Description

DLR (AT-One) DLR (AT-One) will provide HMI expertise and validation know-how to the Validation Plan with respect to the DLR (AT-One) validation exercise.

ON (B4) ON (B4) validation plan will address SDM-0210 of joint DLR-lead exercises focussing on flexible MRTM allocation and RTC supervisor role with the supporting tools needed. Automation functions to increase ATCO situation awareness planned to be covered as well. ON (B4) will contribute to the consolidated Validation Plan providing input to validation objectives, criteria and scenarios.

PANSA (B4) PANSA (B4) will contribute to the validation plan of joint, DLR-lead exercises as well as to consolidated VALP providing inputs to validation objectives.

LFV/COOPANS

Naviair/COOPANS

ACG/COOPANS

CCL/COOPANS COOPANS validation plan will address SDM-0210 focussing on the MRTM development and RTC supervisor planning tool development.

COOPANS partners will use data from SDM-0207 to enhance the CWP with more inputs on how to build an operative environment suitable for even more flexible solutions of remote tower control with a high capacity and safety.

COOPANS partners will coordinate work on the COOPANS Validation Plan and will provide operational input.

COOPANS partners will contribute to the consolidated Validation Plan providing input to validation objectives, criteria and scenarios.

DFS DFS validation plan will address SDM-0210 focussing on advanced automation functionalities being validated in a real-time simulation.

DFS will coordinate work on the DFS Validation Plan and will provide operational input.

DFS will lead development of the consolidated Validation Plan and provide input to validation objectives, criteria and scenarios.

ENAV validation plan will address the execution of real time simulation addressing the RTC supervisor role and required support systems, as well as transition aspects for handing over control of a remote tower module

HC (FSP) HC (FSP) will contribute to the consolidated Validation Plan providing input to validation objectives, criteria and scenarios.

FRQ (FSP) FRQ (FSP) will provide technical input to DFS Validation Plan.

INDRA INDRA (with the support of Indra Navia, HC (FSP) and Avinor) will provide the Validation Plan describing required integration tasks and the configuration of the platform used for the validation exercise.

INDRA (with the support of Indra Navia, HC (FSP) and Avinor) will also define validation scenarios and validation objectives for V3 validation, in particular the what, how, where and when to achieve Validation objectives and also the involvement in terms of resources/expertise and interactions between different stakeholders.

The validation plan will be provided with the validation objectives being co-ordinated between all V3 validations scheduled for solution 35.

SAAB (NATMIG)

SINTEF (NATMIG) SAAB (NATMIG) will provide technical input to the COOPANS validation plan and will contribute in workshops to provide input for validation plan.

SINTEF (NATMIG) will provide technical input to the validation plan including operational and technical guidelines for non-nominal events related to the network or the MRTMs at the RTC.

THALES AIR SYS Thales will provide technical input to the DFS validation plan the shadow mode platform regarding basic ground surveillance.

T.05-35.05 Prototyping and Platform Development

Task Description Development of necessary prototypes and platforms to support the different V3 validation exercises. It will include prototype development, verification activities, prototype integration into the platform, platform tests and acceptance.

Deliverable (PMP): PJ.05-35 Availability Notes

Lead

FRQ (FSP) will lead overall task and will lead prototyping and platform development for FSP Validation

LFV/COOPANS will lead AN in cooperation with SAAB (NATMIG) in lead for prototyping and platform development for COOPANS Validation

INDRA (with the support of Indra Navia, HC (FSP) and Avinor) will lead prototyping and platform development for INDRA Validation

DFS will lead prototyping and platform development for DFS Validation

ENAV will lead prototyping and platform development for ENAV validation, in cooperation with its LTP

Contributors DLR (AT-One), LFV/COOPANS, ACG/COOPANS, CCL/COOPANS, Naviar/COOPANS, ON (B4), PANSa (B4), DFS, LDO, FRQ (FSP), INDRA (with the support of Indra Navia, HC (FSP) and Avinor), SAAB (NATMIG), SINTEF (NATMIG), THALES AIR SYS,

Contribution Description

DLR (AT-One) DLR (AT-One) (with the support of HC(FSP), ON (B4) and PANSa (B4)) will enhance the remote Controller Working Position based on ANSPs' requirements.

DLR (AT-One) (with the support of FRQ (FSP)) will provide a real-time simulator platform to be able to simulate up to several aerodromes in a RTC with supervisor position, planning support and flexible allocation of airports to MRTMs. COOPANS partners will provide requirements for SAAB (NATMIG) platform based on operational and technical needs. Experts in the area of Human Performance and Airport Operations from COOPANS partners will participate in such investigations and will contribute to concept design of tools and features for the CWP and the RTC.

ON (B4) ON (B4) will develop data inputs needed for ON (B4) validation (electronic flight strips, surveillance data, etc.) to the validation platform.

PANSa (B4) PANSa (B4) will provide support to the validation platform design.

DFS DFS will provide the DFS validation platform (real-time simulator) in Langen as well as the shadow mode platform in Erfurt. DFS will develop the flight plan and surveillance related systems for the validation exercise and will co-ordinate integration of prototypes.

ENAV will provide its TBA3d validation platform, which will be further developed and integrated with CWPs and OTW displays to support RTC operations.

FRQ (FSP) FRQ (FSP) will contribute to the DFS validation platform in the area of video based visualization and video tracking.

FRQ (FSP) will contribute to the DLR (AT-One) validation platform in the area of planning and supervisor tools.

INDRA INDRA (with the support of Indra Navia, HC(FSP) and Avinor) will enhance the remote Controller Working Position based on Avinor and HC(FSP) requirements.

INDRA (with the support of Indra Navia, HC(FSP) and Avinor) will provide validation platforms including a real-time simulator platform to be able to simulate up to three aerodromes, and an optical system for shadow mode validations.

SAAB (NATMIG)

SINTEF (NATMIG)

SAAB (NATMIG) will provide an enhanced multiple RTM based based on COOPANS requirements.

SAAB (NATMIG) will contribute with a real-time simulator platform with the same interface to RTM as a normal remote airport and pseudo-pilot positions. Simulator with possibility to simulate traffic to many airports and several MRTM.

SAAB (NATMIG) will develop long term planning tools for a supervisor position and also for technical supervision for RTC.

SINTEF (NATMIG) will contribute by extending the development of the 3D modelling and machine learning prototype from Wave 1, with a focus on automated alarms.

THALES AIR SYS Thales will provide provide technical support to the integration of the ground surveillance component developed by Thales in Pj14-4-3/T04 to the shadow mode platform at the German Airport (Erfurt).

LDO will lead prototyping and platform development for LDO/UKSATSE validation based on UKSATSE requirements

T.02-35.06 Validation Exercises

Task Description Development of a consolidated V3 validation report providing an overview of the different validations and a summary of the conclusions and recommendations. In addition to this a detailed validation report per exercise will be developed.

Deliverable (PMP): PJ.05-35 V3 Validation Report

Leads

DLR (AT-One) will lead detailed Validation Report for DLR (AT-One) Validation

LFV/COOPANS will lead detailed Validation Report for COOPANS Validation

INDRA (with the support of Indra Navia, HC(FSP) and Avinor) will lead detailed Validation Report for INDRA Validations

ENAV will lead detailed Validation Report for ENAV Validation

DFS will lead Validation Report and detailed report for DFS Validation

Contributors DLR (AT-One), ON (B4), PANSa (B4), LFV/COOPANS, ACG/COOPANS CCL/COOPANS, Naviar/COOPANS, DFS, FRQ (FSP), INDRA (with the support of Indra Navia, HC(FSP) and Avinor), SAAB (NATMIG), SINTEF (NATMIG), LDO, THALES AIR SYS, HC (FSP)

Contribution Description

DLR (AT-One) DLR (AT-One) will execute the DLR (AT-One) V3 validation and will lead development of DLR (AT-One) validation report and also contribute to the consolidated validation report. DLR (AT-One) will prepare, execute and analyse DLR (AT-One) V3 validation being a real-time simulation.

DLR (AT-One) will provide Human Factors validation expertise to ensure high quality data from activities to meet operative improvements and safety levels. DLR (AT-One) will use engineers skilled from Remote Tower implementation to provide relevant data from research activities to final deliverables

ON (B4) ON (B4) will support execution of the joint V3 validation providing controllers. PANSa (B4) will support development of validation report and also contribute to the consolidated validation report.

ON (B4) will support DLR (AT-One) validation activity by providing controllers and operational expertise.

PANSa (B4) PANSa (B4) will support execution of the joint V3 validation providing controllers. PANSa (B4) will support development of validation report and also contribute to the consolidated validation report.

PANSa (B4) will support DLR (AT-One) validation activity by providing controllers and operational expertise.

COOPANS partners will execute the COOPANS V3 validation providing controllers. COOPANS partners will lead development of COOPANS validation report and also contribute to the consolidated validation report. COOPANS partners will prepare, execute and analyse COOPANS V3 validation being a real-time simulation.

COOPANS partners will provide operators during COOPANS validations to ensure high quality data from activities to meet operative improvements and safety levels. COOPANS partners will use engineers skilled from Remote Tower implementation to provide relevant data from research activities to final deliverables

DFS DFS will execute the DFS V3 validation providing controllers. DFS will lead development of DFS validation report and also contribute to the consolidated validation report. DFS will prepare, execute and analyse DFS V3 validation being a real-time simulation in combination with a shadow mode trial.

ENAV will execute the planned V3 validation providing controllers and contributing to the development of its part of the validation report. ENAV will prepare, execute and analyse V3 validation outcomes which is a real-time simulation

HC (FSP) HC (FSP) will provide operators during validations to develop relevant data and procedures to support operative improvements and safety levels of a multiple remote tower CWP including medium size airport and civil RPAS. HC (FSP) will use engineers skilled from Remote Tower implementation to provide proper technical information to final deliverables.

FRQ (FSP) FRQ (FSP) will provide technical support during DFS and DLR (AT-One) validation

INDRA INDRA (with the support of Indra Navia, HC(FSP) and Avinor) will produce the Validation Report according to the inputs collected during the validation, summarising the activities undertaken to prepare the environment (including resources and training) and the conduction of the validation according to the plans.

This validation report will serve as basis for the update of the V2 Data pack Contribution.

SAAB (NATMIG)

SINTEF (NATMIG) SAAB (NATMIG) will participate and support validations exercises.

SINTEF (NATMIG) will contribute to the validation report by describing the resilience and flexibility of MRTM reconfiguration in case of non-nominal events related to the network of the modules at the RTC.

THALES AIR SYS THALES AIR SYS will participate and support the DFS validation exercise using shadow mode platform.

LDO will lead detailed Validation Report for Leonardo/UKSATSE Validation exercise.

#### Participation per Partner

Partner number and short name	WP2 effort
1 - DLR (AT-One)	26.10
2 - NLR (AT-One)	4.30
5 - ON (B4)	26.00

Partner number and short name	WP2 effort
6 - PANS (B4)	30.14
7 - ACG/COOPANS	4.76
8 - CCL/COOPANS	1.70
10 - LFV/COOPANS	31.56
11 - Naviair/COOPANS	4.39
12 - DFS	64.00
13 - ENAIRE	4.41
CRIDA	10.31
14 - ENAV	15.60
NAIS	8.85
TECHNO SKY	21.38
IDS AIRNAV	10.67
BIP	8.00
DEEP BLUE	5.14
17 - FRQ (FSP)	111.66
FCO	25.59
18 - HC (FSP)	8.13
19 - INDRA	52.23
INDRA NAVIA	124.50
AVINOR	1.19
20 - LDO	109.80
22 - SAAB (NATMIG)	44.00
23 - SINTEF (NATMIG)	17.00
29 - SWED(SEAC2020)	1.00
31 - THALES AIR SYS	1.00
THALES-DE	13.40
<b>Total</b>	<b>786.81</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	PJ.05-35-V3 Data Pack	10 - LFV/COOPANS	Report	Public	35

#### Description of deliverables

All deliverables will provide data to the V3 documents related to PJ.05 sol 35.

D2.1 : PJ.05-35-V3 Data Pack [35]

Data Pack V3 including OSED/SPR/INTEROP, TS, CBA for PJ.05-35

#### Schedule of relevant Milestones

<b>Milestone number<sup>18</sup></b>	<b>Milestone title</b>	<b>Lead beneficiary</b>	<b>Due Date (in months)</b>	<b>Means of verification</b>
MS5	M5 - HP and SAF Plan	10 - LFV/COOPANS	11	HP und SAF deliverable finalised
MS6	M6 - V3 Maturity Gate	10 - LFV/COOPANS	34	all documentation ready for entering the V3 Maturity Gate



<b>Work package number</b> <sup>9</sup>	WP3	<b>Lead beneficiary</b> <sup>10</sup>	14 - ENAV
<b>Work package title</b>	Sol97 - HMI Interactions mode for Airport Tower		
<b>Start month</b>	1	<b>End month</b>	37

### Objectives

To validate, by 2022, innovative HMI solutions that support the execution of ATCOs duty tasks in the Airport operating environment, thus reducing:  
 Controllers' need to switch in between of head down and head up view  
 Controllers' workload in overload situations  
 and increasing:  
 Controllers' workload in underload situations  
 situational awareness  
 safety of operations  
 controllers' productivity

### Description of work and role of partners

**WP3 - Sol97 - HMI Interactions mode for Airport Tower** [Months: 1-37]  
**ENAV**, DLR (AT-One), NLR (AT-One), ANS CR (B4), ON (B4), ACG/COOPANS, CCL/COOPANS, LFV/COOPANS, ENAIRE, EUROCONTROL, HC (FSP), INDRA, LDO

**Description of work**  
 T.03-97.01 Solution Management  
 Task Description Operational and technical coordination of the SESAR PJ.05 solution 97, management of related validation activities, timely delivery of TRL4 data pack.  
 Deliverable (SGA Contractual) N/A

**Lead ENAV**  
 Contributors DLR (AT-One), NLR (AT-One), ANS CR (B4), COOPANS, ENAIRE, EUROCONTROL, INDRA (with the support of Indra Navia and HC(FSP)), LDO, NATMIG  
 Contribution Description  
 ENAV ENAV will act as leader for solution 97 and provide the expected contributions  
 All All partners will support solution leader and provide the required input, especially those leading tasks

**T.03-97.02 System Requirements (TS/IRS)**  
 Task Description This task consists in the development of the technical requirements for the solution 97. The task will work to set an initial set of Technical Specifications to be used as baseline to start planning validation activities and then will consolidate it after the execution of the validations  
 Deliverable (SGA Contractual) D3.1 Solution PJ05-97 TRL4 Data Pack

**Lead INDRA (with the support of Indra Navia and HC(FSP))**  
 Contributors ENAIRE, ENAV, EUROCONTROL, LDO  
 Contribution Description  
 ENAIRE ENAIRE will contribute through the revision of the identified Technical Specification form the operational perspective  
 ENAV ENAV will contribute through the revision of the identified Technical Specification form the operational perspective  
 EUROCONTROL EUROCONTROL will contribute to the task by providing transversal expertise in support of TS to be used as reference for the future validations  
 INDRA INDRA (with the support of Indra Navia and HC(FSP)) will coordinate the different contributions to the deliverable and be responsible for the overall document  
 LDO LDO will actively contribute to the identification of the TS/IRS

**T.03-97.03 Technical Validation Plan**  
 Task Description This task provides the context of validation and the validation approach, including the identified validation objectives, the benefits mechanisms, the validation scenarios, the assumptions, and the list of exercises  
 Deliverable (SGA Contractual) N/A  
 Lead ENAIRE

Contributors ENAV, EUROCONTROL, ACG/COOPANS, CCL/COOPANS, DLR, ENAIRE, LDO, INDRA (with the support of Indra Navia and HC(FSP)), NLR (AT-One), ANS CR (B4), ON (B4)

#### Contribution Description

ACG/COOPANS ACG/COOPANS will contribute to the TVALP for those part of the document addressing the exercises where it is involved

ANS CR (B4) ANS CR will lead the Safety Assessment Plan

CCL/COOPANS CCL/COOPANS will provide Human Performance assessment for exercises 03 and 06

DLR (AT-One) DLR (AT-One) will contribute to the TVALP for those parts of the document addressing the exercises in which DLR is involved in (exercises 03 and 06).

ENAIRE ENAIRE will coordinate the different contributions and be responsible for the overall TVALP

ENAV ENAV will lead the Human Performance Assessment Plan

EUROCONTROL EUROCONTROL will contribute to the TVALP for those part of the document addressing the exercises where it is involved

INDRA INDRA (with the support of Indra Navia and HC(FSP)) will contribute to the VALP

LDO LDO will lead the identification of Security Requirements

NLR (AT-One) NLR (AT-One) will contribute to the TVALP for those part of the document addressing the exercises where it is involved

ON (B4) ON (B4) will contribute to the TVALP for those part of the document addressing the exercises 03 and 06

#### T.03-97.04 Availability Note

Task Description Development of necessary prototypes and platforms to support the different TRL4 validation exercises. It will include prototype development, verification activities, prototype integration into the platform, platform tests and acceptance

Deliverable (SGA Contractual) N/A

Lead ENAV

Contributors ENAIRE, EUROCONTROL, ACG(COOPANS), DLR, INDRA (with the support of Indra Navia and HC(FSP)), NLR (AT-One), ANS CR (B4), LDO

#### Contribution Description

ACG/COOPANS ACG/COOPANS will perform the described activities and contribute to the deliverable for the exercises 03 and 06

ANS CR (B4) ANS will perform the described activities and contribute to the deliverable for the exercises 03 and 06

DLR (AT-One) DLR (AT-One) will perform the described activities and contribute to the deliverable for the exercises 03 and 06

ENAIRE ENAIRE will perform the described activities and contribute to the deliverable for the exercise 05

ENAV ENAV will coordinate the different contribution to the deliverable and will specifically perform the described activities for the exercises 02 and 03

EUROCONTROL EUROCONTROL will perform the described activities and contribute to the deliverable for the exercise 03

INDRA INDRA (with the support of Indra Navia and HC(FSP)) will perform the described activities and contribute to the deliverable for the exercise 04

NLR NLR (AT-One) will perform the described activities and contribute to the deliverable for the exercise 01

LDO LDO will perform the described activities and contribute to the deliverable for the exercise 05

#### T.03-97.05 Validation Exercises

Task Description This task consists of the actual execution of the planned validation exercises

Deliverable (PMP): N/A

Lead ENAV

Contributors DLR (AT-One), ENAIRE, EUROCONTROL, ACG/COOPANS, CCL/COOPANS, LDO, INDRA (with the support of Indra Navia and HC(FSP)), ON (B4), NLR (AT-One), ANS CR (B4)

#### Contribution Description

ACG/COOPANS ACG/COOPANS executes the exercises 03 and 06

ANS CR (B4) ANS executes the exercises 03 and 06

ON (B4) ON (B4) executes the exercises 03 and 06

CCL/COOPANS CCL/COOPANS will provide Human Performance assessment for exercises 03 and 06

DLR (AT-One) DLR (AT-One) executes exercises 03 and 06

ENAIRE ENAIRE executes the exercise 05

ENAV ENAV executes the exercises 02 and 03

EUROCONTROL EUROCONTROL executes the exercise 03



INDRA INDRA (with the support of Indra Navia and HC(FSP)) executes the exercise 04  
LDO LDO executes the exercise 05  
NLR NLR (AT-One) executes the exercise 01

#### T.03-97.06 Technical Validation Report TRL4

Task Description This task develops a consolidated TRL4 validation report providing an overview of the different validations and a summary of the conclusions and recommendations

Deliverable (SGA Contractual) D3.1 Solution PJ05-97 TRL4 Data Pack

Lead LDO

Contributors ENAV, ENAIRE, EUROCONTROL, ACG/COOPANS, CCL/COOPANS, INDRA (with the support of Indra Navia and HC(FSP)), ON (B4), NLR, ANS CR (B4), DLR

Contribution Description

ACG/COOPANS ACG/COOPANS will contribute to the TVALR, for those part of the document addressing the exercises 03 and 06

ANS CR (B4) ANS CR (B4) will lead the Safety Assessment Report and contribute to VALR for those part addressing the exercises 03 and 06

ON (B4) ON (B4) will contribute to the TVALR for those parts of the document addressing exercises 03 and 06

CCL/COOPANS CCL/COOPANS will contribute to the TVALR for Human Performance for those parts of the document addressing exercises 03 and 06

DLR (AT-One) DLR (AT-One) will contribute to the TVALR for those parts of the document addressing which it is involved in (the exercises 03 and 06)

ENAIRE ENAIRE will contribute to the TVALR and contribute for exercise 05

ENAV ENAV will lead the Human Performance Assessment Plan

EUROCONTROL EUROCONTROL will contribute to the TVALR for those part of the document addressing the exercise 03

INDRA INDRA (with the support of Indra Navia and HC(FSP)) will contribute to the TVALR for the exercise 04

LDO LDO will coordinate the contributions to the validation report and lead the consolidation of Security Requirements

NLR NLR (AT-One) will contribute to the TVALR for those part of the document addressing the exercise 01

#### T.03-97.07 Cost Benefit Analysis for Technological Solution (CBAT) TRL4

Task Description This task will develop the Cost Benefit Analysis, considering the results of the exercises in order to assess the performance with respect to the addressed.

Deliverable (SGA Contractual) D3.1 Solution PJ05-97 TRL4 Data Pack

Lead LEONARDO

Contributors NLR, ENAV, COOPANS, HC (FSP), ENAIRE;

Contribution Description

NLR NLR will provide whatever relevant data will come out of technology evaluation activities (EXE-01) to the overarching CBA.

ENAV ENAV will contribute to the CBA for the part relevant to EXE-02 and EXE-03 if needed.

HC HC will contribute to the CBA for the part relevant to EXE-04.

ENAIRE ENAIRE will contribute to the CBA focusing on the part relevant to EXE 05

ON (B4) ON (B4) will contribute to the CBA for the parts relevant to EXE-03 and EXE-06.

LEONARDO LEONARDO will coordinate and contribute to this task by preparing a Cost Benefits Analysis document, in cooperation with task partners

#### T.03-97.08 Roadmap to TRL 6

Task Description This task will produce the Initial Technical Validation Plan (TVALP) defining the validation roadmap for phase TRL6

Deliverable (SGA Contractual ) N/A

Lead ENAIRE

Contributors INDRA, DLR, ACG/COOPANS, ON (B4), HC

Contribution Description

ENAIRE ENAIRE will coordinate the different contributions and be responsible for the overall TVALP

INDRA Indra Navia supported by Indra will contribute to Roadmap to TRL6 on the basis of the interest on possible future TRL 6 exercises.

DLR (AT-One) DLR will contribute to the task on the basis of possible interest in TRL6 future exercises

ACG/COOPANS ACG/COOPANS will contribute to the task on the basis of possible interest in TRL6 future exercises

ON (B4) ON (B4) will contribute to the task on the basis of possible interest in TRL6 future exercises

HC HC will contribute to the task on the basis of possible interest in TRL6 future exercises

#### T.03-97.09 Communications and Dissemination

**Task Description** This task covers the execution of all the communications and disseminations expected to be performed within PJ05-Solution 97, like for example: participation to the conferences, preparation of papers/publications, live demonstrations

**Deliverable (SGA Contractual)** N/A

**Lead ENAV**

**Contributors** DLR, EUROCONTROL

**Contribution Description**

DLR (AT-One) DLR (AT-One) will contribute to the task, by organizing events, which correlate with the validation exercise 06. DLR will also transform parts of the TVALR into a scientific paper and if accepted present to the corresponding scientific conference (e.g. at the SESAR Innovation Days).

ENAV ENAV will coordinate this task by preparing a dedicated communications and dissemination plan, in cooperation with task partners and in correspondence of specific PJ05-97 milestones/achievements

EUROCONTROL EUROCONTROL will contribute to the task, by organizing events, or directly contributing to the documents

#### Participation per Partner

Partner number and short name	WP3 effort
1 - DLR (AT-One)	16.40
2 - NLR (AT-One)	2.80
3 - ANS CR (B4)	8.00
Integra	9.00
5 - ON (B4)	12.92
7 - ACG/COOPANS	3.75
8 - CCL/COOPANS	5.18
10 - LFV/COOPANS	2.80
13 - ENAIRE	1.47
CRIDA	36.10
14 - ENAV	8.40
TECHNO SKY	9.16
UNIBO	54.68
DEEP BLUE	5.14
15 - EUROCONTROL	123.10
18 - HC (FSP)	4.08
19 - INDRA	60.48
INDRA NAVIA	74.85
20 - LDO	135.20
<b>Total</b>	<b>573.51</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	PJ.05-97-TRL4 Data Pack	14 - ENAV	Report	Public	35

### Description of deliverables

Deliverables:

D3.1 Solution PJ05-97 TRL4 Data Pack: the datapack will include the final versions of:

- Final TRL4 TS/IRS - 08/22: this deliverable will provide the updated set of System Requirements after the execution of the validations.
- CBAT: this deliverable will provide a quantitative assessment of costs and benefits in order to figure out the economic feasibility of the solution.

Supported by:

- TRL4 TVALP: This deliverable will describe the context of validation and the validation approach, including the identified validation objectives, the benefits mechanisms, the validation scenarios, the assumptions, and the list of exercises.
- TRL4 TVALR - 06/22: this report will provide an overview of the different validations and a summary of the conclusions and recommendations.

Complemented by:

- TRL6 Roadmap /draft TVALP: This deliverable will represent the initial Technical Validation Roadmap for TRL 6.

D3.1 : PJ.05-97-TRL4 Data Pack [35]

D3.1 Solution PJ05-97 TRL4 Data Pack: the datapack will include the final versions of: - Final TRL4 TS/IRS - 08/22: this deliverable will provide the updated set of System Requirements after the execution of the validations. - CBAT: this deliverable will provide a quantitative assessment of costs and benefits in order to figure out the economic feasibility of the solution. Supported by: - TRL4 TVALP: This deliverable will describe the context of validation and the validation approach, including the identified validation objectives, the benefits mechanisms, the validation scenarios, the assumptions, and the list of exercises. - TRL4 TVALR - 06/22: this report will provide an overview of the different validations and a summary of the conclusions and recommendations. Complemented by: - TRL6 Roadmap /draft TVALP: This deliverable will represent the initial Technical Validation Roadmap for TRL 6.

### Schedule of relevant Milestones

Milestone number <sup>18</sup>	Milestone title	Lead beneficiary	Due Date (in months)	Means of verification
MS1	T97.M1 - Iteration 1	14 - ENAV	22	Intermediate milestone at the end of first bunch of validations: T97.05.01 - VALEXE-001 - RTS T97.05.02 - VALEXE-002 - RTS T97.05.03 - VALEXE-003 - RTS T97.05.04 - VALEXE-004 - SM
MS2	T97.M2 - Iteration 2	14 - ENAV	27	Intermediate Milestone after second bunch of validations: T97.05.05 - VALEXE-005 - RTS

**Schedule of relevant Milestones**

<b>Milestone number<sup>18</sup></b>	<b>Milestone title</b>	<b>Lead beneficiary</b>	<b>Due Date (in months)</b>	<b>Means of verification</b>
				T97.05.06 - VALEXE-006 - RTS
MS3	PJ05-97 TRL4 Maturity Gate	14 - ENAV	34	TRL4 Maturity Gate for Solution 97

<b>Work package number</b> <sup>9</sup>	WP4	<b>Lead beneficiary</b> <sup>10</sup>	1 - DLR (AT-One)
<b>Work package title</b>	Ethics requirements		
<b>Start month</b>	1	<b>End month</b>	37

### 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: 1-37]

**DLR (AT-One)**

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	OEI - Requirement No. 3	1 - DLR (AT-One)	Ethics	Confidential, only for members of the consortium (including the Commission Services)	12

### Description of deliverables

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

D4.1 : OEI - Requirement No. 3 [12]

The applicants must check the applicability of the Ethics guidelines for trustworthy AI developed by the High-Level Expert Group on AI (issued by the EC on 8 April 2019) and provide the results of this check 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	T97.M1 - Iteration 1	WP3	14 - ENAV	22	Intermediate milestone at the end of first bunch of validations: T97.05.01 - VALEXE-001 - RTS T97.05.02 - VALEXE-002 - RTS T97.05.03 - VALEXE-003 - RTS T97.05.04 - VALEXE-004 - SM
MS2	T97.M2 - Iteration 2	WP3	14 - ENAV	27	Intermediate Milestone after second bunch of validations: T97.05.05 - VALEXE-005 - RTS T97.05.06 - VALEXE-006 - RTS
MS3	PJ05-97 TRL4 Maturity Gate	WP3	14 - ENAV	34	TRL4 Maturity Gate for Solution 97
MS4	Project Finalisation	WP1	1 - DLR (AT-One)	30	Main project objectives available to finalise the project within the project life time of 37 months
MS5	M5 - HP and SAF Plan	WP2	10 - LFV/COOPANS	11	HP und SAF deliverable finalised
MS6	M6 - V3 Maturity Gate	WP2	10 - LFV/COOPANS	34	all documentation ready for entering the V3 Maturity Gate

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

Risk number	Description of risk	WP Number	Proposed risk-mitigation measures
1	Validation platform not ready in time	WP2, WP3	apply buffers in the detailed time schedule and enable transparency with the progress of all platform preparation activities enabled by monthly Project progress meetings
2	Project Partners out of a sudden withdraw from the committed tasks jeopardising reasonable results and passing the gate reviews	WP2, WP3	Provide redundancy with the Project partner skills and with the objectives of the validation exercises

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

	WP1	WP2	WP3	WP4	Total Person/Months per Participant
1 - DLR (AT-One)	15	26.10	16.40	✓	57.50
2 - NLR (AT-One)	0	4.30	2.80		7.10
3 - ANS CR (B4)	0	0	8		8
· Integra	0	0	9		9
4 - LPS SR (B4)	0	0	0		0
5 - ON (B4)	0	26	12.92		38.92
6 - PANSa (B4)	0	30.14	0		30.14
7 - ACG/COOPANS	0	4.76	3.75		8.51
8 - CCL/COOPANS	0	1.70	5.18		6.88
9 - IAA/COOPANS	0	0	0		0
10 - LFV/COOPANS	0	31.56	2.80		34.36
11 - Naviair/COOPANS	0	4.39	0		4.39
12 - DFS	0	64	0		64
13 - ENAIRE	0	4.41	1.47		5.88
· CRIDA	0	10.31	36.10		46.41
14 - ENAV	0	15.60	8.40		24
· NAIS	0	8.85	0		8.85
· TECHNO SKY	0	21.38	9.16		30.54
· IDS AIRNAV	0	10.67	0		10.67
· UNIBO	0	0	54.68		54.68
· BIP	0	8	0		8
· DEEP BLUE	0	5.14	5.14		10.28
15 - EUROCONTROL	0	0	123.10		123.10
16 - ATOS (FSP)	0	0	0		0



	WP1	WP2	WP3	WP4	Total Person/Months per Participant
17 - FRQ (FSP)	0	111.66	0		111.66
· FCO	0	25.59	0		25.59
18 - HC (FSP)	0	8.13	4.08		12.21
19 - INDRA	0	52.23	60.48		112.71
· INDRA NAVIA	0	124.50	74.85		199.35
· AVINOR	0	1.19	0		1.19
20 - LDO	0	109.80	135.20		245
21 - AIRTEL (NATMIG)	0	0	0		0
22 - SAAB (NATMIG)	0	44	0		44
· Saab Kockums	0	0	0		0
23 - SINTEF (NATMIG)	0	17	0		17
24 - ADP (SEAC2020)	0	0	0		0
25 - AVINOR-SEAC2020	0	0	0		0
26 - HAL (SEAC2020)	0	0	0		0
27 - MUC (SEAC2020)	0	0	0		0
28 - SNBV (SEAC2020)	0	0	0		0
29 - SWED(SEAC2020)	0	1	0		1
30 - ZRH (SEAC2020)	0	0	0		0
31 - THALES AIR SYS	0	1	0		1
· THALES-DE	0	13.40	0		13.40
<b>Total Person/Months</b>	15	786.81	573.51		1375.32

### *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	15	SJU	project review linked to the first period
RV2	27	SJU	project review linked to the second period

### 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

- VA        if virtual access,
- TA-uc    if trans-national access with access costs declared on the basis of unit cost,
- TA-ac    if trans-national access with access costs declared as actual costs, and
- TA-cb    if trans-national access with access costs declared as a combination of actual costs and costs on the basis of unit cost.

#### 23. Access costs

Cost of the access provided under the project. For virtual access fill only the second column. For trans-national access fill one of the two columns or both according to the way access costs are declared. Trans-national access costs on the basis of unit cost will result from the unit cost by the quantity of access to be provided.

## History of Changes

Version	Date	Who	What
0-01	2019-07-17	PJ05-W2 Coordinator	<ul style="list-style-type: none"> <li>Composition of this document from submitted PartB proposal by deleting all pages which are already included in Annex part A, i.e. which are automatically generated.</li> <li>Deletion of work package descriptions, effort, milestone and risk tables</li> <li></li> </ul>
0-02	2019-08-06	PJ05-W2 Ethics Coordinator	<ul style="list-style-type: none"> <li>Address the ethical requirements from EthSR via statements in section 5.1</li> </ul>
0-03	2019-08-09	PJ05-W2-WP3 Leader	<ul style="list-style-type: none"> <li>General public has been included as target group of dissemination activities in §2.2, to address Evaluation Summary report indication;</li> <li>Paragraph in §2.1 rephrased;</li> <li>Gantt chart for solution 97 updated (§3.1.1);</li> <li>Missing acronyms added in §6.</li> </ul>
0-04	2019-08-20	NLR Contributor	<ul style="list-style-type: none"> <li>Justification for other direct cost items of NLR (AT-One) was added (§3.4)</li> </ul>
0-05	2019-08-23	PJ05-W2 Ethics Coordinator	<ul style="list-style-type: none"> <li>Update section 5 with comments from Secretary to the SJU Administrative Board</li> </ul>
0-06	2019-08-27	PJ05-W2 Coordinator	<ul style="list-style-type: none"> <li>General proof check and final incorporation of the ESR comments/recommendations and submission to SJU</li> </ul>
0-07	2019-09-09	NLR (AT-One), ACG/COOPANS, NAVIAIR/COOPANS, FRQ (FSP), HC (FSP) LFV/COOPANS, PANSA (B4), ON (B4)	<ul style="list-style-type: none"> <li>Justification for other direct cost items of NLR (AT-One), ACG/COOPANS, NAVIAIR/COOPANS, FRQ (FSP), HC (FSP) LFV/COOPANS, PANSA (B4), ON (B4)now includes more detailed planning figures.</li> </ul>
0-08	2019-09-09	Sol-35 Lead	<ul style="list-style-type: none"> <li>Sol-35 (WP2) related SJU comments from 09/09/2019 addressed</li> </ul>

0-09	2019-09-09	ENAV CM	<ul style="list-style-type: none"> <li>Update of ENAV profile to better reflect the ENAV Group composition</li> <li>ENAV LTP change: IDS replaced by IDS AIRNAV</li> <li>Change of ENAV solution 97 leader and relevant CV</li> </ul>
		FRQ (FSP)	<ul style="list-style-type: none"> <li>Deletion of LTP FRQ RO (<i>Justification: After the proposal phase the contribution of the Frequentis group was repartitioned in order to reflect the continuation of the latest W1 lessons learned. For this reason the development and prototype contribution will be shifted from Frequentis Romania to the development team in Frequentis Vienna. This change does not influence the overall contribution of Frequentis and does not mean modification of the general terms of the proposal.</i>)</li> <li>chapter 4.2.17. in the part B section 4-5 therefore updated so that the consortia of the project will remain without the contribution of Frequentis Romania.</li> </ul>
0-10	2019-09-10	Saab (NATMIG)	<ul style="list-style-type: none"> <li>Updated justification for other direct cost items of Saab, section 3.4</li> </ul>
0-11	2019-09-12	Saab (NATMIG)	<ul style="list-style-type: none"> <li>Updated justification for other direct cost items of Saab, section 3.4</li> </ul>
0-12	2019-09-13	COOPANS	<ul style="list-style-type: none"> <li>Update according to GAP meeting, RPAS, Flow, APP etc updated. Coordination with EASA Eurocae added</li> </ul>
0-13	2019-09-13	ACG/COOPANS	<ul style="list-style-type: none"> <li>Update of section 4.2.7 with respect to subcontracted work</li> </ul>
0-14	2019-09-13	DLR-(AT-One)	<ul style="list-style-type: none"> <li>Update of §3.4 w.r.t. adoption of the process of the First Instalment to reduce max. grant amount</li> </ul>
0-15	2019-09-13	DLR (AT-One)	<ul style="list-style-type: none"> <li>Version upload on H2020 Portal for next SJU review due by 20/09/2019</li> </ul>
0-16	2019-09-20	DLR (AT-One)	<ul style="list-style-type: none"> <li>D2 D4.1H - Requirement No. 1, D3 D4.2 POPD - Requirement No. 2 and D5 D4.4 GEN - Requirement No. 4 has been deleted from §3.4</li> </ul>

			<ul style="list-style-type: none"> <li>§4.3 deleted by request of SJU</li> </ul>
0-17	2019-09-24	Saab (NATMIG)	<ul style="list-style-type: none"> <li>Updated justification for other direct cost items of Saab, section 3.4. Added cost in section 4.2.22.</li> </ul>
0-18	2019-09-25	EUROCONTROL	<ul style="list-style-type: none"> <li>Update section 4.2.15 to take into account SJU feedback O[v.2 (16 Sep 2019) - GM</li> </ul>
0-19	2019-09-25	COOPANS	<ul style="list-style-type: none"> <li>Update according to SJU feedback</li> </ul>
0-20	2019-09-26	HC (FSP)	<ul style="list-style-type: none"> <li>Update according to SJU feedback (section 3.4 table)</li> <li>Update according to SJU feedback (section 3.4 table)</li> </ul>
0-21	2019-09-26	ON (B4)	
0-22	2019-10-15		<ul style="list-style-type: none"> <li>ENAV LTP update</li> </ul>
0-23	2019-10-24		<ul style="list-style-type: none"> <li>Justification for other direct cost items of NLR (AT-One) now includes all detailed planning figures available.</li> <li>The ethics requirements 1,2,4 have been appropriately addressed during the GAP. Therefore, the relevant deliverables are cleared. Requirement 3 will be address during the project lifetime (M12) through a dedicated deliverable.</li> </ul>
0-24	2019-10-25		<ul style="list-style-type: none"> <li>LEONARDO update with §3.4 &amp; 4.2.20</li> <li>Update of section 3.4 table for PANSA (B4) according to SJU feedback</li> <li>Update of section 3.4 table for FRQ (FSP) according to SJU feedback</li> </ul>
0-25	2019-10-28		<ul style="list-style-type: none"> <li>Update of section 3.4 for COOPANS partners</li> </ul>
0.26	2019-11-04	NLR, FSP, COOPANS, ON	<ul style="list-style-type: none"> <li>SJU comments addressed (§3.4 update by NLR, FSP, COOPANS, ON (deletion / below 15%), and LDO, &amp; §4.2.20)</li> </ul>
0.27	2019-11-18	LDO	<ul style="list-style-type: none"> <li>SJU comments addressed §1.3, §3.4, &amp; §4.1.20 §4.2.20</li> </ul>
0.28	2019-11-19	DLR(AT-One)	<ul style="list-style-type: none"> <li>Final checkup for submission</li> </ul>

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## 1 Excellence

This project is part of the SESAR JU Single Programming Document 2019-2021. It is part of the Industrial Research & Validation phase, developed under the SJU Private Public Partnership, developed under the SJU Private Public Partnership and addresses topic SESAR-IR-VLD-WAVE2-05-2019.

### 1.1 Objectives

The project ‘PJ.05-W2 Digital technologies for Tower’ deals with two solutions:

- Solution 35: "Multiple Remote Tower and Remote Tower centre" and
- Solution 97: "HMI Interaction modes for Airport Tower".

The project aims to validate and progressively mature the addressed SESAR solutions and to contribute to the SESAR2020 Programme Lifecycle. The overall objective is to provide benefits to the ATM Network in the following key areas:

- Safety
- Capacity
- Efficiency
- Flexibility
- Cost-Efficiency

14 SESAR2020 members (in sum 31 legal beneficiaries) showed interest in these solutions.

#### 1.1.1 Objectives of Solution 35

The main objective of PJ.05-Solution 35: “Multiple Remote Tower and Remote Tower centre” is to validate SDM-0210, RTC with Flexible Allocation of Aerodromes to MRTMs, that the provision of ATS for two or three aerodromes is possible simultaneously, and concurrently reveals a sufficient level of safety of ATC service provision. To validate remote tower services for multiple airports, the work to be addressed focuses on different kinds of environment in order to determine the amount of airports to be controlled simultaneously. The different environments may be composed of:

- airport complexity,
- controller workload and
- type of traffic (VFR- IFR-mix, rotor-fixed wing, special, RPAS).

Technical aspects, such as network quality of service and other resilience/redundancy related issues that are of key importance to the regulatory authorities need to be addressed. Furthermore, the information needs for maintaining situational awareness including the actual status of the infrastructure (AIM) will be addressed from various operational perspectives. Technical degradation will be addressed to cover contingency during degraded modes.

Human Performance (HP) aspects in the working environment will be addressed, as well as the impact of different technical solutions on operations. Training and endorsement aspects will be considered for the aerodromes within an RTC.

Additionally the flexible use of the human resource ATCO/AFISO through a flexible and dynamic allocation of airports connected to different MRTMs will be investigated as well as a more flexible service for airport users. The Design of the Multiple Remote Tower Module is such that simultaneous landings and takeoffs at different aerodromes can be handled. Therefore the co-ordination from the MRTM to approach will remain the same. Integration of approach units will be investigated in needs of traffic control to the MRTM.

Aerodromes connected to an RTC struggle with low traffic volumes wherefore Flow Management seldom is an issue. The flexible allocation of aerodromes to an MRTM has a goal to allocate each aerodrome to ensure balanced traffic levels at each MRTM to mitigate any need for flow restrictions at any of the aerodromes. These aspects will be validated in the exercises.

Development of RTC supervisor planning tools and features for a flexible planning of aerodromes connected to remote tower centre will be addressed. The solution further addresses additional automation functionalities like, alerting and warnings for conflict. SWIM infrastructure, the need for the role of a RTC supervisor, technical aspects (e.g. network aspects, such as seamless integration of air/ground multi-sensor tracking), and situational awareness as indicator for safety will be considered by this solution. The solution SDM-0210, “RTC with Flexible Allocation of Aerodromes to MRTMs” aim for V3 maturity.

Information Management between MRTMs within a Remote Tower Centre will be addressed to ensure the full flexible allocation of aerodromes within the centre with SWIM infrastructure.

### **1.1.2 Objectives of Solution 97**

Solution 97 deals with operational and technical objectives of the Controller Working Position. It takes into account the work already performed during Wave 1 continuing to provide significant improvements thanks to advanced interaction methods with HMI.

Solution 97 main objective is to validate, by 2022, innovative HMI solutions that support the execution of ATCOs duty tasks in the Airport operating environment, thus reducing:

- Controllers’ need to switch in between of head down and head up view
- Controllers’ workload in overload situations

and increasing:

- Controllers’ workload in underload situations
- situational awareness
- safety of operations
- controllers’ productivity

Additionally, the solution will test the use of the developed solutions in different Airport operating environments, which may vary in layout complexity, traffic volumes, and meteorological conditions.

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

This document constitutes the SESAR2020 Consortium Members' response to the Industrial Research topic SESAR-IR-VLD-WAVE2-05-2019 by its project proposal: "PJ05-W2 Digital technologies for Tower".

The proposal with its solution 35 'Multiple Remote Tower and Remote Tower centre' addresses the remotely provision of Air Traffic Services (ATS) from a Remote Tower Centre (RTC) to a large number of airports (including the service provision to two or more airports from a remote tower position) thanks to a flexible and dynamic allocation of airports connected to different Multiple Remote Tower Modules (MRTM) over time. The solution continues and completes the work performed in wave 1 by SESAR solution #05-03 with a seamless continuation to move forward the concept on a V3 maturity level.

Solution 97 'HMI Interaction modes for Airport Tower' addresses the development of new human machine interface (HMI) interaction modes and technologies in order to minimise the load and mental strain on the Tower controllers (especially under high traffic density situations, low visibility conditions, etc.). These improvements may be applicable in current operations and/or in future operational concepts still in development under the scope of other SESAR solutions.

## **1.3 Concept and methodology**

### **1.3.1 Concept**

#### *1.3.1.1 PJ.05-W2-35 "Multiple Remote Tower and Remote Tower centre"*

#### **Main Ideas**

In SESAR 1 the concept for Single Remote Tower (SDM-0201), Contingency Remote Tower (SDM-0204) and Multiple Remote Tower for two very small aerodromes (SDM-0205) was developed. Based on this work the concept for Multiple Remote Tower was expanded in SESAR 2020 to cover more airports at a time and more traffic that is controlled from one MRTM. While PJ05 SDM-0207 (PJ.05.02 wave 1) is expected to reach V3 maturity in wave 1, PJ05 SDM-0210 (PJ.05.03 in wave 1) is expected to reach V2 maturity level in wave 1. Solution 35 is the successor of PJ05 solution 3 and will be validated up to V3 level in wave 2. This concept for solution 35 will be validated in several validation activities and validation platforms. Simulations will be performed to in a safe wave develop the concept with abnormal use cases and degraded modes of operations, this with ATCOs as test subjects. The validated concept aims at providing input for EASA for having common regulations for approval of CWP (that approved CWP from one NSA are approved for all ANSPs with minor local implementation).

Solution 35 is described as SDM-0210, 'RTC with Flexible Allocation of Aerodromes to MRTMs'. The solution aims at increasing cost efficiency. The objective for this solution is to develop and validate:

- A MRTM which allows ATCOs to provide ATS service to remote aerodromes while maintaining situational awareness for 3 airports simultaneously.
- The RTC and the dynamic allocation of airports between MRTMs.

The following traffic characteristics are just providing an indication of the traffic volumes regarding simultaneous movements (mix of IFR and VFR):

- Small environment airports
- Airports with up to 6 simultaneous movements
- 20 to 30 movements (air and ground) per hour in total for all airports
- 15 000 to 45 000 annual movements, small' environment airports

The traffic volumes in specific situations might deviate from this indication depending on traffic complexity and other factors influencing workload. The airports in scope of solution 35 are within category - LUSL Airport: Low Utilisation (<90% utilisation during 1 or 2 peak periods a day), Simple Layout and categorises as small environment airports commonly staffed by a single ATCO.

The Remote Tower Centre (RTC) is the centralised facility housing MRTMs where the provision of a remote ATS can be provided to one or more aerodromes from each MRTM. To achieve this goal of increased number of airports connected to the RTC and larger traffic volumes to be controlled from a MRTM, two complementary approaches are investigated:

- Additional automation functionalities for the ATCO are added into the MRTM (e.g. conformance monitoring, task planning and prioritisation) in order to be able to allow more airports and/or higher traffic volumes to be controlled simultaneously from one MRTM by one ATCO.
- The supervisor can dynamically allocate any airport to another MRTM within the remote tower centre (RTC) in order to balance ATCO workload and traffic volumes  
As more airports are grouped than for SDM-0207 (solution PJ.05-02 in wave 1) (up to all airports within a remote tower centre being grouped), this results in a much higher complexity regarding planning. The Supervisor is supported in evaluating traffic volumes and workload by a planning tool.
- A harmonisation of systems in the MRTMs/RTC and a harmonisation of procedures which make it easier for the ATCOs to hold endorsements for more than 3 airports.

The OI step that will be addressed in the validations is:

- SDM-0210: 'RTC with Flexible Allocation of Aerodromes to MRTMs'

'The provision of remote ATS service to the remote aerodromes can be dynamically assigned (over time) to any other Remote Tower Module (RTM) within a Remote Tower Centre (RTC). RTC planning tools supporting the RTC supervisor enable an efficient usage of all RTMs and staff in an RTC.'

The following figure shows the OIs and allocation of enablers:

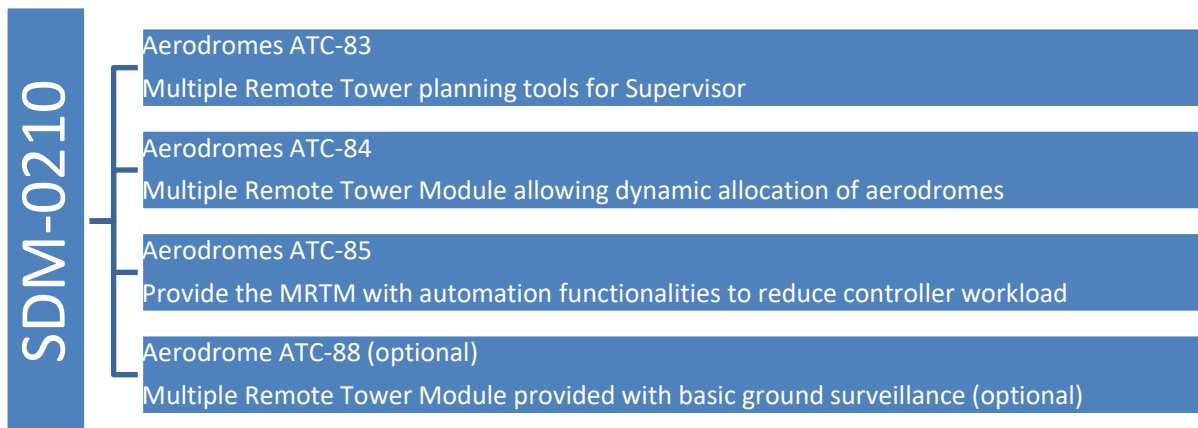


Figure 1 Enablers addressed in PJ.05-35

### Maturity

Solution 35 starts with maturity level V2 (based on PJ05-solution 03) and will reach V3 by the end of wave 2.

### Assumptions

The human actor involved in the solution is the operator (ATCO and RTC supervisor) that works on one MRTM. There is no workshare foreseen between different MRTMs. The systems available within the RTC are harmonized in solution 35 in order to be able to transfer airports between MRTMs in a flexible manner.

It is expected that a supervisor role will change with the flexible allocation of airports to MRTMs. This requires that the supervisor is provided with supervisor planning tools.

Solution 35 will base on existing standards, guidelines and regulations, e.g. EUROCAE ED-240A, EASA GM on remote aerodrome air traffic services — Issue 2 and ICAO doc 4444. Validation results will focus on HMI design questions, roles and responsibilities of the operators involved, planning support to better balance workload. Results will be provided to EASA and EUROCAE to be considered in future updates in their standards and regulations.

Airspace users are not directly affected by solution 35. When pilots acting on a remote tower controlled airport they are informed about via AIP and NOTAM information including to be applied phraseology right in advance. Airspace Users are only effected with respect to new phraseology. This item should be addressed in a workshop with airspace users.

### Operational R&D Needs

The flexible allocation of airports to MRTMs within a RTC requires the following items to be investigated:

- Support of ATCO situational awareness  
The MRTM needs to be designed in a way that it supports ATCO situational awareness integrating all the information from the different airports. HMI guidelines need to be applied in order to find the balance between providing all information required at a certain moment while avoiding clutter of information.  
Use of automation tools supporting ATCO situational awareness needs to be validated

- **Handover between MRTMS**  
Handover procedures and features for transferring an airport from one MRTM to another need to be defined and validated.
- **Planning and allocation of airports and staff to MRTMS**  
Roles and tools related to planning needs to be established considering aspects like planning allocation of operators, airports and MRTMs which are closely interlinked.
- **Role of Supervisor**  
The role for the supervisor needs to be defined and validated.

### **Technical R&D Needs**

- **Automation support tools**  
Automation support tools for monitoring tasks need to be developed in order to reduce ATCO workload / increase situational awareness. This adds requirements on low cost surveillance (co-operative and non-co-operative) and voice services that need to be investigated.
- **Technical Handover**  
The technical solution needs to be developed to flexibly switch all required systems between the MRTMs
- **Supervisor Planning tools**  
Supervisor planning tools for planning and allocation of airports to the MRTMs need to be developed.
- **Resilience and Redundancy**  
Any issues regarding Resilience and redundancy need to be analysed
- **Technical supervision**  
It needs to be investigated whether there are any new requirements regarding Technical supervision in the remote tower centre compared to single remote tower or multiple remote tower in solution PJ05-02
- **Cyber Security**  
It needs to be investigated whether there are any new requirements regarding Cyber Security in the remote tower centre compared to single remote tower or multiple remote tower in solution PJ05-02

#### *1.3.1.2 PJ.05-W2-97 “HMI Interaction modes for Airport Tower”*

### **Main Ideas**

The solution “HMI Interaction modes for Airport Tower” addresses the development of new human machine interface (HMI) interaction modes and technologies. It deals with both the current operating airport environment and future environments and is aligned to the current evolution happening within SESAR 2020 Programme.

The solution will exploit usage of innovative HMI interaction modes in different airport sub-operating environments. In particular, airport environments to carry out validation exercises will be selected by choosing between simple and complex layout, as well as low and high utilization.

The core of the activities will be oriented towards:

- Virtual and augmented reality in different applications (e.g. smart screens, head-on display) to allow tower ATCOs to conduct safe operations under any meteorological conditions while maintaining a high taxiway and runway throughput.
- Integration of artificial intelligence (AI) and machine learning algorithms for the intelligent data provision to the controllers on the HMI, which should be only available and presented



to ATCOs if needed, to avoid information overflow. In fact, "raw data" will be presented together with the reason for presenting it and suggestions for its use are provided.

- Automatic speech recognition (ASR), which enables the recognition and translation of spoken language (e.g. ATCO commands) into the system reducing their workload and improving safety (e.g. reduce head-down times of the controller).
- Multi-touch input devices, which is a technology that enables a surface (e.g. touchscreen) to recognize the presence of several points of contact with the surface. The results indicate that multi-touch systems are in general suitable to overcome mental bottlenecks in the human-system interaction.
- Use of in-air gestures for user interaction, to speed up and make simpler human-system interaction;
- Attention control: attention control enables to guide the attention of the controller, especially in a highly automated environment to important events to support the future monitoring task of the controller.
- Tracking labels, including not only the potential to deliver benefits for the ATCO, but also potential side effects on the ATCO's situational awareness in particular in the context of abnormal situations (e.g. ATCO may not notice events that are not tracked automatically if he/she becomes too reliant on the tracking labels).

### **Maturity**

PJ05-SOL97 starts taking into account the work performed by S2020 SOL16-04 Wave 1 project, as well as the RETINA and MALORCA projects, executed in the context of Exploratory Research. Its starting maturity level is TRL2 and it targets to reach TRL4 maturity at the end of Wave 2 activities.

### **Assumptions**

The solution addresses HMI solutions of both Executive and Planner controllers.

### **Operational R&D Needs**

The controllers will no longer be limited by what the human eye can physically see out of the tower windows. In fact, by giving increasing trust in the digital data the controller will have the possibility of an increased head-up view of the airport traffic, even in low visibility conditions. Furthermore, in good visibility, some of the limitations regarding the display of information (e.g. planning times and warnings) that might be missed due to increased focus on the outside view can be mitigated. This is expected to lead to an increased ATCO situational awareness and a reduction in reaction times.

### **Technical R&D Needs**

There is the need to evaluate the enabling existing and brand new technology that best supports air traffic controllers in performing their tasks.

Survey and exploitation of the technologies in the field of virtual and augmented reality, Artificial Intelligence (AI) and machine learning algorithms, speech recognition, and multi-touch devices is going to be performed to choose the best technologies for supporting tower ATCOs tasks.

In fact, based on that technology, automation support tools for monitoring and execution tasks need to be developed in order to reduce ATCO workload, as well as increase situational awareness.

#### **1.3.2 Methodology**

The following Main Assumptions are valid for both solutions.

SESAR 1 solutions on Single and Multiple Remote Tower are already available and will be used as baseline for this project. Some of the assumptions referring to SESAR 1 are:

Aerodromes might have different equipment regarding radar, approach instruments, etc.

- It is assumed that operations of civil RPAS will increase and will in the future be operated under VFR and IFR conditions. In case that new procedures are available they will also be considered for the multiple remote tower application. Non cooperative RPAS will be managed according to recommendations/regulations in the same way.
- It is assumed that Cyber Security was sufficiently addressed when implementing single remote tower solutions. In case that new experiences are available they will be considered also for multiple remote tower.
- Various advanced features were already validated within the frame of SESAR 1 and will be taken as baseline for this project. The ATCO/AFISO is supported by functionalities in the visual presentation like:
  - object bounding – moving objects in the visual presentations are highlighted for tracking purposes
  - Pan Tilt Zoom (PTZ) cameras with automatic tracking
  - static overlay information (e.g. runway and taxiways)
  - dynamic overlay information (e.g. ac-label, weather)
- Existing SWIM services can be used in context of remote tower.
- It is assumed that the licencing aspects for remote tower applications have sufficiently been considered in the past work. Nevertheless this assumption will be reconsidered and if necessary adjusted.

#### *1.3.2.1 PJ.05-W2-35 “Multiple Remote Tower and Remote Tower centre”*

The combination of the following parameters will essentially influence the number of airports and the traffic that can be controlled:

- Different traffic volumes
- Different traffic complexity (IFR and VFR will be considered)
- Different operating methods at the remote airports (e.g. different operating direction, different views on the runway)
- Different visibility conditions at the remote airports (e.g. different CAT conditions, night and daytime)
- Different wind conditions at the remote airports

As the list shows that there are many different factors that influence multiple remote tower operations, a number of validation sites will be investigated addressing different combinations of those factors in order to allow providing guidelines on how to implement such a solution.

#### **Validation Approach**

All validations in total will provide results to the consolidated report wherefore each validation will provide parts of the scope or the full scope,

The following validations will be executed in order to reach V3 maturity for Solution 35:

- EXE\_2.1\_V3\_DLR  
DLR (AT-One) validation for other/small sized generic airports based on integrated DLR/Frequentis prototype platform (Real Time Simulation) supported with ATCOs and other operational experts from ON (B4), PANSA (B4) and HC (FSP)...
- EXE\_2.2\_V3\_COOPANS



COOPANS validation for small environment airports (15.000 to 45.000 annual movements) based on wave 1 validations will be further developed for MRTMs based on SAAB Industrial Based Platform. Further developing the supervisor tool from NLR NARSIM FTS performed in wave 1 as Simulations.

- EXE\_2.3\_V3\_HC(FSP)\_AVINOR

- **Shadow Mode with HungaroControl (ANSP):**

The System Under Test (SUT) mentioned in our description, refers to a Passive Shadow Mode (PSM) remote tower system, consisting of several Multiple Remote Tower Modules (MRTMs) organized as a Remote Tower Centre (RTC), connected to multiple aerodromes.

The purpose of the project is to further develop the Indra Remote Tower system from Wave 1, and validate the functionality at V3 level in a PSM validation under operational conditions (live data) with HungaroControl ATCOs. Using the PSM type of validation, is complementary to the Real Time Simulations towards full V3 maturity.

- The validation will include RTC functionalities as e.g. split and merge in different conditions which could be due to planned changes, equipment failure etc. A further development of the planning tool in a centre context will also be included.

- **Simulation at Indra Navia facilities with Avinor (ANSP):**

An expansion of the validation platform used in SESAR PJ05 Wave 1:

- Indra 3D airport simulators for three airport providing input to the Indra Navia validation platform
    - Indra Navia integrated ATM platform providing ATC tools for all three airports
    - Validation using simulator will allow a specific type and amount of traffic load to be inserted to several ATCOs independently

Avinor ATCOs will perform a number of operational validation scenarios on the validation platform for up to three small and medium sized Norwegian airports.

- EXE\_2.4\_V3\_ENAV

ENAV will use an updated version of the validation platform used in SESAR PJ05 Wave 1 to execute the planned RTS. It consists of:

- Upgraded tower simulator: TBA 3D platform equipped with 2 CWP's and 1 Supervisor workstation
  - Integrated and upgraded Tower Controller Working Positions
  - Integrated Pilot Working Positions
  - Flights and Surveillance simulator

- EXE\_2.5\_V3\_DFS

DFS validation for small German airports based on integrated Frequentis/DFS prototype and DFS platform (Real Time Simulation) complemented by the basic ground surveillance" (Shadow Mode evaluation) developed by DFS/Frequentis/Thales.

- EXE\_2.6\_V3\_LEONARDO/UKSATSE

Leonardo will use its platform to execute the planned RTS with the support of UKSATSE ANSP. MRTC will take into account three small Ukraine airports to validate the operations concepts. Platform consists of:

- the use tower simulator: 3D platform equipped with 2 CWP's and 1 Supervisor workstation to provide input to the Leonardo validation platform.

- Integrated and upgraded Tower Controllers Working Positions;
- Integrated Pilot Working Positions;
- Flights and Surveillance simulator;
- All equipments useful to handle and manage PTZ cameras.

The validations will be complementary in terms of:

- Addressing different environments with combinations of different traffic complexities
- Addressing different enablers and focussing on different aspects related to the description in the MAWP.

SDM-0210 with the respective enablers will be addressed in the validations as shown in the table below (based on DS19):

	EXE_2.1_ V3_DLR	EXE_2.2_V3 _COOPANS	EXE_2.3_V 3_HC(FSP) _AVINOR	EXE_2.4_ V3_ENA V	EXE_2.5_ V3_DFS	EXE_2.6_ V3_LEON ARDO/UK SATSE
AERODRO ME-ATC- 83	X	X	X	X		X
AERODRO ME-ATC- 84	X	X	X	X	X	X
AERODRO ME-ATC- 85	X				X	X
AERODRO ME-ATC- 88 (optional)					X	

With the enablers being defined as:

- **AERODROME-ATC-83:**  
**‘Multiple Remote Tower planning tools for Supervisor’**  
Provide Remote Tower planning tools for a Supervisor role that support dynamic allocation of airports and staff to a number of Remote Tower Modules (Single and Multiple) within a Remote Tower Centre.
- **AERODROME ATC-84:**  
**‘Multiple Remote Tower Module allowing dynamic allocation of aerodromes’**  
Provide Multiple Remote Tower Modules (MRTM) with a capability to dynamically allocate aerodromes between MRTMs within a Remote Tower Centre (RTC).
- **AERODROME ATC-85:**  
**‘Provide the Multiple Remote Tower Module with automation functionalities to reduce controller workload ‘**  
Provide the Multiple Remote Tower Module with automation functionalities to reduce controller workload in high traffic volumes and/or complex traffic.
- **AERODROME ATC-88 (optional):**

## **‘Multiple Remote Tower Module provided with basic ground surveillance’**

Multiple Remote Tower Module provided with basic ground surveillance

The different validations will also focus on the following aspects related to the call text showing the complementary nature of the validations:

<b>WP2 sol35 topics</b>	<b>EXE-2.1-V3-DLR</b>	<b>EXE-2.2-V3-COOPANS</b>	<b>EXE-2.3-V3-HC(FSP)_AVINOR</b>	<b>EXE-2.4-V3-ENAV</b>	<b>EXE-2.5-V3-DFS</b>	<b>EXE_2.6_V3_LEONARDO/UKSATSE</b>
The RTC supervisor role and required support systems. This includes the development of tools and features for a flexible planning of all aerodromes connected to remote tower services, including effective planning tools in both short term and long term all managed by the supervisor	X	X	X	X		X
Transition aspects e.g. how to handle a handover (planned and urgent) and what are the operational / system support needs e.g. debriefing tool, MRTM to MRTM coupling transferring responsibility of an airport, etc.	X	X	X	X	X	X
Advanced automation functions to maintain ATCO situational awareness in operations involving multiple remote towers e.g. voice recognition, alerting and warnings for conflict detection, etc	X		X		X	X
Further development of the CWP (Controller Working Position) is required for a module more suitable for a centre with several CWPs	X	X	X	X	X	X
Training and licensing, endorsement, aspects, in particular in RTCs are elements that will have to be considered		X				

### **Validation Methods**

The main validation method used will be real-time simulations as this allows varying independent variables (e.g. traffic volumes, weather and operating conditions) in repetitive way. In addition to this, expert groups will help to analyse the validation results and propose new designs (HMI, architecture). The real-time simulations might be complemented by fast time simulations for the supervisor planning tool as well as Shadow Mode trials where live camera systems are available. Furthermore following list will cover areas not covered during validation activities:

- HP and SAF workshop
- Invitation to airspace users for fraseology workshop

### Validation Platforms

The following validation platforms will be used in the validations exercises:

- EXE-2.1-V3-DLR:
  - Real Time Simulation NARSIM platform set up at DLR Braunschweig Remote Tower Lab  
Will be provided by DLR (AT-One) in cooperation with Frequentis delivering an IBP. Including all ATM-systems for a real time simulation including, Visual reproduction, PTZ, electronic flight strips and aerodrome system control, planning support several MRTMs and a supervisor position for validations of the supervisor planning tool.
- EXE-2.2-V3-COOPANS:
  - SAAB (NATMIG) Real Time Simulation platform  
Will be provided by SAAB for LFV/COOPANSCOOPANS validation delivering an IBP. Including all ATM-systems for a real time simulation including, Visual reproduction, PTZ, electronic flight strips and aerodrome system control.
  - SAAB (NATMIG) Real Time Simulation platform  
Will include a RTC supervisor position to the MRTMs for validations of the supervisor planning tool.
- EXE-2.3-V3- HC(FSP)\_AVINOR:
  - Shadow Mode with HungaroControl (ANSP) using an Indra Navia platform.
  - Simulation at Indra Navia facilities with Avinor (ANSP) using an Indra Navia platform.  
An expansion of the validation platform used in SESAR PJ05 Wave 1:
    - INDRA 3D airport simulators for three airport providing input to the INDRA validation platform
    - INDRA integrated ATM platform providing ATC tools for all three airports
    - Validation using simulator will allow a specific type and amount of traffic load to be inserted to several ATCOs independently
- EXE-2.4-V3-ENAV:
  - Realtime Simulation platform  
will be provided by ENAV with prototypes being provided by its LTPs Techno Sky (Supervisor and Controller Working Position), NAIS (Remote Tower planning tool) and IDS AIRNAV (TBA 3D, OTW features)  
Simulation will be hosted at ENAV Ciampino premises or at ENAV ad-hoc selected facility.
- EXE-2.5-V3-DFS:
  - Realtime Simulation platform  
will be provided by DFS with prototypes being provided by DFS (Electronic Flightstrips, Surface Manger and Event List) and Frequentis (Visual Representation and PTZ).
  - Shadow Mode platform  
will be provided by the partners mentioned above but complemented with low cost surveillance provided by Thales, Frequentis and DFS.

- EXE-2.6-V3-LEONARDO/UKSATSE:
  - o Realtime Simulation platform  
will be provided by LEONARDO along all the prototypes required for the validation activities.  
Simulation will be hosted at Kiew premises or at Leonardo Via tiburtina ad-hoc selected facility.

The different platforms will allow validating the multiple remote tower concepts at five different sites. Using the different validation platforms will allow a competitive approach with mutual learning in order to figure out best practice solutions to bring comprehensive input into CBA.

### **Dependencies with other solutions**

A dependency will be between solution 35 (PJ05) and solution 84 (Project 14.4.3). Solution 84 will provide a low cost surveillance solution that can be used as baseline for the automated monitoring support. The low cost surveillance will consist of a secondary surveillance with a minimum number of sensors and a video based primary surveillance. These surveillance components will be integrated by a multi sensor data fusion in order to provide the best surveillance quality and integrity. A close link between sol 84 and sol 35 will be established by Thales, Frequentis and DFS. The following dependencies are planned:

- Sol 84 (T04) will provide to sol35:
  - o MRTC surveillance sensor at airport Erfurt for V3 operational validation
- Sol 35 will provide to sol 84 (T04):
  - o MRTC OSED
  - o Review of sol 84 TS/IRS (DFS)
  - o Review of sol 84 VALP and VALR (DFS)

### **Linked (non-SESAR) Research Activities**

There are currently no non-SESAR Research Activities known.

#### *1.3.2.2 PJ.05-W2-97 “HMI Interaction modes for Airport Tower” (SL97)*

### **Validation Approach**

This solution proposes to use an incremental approach to mature the relevant OI Steps to the target maturity level, set to TRL4 by the end of S2020 Wave 2 activities. Notably, those OIs are:

- AO-0212 – Equivalent visual operations for tower control in low visibility;
- POI-0003-SDM – Improving controller productivity by introducing new means of controller interaction.

A total of 6 complementary exercises is planned, covering different items listed in the call for proposal and executed in different operating airport environments, in terms of layout complexity, traffic volumes, operating conditions.

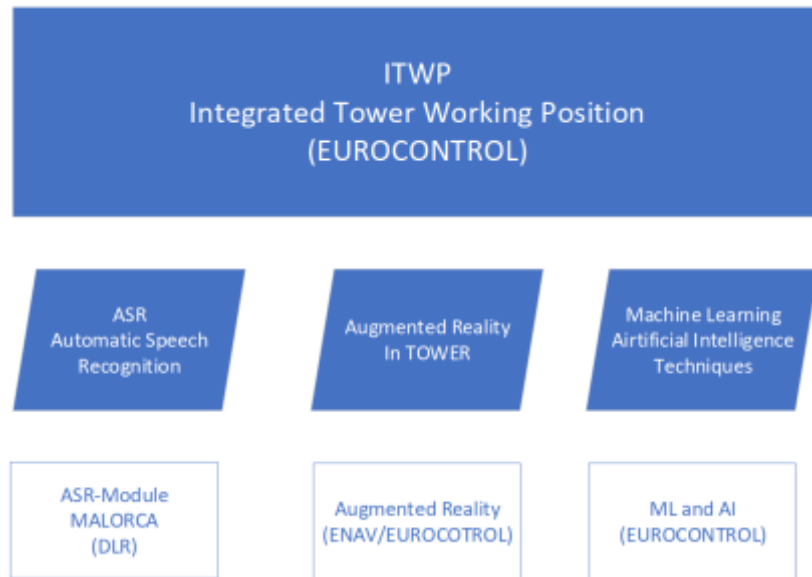
The table below provides a summary containing the main items addressed by the single exercises. Please note that this table could not be exhaustive.

SOL 97 Exercises List						
Timing	oct-20	oct-21	oct-21	oct-21	feb-22	feb-22
WP3 sol97 topics	EXE-97-001-NLR	EXE-97-002-ENAV	EXE-97-003-ACG/COOPANS; CCL/COOPANS; DLR (AT-One); ANS CR (B4); ON(B4), EUROCONTROL, ENAV	EXE-97-004-HC(FSP), INDRA	EXE-97-005-ENAIRES, LDO	EXE-97-006-DLR (AT-One); ACG/COOPANS; CCL/COOPANS; ANS CR (B4), ON(B4)
Virtual and augmented reality	X	X	X	X	X	
AI and Machine learning algorithms			X			X
Automatic speech recognition			X			X
Tracking labels	X	X	X	X	X	
Air Gestures/ Multi touch interactions		X	X	X	X	
Attention Control			X			
Technique	RTS	RTS	RTS	SM	RTS	RTS

### Validation Methods

The proposed validation techniques are real-time and shadow mode simulations. They will be used as either complementary or stand-alone techniques. Both techniques are executed with the “Human in the Loop”. The former allows to vary independent variables (e.g. traffic volumes, weather and operating conditions) and compare current operating methods against proposed new means of HMI interaction modes, the latter add the possibility to start integrating real ATM systems with high-fidelity emulators.

As the combination of HMI means might even deliver greater benefits than just single interaction modes, the ITWP is used to integrate multiple aspects for different exercises (see Figure 2):



**Figure 2: Combination of HMI aspects into a single platform**

### Validation Platforms

The following Validation Platforms will be used to execute the planned exercises:

#### EXE ID – 001

EXE-01 will be carried out on the NLR ATC Research Simulator (NARSIM) Tower and Remote Tower validation platforms in Amsterdam, the Netherlands. Both facilities are highly realistic and versatile, in-house developed simulation environments. The NARSIM core itself is also highly scalable, from a laptop configuration up to the simulation of a real-life environment. The platform has been successfully used in the past as SESAR IBP in co-operation with ATC the Netherlands (LVNL), Italian ANSP ENAV and LFV/COOPANS Sweden.

The dedicated Remote Tower front end working position was developed in recent years to allow for investigations that particularly focus on the additional possibilities offered by the use of a camera system and the development of controller support tools for Multiple Remote Tower set-ups. NARSIM Tower already has a long history of having been used in EUROCONTROL and European Commission validation activities. It is considered an ideal platform for prototyping, evaluation, operational feasibility and performance testing. NARSIM Tower has a projection system with a field of view of 360 by 40 degrees and its diameter is 11 metres. It has a realistic outside view under all atmospheric conditions. 15 standardized pseudo-pilot working positions can be employed to set-up several simultaneous simulations or large-scale simulations with about 250 simultaneous aircraft movements. NARSIM Tower is currently also used as training platform by ATC the Netherlands for integration of new technology and procedures.

EXE-006 will use the NARSIM platform and look at the differences between the introduction of new HMI interaction modes in both the classic control tower and Multiple Remote Tower environment settings.

#### EXE ID – 002

Validation activities EXE 02 will be based on the validation platform *UNIBO CAVE V-LAB* available at the University of Bologna (Italy). That platform was developed to validate the SESAR ER RETINA concept in laboratory environment by means of human-in-the-loop real-time simulations where the out-of-the-tower-windows view was provided to the user through a high fidelity 4D model in an immersive environment.



The validation platform is described in [D4.1 RETINA, Validation Plan, Ref. Ares(2017)4837437, Edition 00.01.00, 04/10/2017] and it consists of five main modules. The *core system* is the *4D model* of the reference scenario which communicates through data exchange protocols with the following four subsystems:

- *Out of the Tower View Generator (OOT)*: it provides the ATCO with a consistent and photorealistic view of the out of the tower scene.
- *Augmented Reality Overlay Application (AR App)*: it derives the relevant Augmented Reality Overlays and deploys them on the appropriate ATCO Head-Up Interface.
- *Head Down Equipment (HDE)*: it consists of a simplified interface that replicates the actual head down equipment in the control tower.
- *Pseudo-pilot application (PP App)*: it allows the pseudo-pilot to monitor and update the state of the 4D model according to the commands provided by the ATCO.



Figure 3: UNIBO (ENAV LTP) Platform.

### EXE ID – 003

The EUROCONTROL Tower Platform (see Figure 4) is composed of two systems:

- the Integrated Tower Working Position (ITWP): EUROCONTROL prototype provides three ATCOs working position (Clearance Delivery, Ground position and Runway position). The ITWP includes servers developed by EUROCONTROL in the context of SESAR Airport A-SMGCS projects: Routing, D-TAXI, AGL, Safety nets and CWP HMI. It provides also pilots position to manage all aircrafts during the validation.
- 3D Tower, connected to the ITWP and allows simulating the outside view at the airport.

Both systems were used in SESAR2020 Wave 1 to simulate Europeans airports such as Vienna, Paris CDG, Hamburg, Prague and Budapest for PJ02, PJ03a and PJ03b projects.

The platform will be enhanced during the Wave 2 to include augmented reality and integrates all the prototypes that will be needed for the validation.

DLR (AT-One) will provide a controller command hypotheses generator to be integrated with a speech recognition system. ACG/COOPANS will send controllers to Brétigny and is responsible to sub-contract the respective external institutes for delivery of an adapted speech recognition system for the tower area. CCL/COOPANS will participate with Human Performance expert providing



Human Performance Assessment. ENAV will also provide ATCOs to support the exercise. EUROCONTROL is responsible for the simulation environment and the ASR output presentation.



Figure 4: EUROCONTROL platform – Vienna Tower

#### EXE ID – 004

The following validation platform will be used in the validation exercise:

- HungaroControl and Indra Exercise (supported by Indra Navia):
  - *EXE-004 Shadow Mode with HungaroControl:*
    - Multi-touch feature: The use of Advanced Controller Working Position increasing controllers' productivity such as those requested by the SESAR PJ02 Solution 21 "Digital evolution of integrated surface management.

#### EXE ID – 005

The EXE 005 validation will be performed by ENAIRE/CRIDA at a Spanish airport using visualization tools developed to validate the SESAR ER RETINA concept in a laboratory environment. In that validation, the out-of-the-tower-window view was simulated by a high fidelity 4D model. EXE005 will be using the ATCO Head-Up Interface in combination with real traffic views from an airport tower in a real time simulation environment.

The validation platform will consist of an *Augmented Reality Overlay Application (AR App)* which derives the relevant Augmented Reality Overlays (surveillance information, runway markers, etc.) These overlays will be deployed on the appropriate ATCO Head-Up Interface, integrating real-time surveillance data.

The objectives of this exercise are to validate that the ATCO Head-Up Interface:

- Increases the out-the-window viewing time.
- Reduces the changes of controller gaze from out-the-window to computer screen.
- Increases situational awareness in low visibility conditions.
- Accurately tracks the aircraft motion.

#### EXE ID – 006

At DLR Braunschweig the challenges of adaptation for assistant based speech recognition in the tower area will be analysed. DLR, on the one hand, provides the remote tower simulation platform with an integrated ABSR system. On the other hand, DLR (AT-One) also provides controller

command context that is conform to the further enhanced ontology for tower commands, as well as a plausibility checker module. The ANSPs will support the validation trials with controllers and in the simulation airport preparation phase.

For EXE ID 006 the validations will be carried out at “Remote Tower” DLR site Braunschweig. The DLR Remote Tower Laboratory in Braunschweig at the Institute of Flight Guidance provides In the TowerLab, innovative working positions. Besides conventional support systems such as approach radar, weather display and outside view, novel tools for controlling and manipulating air traffic are available. Special simulation software calculates the movements of the aircraft and sends these data to the radar display and outside view system. The aircraft are controlled in a fully automated manner or by pseudo pilots.

In the TowerLab, these tools can be used in different ways, new systems can be installed and even completely new concepts for working positions can be evaluated. Thus, this facility offers a wide range of research options for this field of air transport. The TowerLab is highly flexible, particularly in terms of the controller consoles used. Unlike the consoles used in operations, these consoles can be fitted with new systems in a quick and flexible manner. Hence, the design of a controller working position can be tested in all its variants and can be carefully analyzed.

The controller has an outside view on high-resolution flat screens next to the console. Displays can be combined as desired, including 3D stereo displays. Innovative concepts, such as the remote monitoring of airports, can be prepared in this way. Data and information can be sent to the working positions via various simulation components, allowing different operating conditions and simulation scenarios to be generated. Apart from different ways to design the controller working position, additional measuring devices can be integrated into the TowerLab. One example is an eye tracking device that requires lots of room to perform exact measurements. Using these data, more detailed results of the systems assessed can be achieved.

### **Dependencies with other solutions**

Main dependencies, despite not yet formally identified, are with other S2020 Wave 2 solutions addressing digitalization topic. Due to the transversal nature of the HMI there is mutual dependency with PJ02-SOL21 - digital evolution of integrated surface management.

Some work from Wave 1 related to airport activities (PJ03a/b) may serve as input to the test activities for new HMI interaction modes.

Then, this project is performed to continue the work carried out in the context of Exploratory Research projects, such as RETINA, as well as in S2020 Wave 1 by solution 16-04.

## **1.4 Ambition**

### **1.4.1 PJ05 Solution 35**

- PJ05-Solution 35 will add further flexibility in the allocation of airports to MRTMs in an RTC, which in turn allows to even better match traffic demand with required ATCO. The ambition of this extension to the state-of-the-art is to contribute to further reducing cost for ATS. The work will deliver new prototypes that will serve as basis for new ATS-systems that are the basis for providing ATS to multiple remote towers.
- Solution 35 is expected to reach V3 maturity by the end of wave 2.

### **1.4.2 PJ05 Solution 97**

- PJ05-Solution 97 ambition is to develop innovative human machine interface (HMI) interaction modes and technologies, which are expected to minimise the load and mental strain, thus resulting in a direct benefit for controllers and an indirect benefit for the overall efficiency of ATM;

- PJ05-Solution 97 ambition is to reach TRL4 maturity level at the end of S2020 wave 2 activities;
- Additionally, PJ05-Solution 97 wants also be part of the digitalization process that is changing businesses in many areas, and particularly in ATM. Actually, digital interfaces are transforming the way we all work, giving us better data quality, timeliness of data exchange and considerable workload reduction.

## 2 Impact

### 2.1 Expected impacts

#### 2.1.1 PJ.05-W2-35 “Multiple Remote Tower and Remote Tower centre”

SESAR 1 showed that single remote tower concepts has a possibility to reduce costs, installation of technology cost less than an ordinary tower and new technique and maintenance can be more efficient with several airports connected to a remote centre.

The main driver for solution 35 is increased cost effectiveness. While SDM-0207 in Wave 1 will in general still show significant times with low traffic due to the fact of a fixed allocation of aerodromes to an RTM, solution 35 will allow to add further traffic to one ATCO/AFISO (while avoiding overload situations) by flexible allocation of aerodromes to RTMs within a RTC. This will further increase ATCO/AFISOs' efficiency. The main KPI addressed will be 'flights per ATCO/AFISO-Hour on duty' (CEF2) that will significantly be increased while 'Technology cost per flight' (CEF3) might be somewhat increased but still superseded by CEF2.

Baseline for providing ATC/AFIS to multiple remote airports is that safety levels are sufficient for the tasks being performed from the remote location. Despite the Safety KPI is not directly measured, it is addressed anyhow. Based on Safety Reference material, processes will help to give assurance that the safety targets can be met significantly, supported by evidences obtained from the validation activities. Any issues regarding degradation of Human Performance are either mitigated by adjusted procedures or new system functionalities. Human performance KPA is very closely interlinked with the safety aspect.

Access and Equity will be considered in the solution, assuring that all airspace users have access to the remote airport.

The Solution will provide data to work within EUROCAE and EASA. It is out of great importance that every remote tower solution delivered from the research towards implementation gets an approval on a broad level to ensure effective approvals from the NSAs.

Standardized checklists for implementation programs could increase effectiveness as every NSA and ANSP have a standardized way to implement the new technology.

#### *a) Technical Impact*

Remote Tower is a fairly new development within local air traffic management and the fruitful development within SESAR 1 has shown that it is feasible at smaller aerodromes. Wave 1 has shown results for small environment airports with up to 45.000 annual movements.

The technical impact could be any of the enablers figured out during the research.

### ***b) Economic Impact***

Impact for local airport owners could lead to savings as the concept grows. Airlines could benefit when technology, earlier only affordable for large aerodromes such as short and long term traffic planning, is available even for more rural aerodromes with less traffic.

### ***c) Social Impact***

There will be a social impact which has both pros and cons. Many of the results from SESAR 1 will be the same in the ***SESAR 2020 development***.

*As there will be a change of location of local air traffic management operators will have completely new places for work. The benefits are the safety of working in a larger environment with an easier way to have back up resources available which is a problem in many small rural areas.*

*In the European context PJ05 solutions will contribute to satisfaction of growing EU citizen's mobility demand thus meeting Societal and Market needs and facilitating via improvement of transportation infrastructure (improved access to rural airports, vertiports, heliports) the development of "...diffused intermodal system taking travellers and their baggage from door-to-door, safely, affordably, ...,seamlessly, predictably and without interruption. " (ref. Flightpath2050).*

## **2.1.2 PJ.05-W2-97 "HMI Interaction modes for Airport Tower"**

### ***a) Technical Impact***

The identified performance objectives, contributing to the higher-level objectives identified at Master Plan level, are associated to different KPAs. Notably, the main areas of expected benefits are:

- Safety through increased situational awareness
- Human Performance through:
  - Improved and innovative working operating environment
  - Improved and innovative Human Machine interaction
  - Improved Usability/User Confidence acceptance
  - Reduced Mental Workload
- Cost-Efficiency through:
  - Increase in ATCO Productivity
  - Reduction in technology cost per flight

Those objectives will be further refined and specified during the planning of the project-related validation activities.

### ***b) Economic Impact***

Introducing increasing automation level, together with the possibility of adopting innovative design solutions, could result in a more cost-efficient solution for the CWP, thus reducing ANSP costs, which would cascade down the cost reduction to the final users.

### ***c) Social Impact***

Firstly, the possibility for controllers to handle increased number of aircraft in a more efficient way brings direct benefits to passengers, travelling for business or leisure purposes.

Additionally, the introduction of innovative human-machine interaction modes may indirectly bring benefits and advantages in people's daily life. Progresses in the use of augmented reality, or artificial intelligence, are reported in several fields and they all contribute towards a massive implementation of those technologies in our houses, cars, entertainment, and portable devices (e.g. mobile).

It is then understood that, this specific research in the Air Traffic Management is likely to have a side effect on different fields of application paving the way for a switch from niche technology to massive use of Augmented Reality or Artificial Intelligence. .

## **2.2 Measures to maximise impact**

### ***d) Dissemination and exploitation of results***

Two important objectives regarding dissemination and exploitation of activities will be pursued:

- Spreading and embedding project's results; and
- Contributing to the implementation and shaping of national and European policies and systems.

PJ05-W2 DTT project will produce a dissemination and exploitation of results' plan as part of project management activities which would include measurable and realistic objectives, adhere to a timetable and provide a resource planning for the activities to be undertaken.

Dissemination and exploitation of results will be a fundamental part of the communication activities taking place during the project's lifetime. In that respect successful dissemination and exploitation activities linked to this project are seen as vectors towards external recognition of the work carried out. Those activities will lead to increased awareness of RTC & HMI Technologies for Towers, extend its impact, and influence standardisation of solutions, as well as preparing and accelerating the deployment phase.

Two key lessons learned during SESAR 1 programme concerning awareness are that:

- The awareness of those airports not participating in the programme of the work is often limited.
- It was difficult to gain acceptance for the multiple remote/digital tower concept in the beginning that today is heading commissioned and accepted.

In order to address these two areas, a number of initiatives were undertaken covering invitation of organisations of interest to participate during the validations and a number of demonstrations.

These approaches will continue in SESAR2020 Wave 2 with the level of participation in the program and from other organisation of interest closely monitored. Project deliverables (e.g. conceptual documentation and results of validations) are expected to be disseminated, as well as newsletters and information leaflets. Targeted audience will at least include:

- End-users of project activities and deliverables and Unions;
- ATM Stakeholders and experts;
- Decision makers and regulators at both National and European level
- General public.

English language will be used throughout project documentation and outputs. However, whenever necessary, key communication materials might be translated in languages of the partnership to reach as many people as possible.

For dissemination and exploitation of results, this project is expected to use:

- Future S2020 Programme Website (internal to the programme) and SJU public website,
- Meeting and visit of key stakeholders;
- Information sessions, workshops, demonstrations, conferences, and exhibitions;
- Audio-visual media and products (video clips, YouTube, ...);



- Existing contacts and networks
- Open Days related to Validation Exercises.

Indicators related to the different dissemination and exploitation of results activities will be established to assess the impact of project activities in this area, such as:

- Number of meetings with key stakeholders;
- Number of participants involved in workshops and information sessions;
- Participation in public events;
- Feedback from end-users.

Activities will occur at different stages of the project lifecycle.

- In the first 3 first month after projects starts,
  - The dissemination and exploitation schedule will be drafted,
  - The expected impact and outputs of this activity will be defined, and
  - How and to whom outcomes will be disseminated will be addressed.
- During the project, dissemination and exploitation of results will include;
  - Updating the S2020 website and SJU public website with recent information on project and results;
  - Conducting information sessions, demonstration days,
  - Involving stakeholders to ensure the transfer of results to end users and policy makers.

The following table summarises the envisaged activities related to dissemination and exploitation of results.

Goal	Message	Internal Dissemination	External Dissemination
<b>Project Updates</b>	Essential to have every partner connected and up to date, but also to explain better expected results to stakeholders	<ul style="list-style-type: none"> <li>• S2020 Project Website</li> </ul>	
<b>Archives &amp; Reference documents</b>	Keep past records for future needs and documents that might support the activities of any area	<ul style="list-style-type: none"> <li>• S2020 Project Website</li> </ul>	
<b>Notices</b>	News that can affect or help and develop the project	<ul style="list-style-type: none"> <li>• S2020 Project Website</li> </ul>	
<b>Schedule updates</b>	Updated calendar of events	<ul style="list-style-type: none"> <li>• S2020 Project Website</li> </ul>	
<b>Results</b>	The need to verify projects outcome and effectiveness	<ul style="list-style-type: none"> <li>• S2020 Project Website</li> </ul>	<ul style="list-style-type: none"> <li>• SJU public Website</li> <li>• Information sessions</li> <li>• Demonstrations</li> <li>• Exhibitions (e.g. WAC)</li> <li>• Conferences</li> <li>• Publications (e.g. SIDs)</li> </ul>

- At project closure,
  - Evaluating achievements and impact;
  - Disseminating key project results data pack;

- Participating to a S2020 closure event;
- Developing areas for future cooperation.

***e) Communication activities<sup>1,2</sup>***

Most of the project participants are members of several international organizations, associations and forums. In this way, they will be able to present project's results to a large ATM community, through for instance workshops, conferences, and seminars. Another opportunity to communicate project's results will be through presentations to the European Commission or at specific meetings organized by European bodies in Air Transport.

As internal communication channel the Stellar platform is already established. Furthermore, it is planned to build up a database on an extranet containing all relevant documents produced in PJ05-W2 DTT. At least all program documentation will be stored in order to provide full electronic access to documentation.

The second step, after internally using Stellar, will be the continuation of the exiting PJ05 project's website for external communication [www.remote-tower.eu](http://www.remote-tower.eu). The external accessible website will inform about all public objectives and goals of the project, the consortium members with contact data, it will provide short descriptions of work packages and co-operation activities between partners. In the course of project, a newsletter with current project status and planned meetings will be the means of a regular flow of information about the project's general progress.

Great attention will be paid to the quality of communication with the European Commission, and to the quality of the reporting. For allowing such precise reporting, the consortium has defined a number of deliverables which will ensure a tight follow-up of the works being carried on. These deliverables have been designed as successive milestones for both the partners and the consortium.

The coordinator and the so-called Project Coordination Committee (the leaders of tasks and subtasks) will pay much attention to deliver on due time contractual reports and cost statements to the Commission. A precise planning will be established to allow precise monitoring of reporting.

PJ.05 solution 35 will communicate with Eurocae WG 100 and EASA for standardisation initiatives on the Multiple Remote Tower and RTC concept.

### **3 Implementation**

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

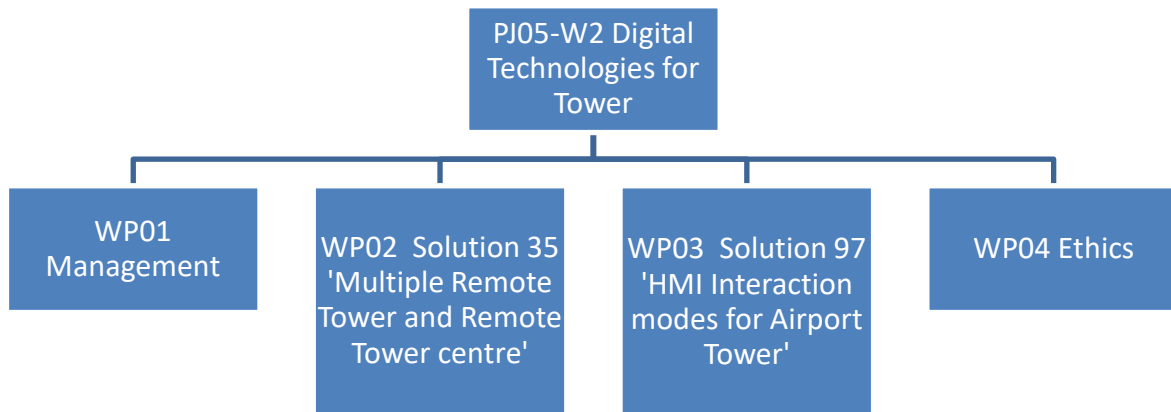
##### ***3.1.1 Project Structure***

The project is divided into 2 different Solutions; each split into a certain number of activities and to a certain extent, coordinated independently by its SL. The project structure is displayed in

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<sup>1</sup> See participant portal FAQ on how to address [communication activities](#) in Horizon 2020

<sup>2</sup> For further guidance on communicating EU research and innovation for project participants, please refer to the [H2020 Online Manual](#) on the Participant Portal.



**Figure 5: PJ05 - 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 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.



	2020		Jan	Feb	Mar	Apr	Maj	Jun	Jul	Aug	Sep	Okt	Nov	Dec	
PJ.05	05.35														
	SDM-0210		ADM		OSD		OSD	VALP			V3 VALP	prototyping			
		start set up			start		initial	start			final				
					TS		TS	HP plan				HP plan			
					start		initial	SAF plan				SAF plan			
	2021		Jan	Feb	Mar	Apr	Maj	Jun	Jul	Aug	Sep	Okt	Nov	Dec	
PJ.05	05.35														
	SDM-0210	Prototyping workshop				EXE	EXE	EXE			EXE	EXE	EXE	EXE	
	2.2	COOPANS - RTS				prototyping					Start	EXE-2.2-COOPANS	Final		
	2.5	DFS- RTS & PSM													
	2.1	DLR joint EXE													
	2.4	ENAV													
	2.3	INDRA Navia													
	2022		Jan	Feb	Mar	Apr	Maj	Jun	Jul	Aug	Sep	Okt	Nov	Dec	
PJ.05	05.35														
	SDM-0210		VALR		VALR	OSD	OSD	DP	SJU	SJU	update	DP	Gate		
			start		final	start	final	delivery							
			HP workshop												
			SAF workshop												
					TS update		TS update								
					start		final								

Figure 6: Planning Chart for Solution 35

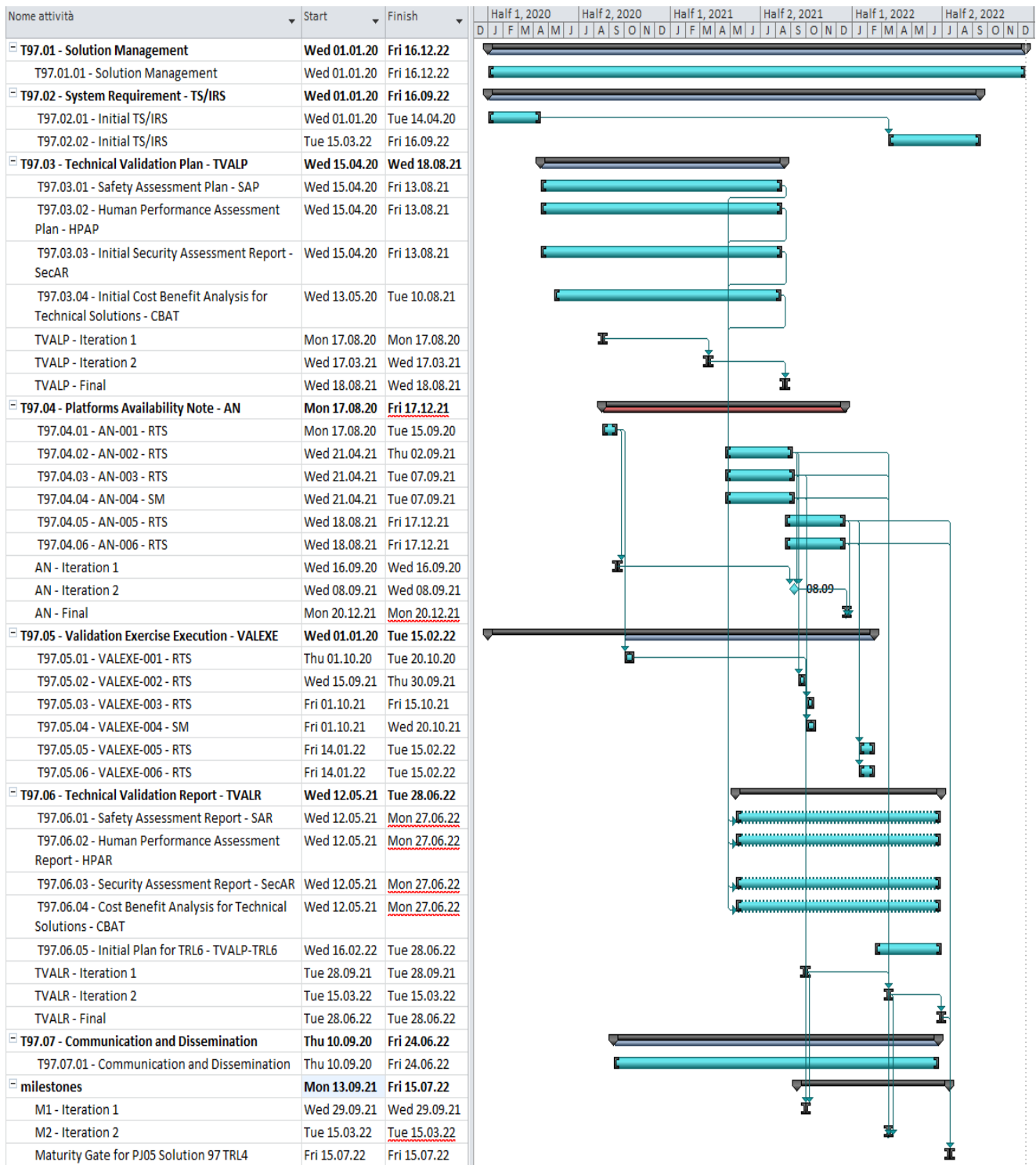
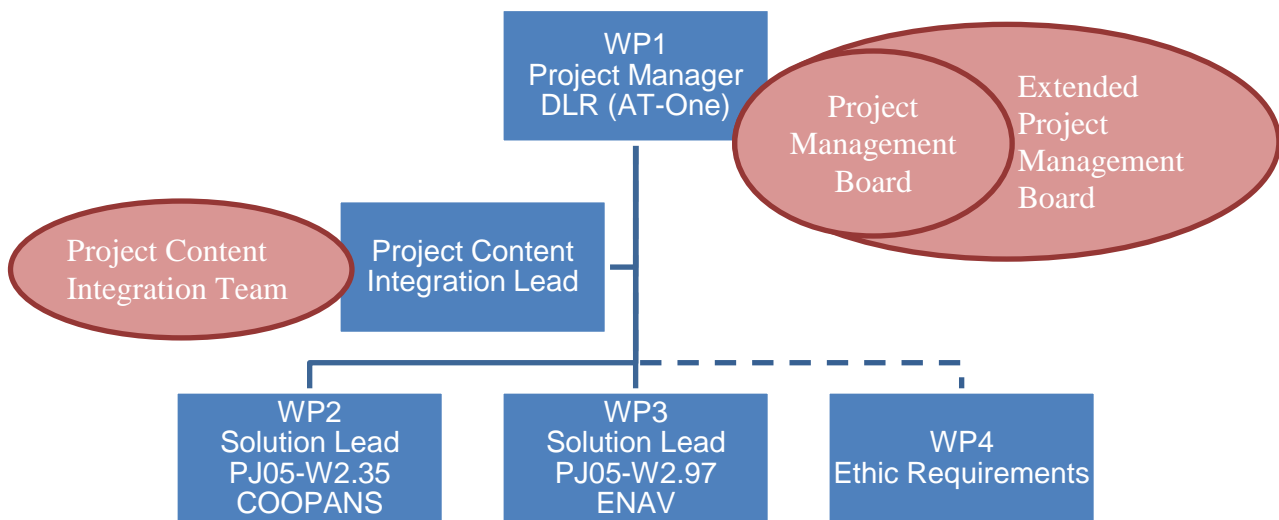


Figure 7: Gantt Chart for Solution 97

### 3.2 Management structure, milestones and procedures (PM)

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 8.



**Figure 8: 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 for IRs projects;
- 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);
- 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)
  - V/TRL Data Pack
- 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, V2 and V3);
- Prepare and represent the solution at the maturity gate, notably responsible for producing the Maturity Report;
- Participate to the PMB/EPMB.

### **3.2.5 *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.

### **3.2.6 *Project Content Integration Team (PCIT)***

The Project Content Integration Team is a virtual team composed of the ATM 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 PM**

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 Ground ATM Systems, Service Provision, research organisations and EUROCONTROL hence providing a wide range of expertise covering all aspects of EUROPEAN ATM.

At the time of submitting this proposal, this consortium comprises 21 active organisations from 14 member states of the European Union, and 1 active organisation from Norway, a nation beyond the EU. 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.

### 3.4 Resources to be committed

**Table 3.4b: ‘Other direct cost’ items (travel, equipment, other goods and services, large research infrastructure)**

Participant 2/ NLR (AT-One)	Cost (€)	Justification
<b>Travel</b>	9.000,00	Estimate for travel costs are based on the prospected number of regular meetings (two face-to-face meetings per year in Germany for one person with a duration of one to two days) and simulation-related activities in other countries (NARSIM platform support in Sweden/Germany) with one additional activity per year (with two persons and a duration of one to two days). This results in 12 missions of about 18 person days duration (including a relevant uncertainty margin, as this is an average value). The estimate of person days required is based on experience from previous SESAR-2020 work for coordinating and carrying out validation work (PJ05). The description in this justification text follows the guidance provided by SJU and contains all available planning figures.
<b>Equipment</b>	N/A	N/A
<b>Other goods and services</b>	15.000,00	Use of NARSIM Tower as HMI development and real-time simulation platform for testing of operational prototypes for Remote Tower Operations. The costs for the platform (including computing costs for preparation of the platform, which are generated on computers being part of the platform infrastructure and accordingly tariffed) are specified in the “Internally Invoiced Goods and Services” category. This is in accordance with the audit report of the European Commission with audit reference number BAEA366019. The report indicates that all the validation platform costs have to be specified in this category. Prototypes will be tested for both Solution 35 and Solution 97. In Solution 35, NARSIM Tower will be available for 40 hours (the planned duration of all exercises) and in Solution 97, NARSIM Tower will be available for 20 hours (the planned duration of all technology evaluations). The related computing costs on the platform for preparation of the platform are based on previous experience with prototype experiments from SESAR-2020 PJ05.
	3.000,00	Operational expert support will be necessary in both Solutions. The estimate considers the costs for at least one pseudo-pilot in both solutions and one air traffic controller in Solution 97 to be available for the simulations. According to Article 10 (Contracts to purchase goods, works or services) contracts that are necessary to implement action tasks fall under the “Other Goods and Services” category. The costs for supporting operational experts are consequently specified here.

<b>Total</b>	27.000,00
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<b>ACG/COOPANS</b>		<b>Justification</b>
<b>Travel</b>	€ 22.295,40	Estimated number of travels: 22. Primarily SESAR experts travelling for coordination meetings and validation activities. The estimate of travels required is based on experience from previous SESAR-2020 work for coordinating and carrying out validation work
<b>Equipment</b>		
<b>Other goods and services</b>	€ 5.296,50	catering for meetings at ACG/COOPANS premises with external guests
<b>Total</b>	€ 27.591,90	

<b>Participant CCL/COOPANS</b>	<b>Cost (€)</b>	<b>Justification</b>
<b>Travel</b>	€ 33.570,00	Estimated number of travels 22, primarily SESAR experts travelling to coordination meetings and validation activities. The estimate of travels required is based on experience from previous SESAR-2020 work for coordinating and carrying out validation work.
<b>Equipment</b>		
<b>Other goods and services</b>	€ 1.830,00	catering for meetings at CCL/COOPANS premises with external guests
<b>Total</b>	€ 35.400,00	

<b>LFV/COOPANS</b>		<b>Justification</b>
<b>Travel</b>	<b>€ 64.800,00</b>	Estimated number of travels is 43 – average cost per travel 1500 euro. Primarily SESAR experts travelling for coordination meetings and validation activities. The estimate of travels required is based on experience from previous SESAR-2020 work for coordinating and carrying out validation work (PJ05).
<b>Equipment</b>	<b>€ 18.000,00</b>	Depreciation Costs of equipment for validation activities and low-value assets necessary for those activities
<b>Other goods and services</b>	<b>€ 20.768,00</b>	Final H2020 Certificate on Financial Statement, catering for meetings at LFV/COOPANS premises with external guests and contracting external company to provide a service – delivery of resources to support LFV in non-core activities
<b>Total</b>	<b>€ 103.568,00</b>	

<b>Naviar/COOPANS</b>		<b>Justification</b>
<b>Travel</b>	<b>€ 9.000,00</b>	Estimated number of travels is 6. Primarily SESAR experts travelling for coordination meetings and validation activities.
<b>Equipment</b>		
<b>Other goods and services</b>	<b>€ 3.000,00</b>	catering for meetings at Naviar/COOPANS premises with external guests
<b>Total</b>	<b>€ 12.000,00</b>	

<b>6/ PANSA (B4)</b>	<b>Cost (€)</b>	<b>Justification</b>
<b>Travel</b>	€63.808,00	Estimated number of travels (e.g. project and solution coordination meetings, workshops and validation exercise) is 25 in total for the duration of the project. Two persons travelling to coordination meetings and workshops. Participation of up to eight people (ATCOs and operational experts) in validation exercise. Estimated unit cost round EUR 2550/ trip.
<b>Equipment</b>	€0	
<b>Other goods and services</b>	€0	
<b>Total</b>	<b>€63.808,00</b>	



<b>Participant 17 FRQ (FSP)</b>	<b>Cost (€)</b>	<b>Justification</b>
<b>Travel</b>	85.500,00	<p>Travels for PJ05-35</p> <p>The estimated travel cost will cover the following:</p> <p>Frequentis AG</p> <p>32 trips a EUR 1900,- per person for the following reasons: One or two persons travelling to coordination meetings (EPMB, solution meetings, installation before validation, attendance of the validation as supervisor role, open day attendance). Frequentis will contribute to two validations, each with similar requirements as listed above.</p> <p>Comsoft AG</p> <p>13 trips a EUR 1900,- per person in support of the action for on site assistance in the installation of and the execution of the validation exercise. Again, participation in two exercises is foreseen.</p>
<b>Equipment</b>	38.000,00	<ul style="list-style-type: none"> <li>- Depreciation of IT equipment for video processing for validation platform</li> <li>- Depreciation of Camera system for validation platform</li> <li>- Depreciation of Controller working positions for validation platform</li> </ul>
<b>Other goods and services</b>	25.000,00	<ul style="list-style-type: none"> <li>- Production of videos/pictures for dissemination of results</li> </ul>
<b>Total</b>	148.500,00	

<b>Participant 18/ HC (FSP)</b>	<b>Cost (€)</b>	<b>Justification</b>
<b>Travel</b>	€ 37.700,00	<p>Travel costs are based on HC (FSP)'s participation at validation activities, project or solution meetings, coordination meetings, integration work, tests and preparation work at non-HC (FSP) site. Trips for PJ05-W2 includes an average of 5 travels/year for 2-3 person, on the approximated cost of €1200 per travel and person.</p>
<b>Equipment</b>	€ 220.833,00	<p>Budapest Remote Tower Center validation (2-3 airports)</p> <p>Depreciation cost of:</p> <ul style="list-style-type: none"> <li>• Surveillance system - cameras (fixed &amp; PTZ)</li> </ul>

		<ul style="list-style-type: none"> <li>• Installation of cameras and cabling</li> <li>• 1 CWP and 1 supervisor position</li> <li>• LAN infrastructure, CWP Displays &amp; Console, microwave connection</li> </ul>
<b>Other goods and services</b>	€ 2.500,00	Marketing and representation: Publicity for the results of the solution (electronic press, social media etc)
<b>Total</b>	€ 261.033,00	

<b>Participant 22/ SAAB (NATMIG)</b>	<b>Cost (€)</b>	<b>Justification</b>
<b>Travel</b>	60.000,00	Cost based on participation at validation activities at non-Saab site, project/solution meetings, coordination meetings, integration work, tests, preparation work etc. . Travel for PJ05 Sol 35 includes 12 travels/year to the approximated average cost of €1650 per travel and person.
<b>Equipment</b>	175.000,00	Due to large scale 3D simulations in solution 35 with many airports simultaneously in several RTMs. Provision of the Saab Real Time Simulation platform including all ATM-systems for a real time simulation including Visual reproduction, PTZ, electronic flight strips and aerodrome system control, an RTC supervisor position to the MRTMs for validations of the supervisor planning tool. The cost refers to depreciation and to low value assets.
<b>Other goods and services</b>		
<b>Total</b>	235.000,00	

Participant (Leonardo)	Cost (€)	Justification
<b>Travel</b>	27.000	<p>Estimate for travel costs are based on regular meetings with partners involved in the Project and to reach the Validation Platform in other countries. About 20 mission has been planned based on experience from previous SESAR-2020 work.</p> <p>Travels will be mainly to attend in meeting for SESAR activities, as well as for preparing the testbed and accomplishing validation exercises in Italy and Ukraine.</p>
<b>Equipment</b>	90.138	<p>Due to large scale 3D simulations in solution 35 with many airports simultaneously in several RTMs. Deprecation of the IT Real Time Simulation platform including all ATM-systems for a real time simulation including Visual reproduction, PTZ, electronic flight strips and aerodrome system control, an RTC supervisor position to the MRTMs for validations of the supervisor planning tool. The cost refers to deprecation and to low value assets.</p> <p>Depreciation of Controller working positions for validation platform</p>
<b>Other goods and services</b>	80.000	<p>- Production of videos/pictures for dissemination of results.</p> <p>-Final H2020 Certificate on Financial Statement</p> <p>-Catering for meetings at Ukraine/Rome involving guests</p> <p>-</p>
<b>Total</b>	197.138	

As per Sections 2.4 and 2.5 of the SJU Single Programming Document 2019-2021, “It is also envisaged that the same grant budget amendment procedure used for Wave 1 projects will be applied for Wave 2 projects in 2020”.

Therefore, the SJU contribution to the Action shall be broken down into several instalments.

The first instalment (“First SJU Contribution” of the Action), corresponding to the initial “maximum grant amount” as per Article 5.1 of the Grant Agreement, will be calculated in proportion of:

- the maximum grant amount after evaluation for the Action,
- the number of grants awarded under the IR call, and
- the 95 M€ SJU budget available.

On the basis of the First SJU Contribution for this Action established at a maximum grant amount of **6.150.284,22 € EUR** it is clarified that as a consequence, at the date of signature of the Grant Agreement and without prejudice to the total amount of the budget agreed for this Action, notwithstanding the activities described in the Annex 1, the work to be performed under the First SJU Contribution as per Article 5.1 of the Grant Agreement is limited as summarized below:

Number	Relative	Title	Lead Beneficiary	Type	Diss	Due Date (in
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	Number in WP				Level	months)
D1	D1.1	Project Management Plan	DLR (AT-One)	R	CO	2
D4	D4.3	OEI - Requirement No. 3	DLR (AT-One)	ETHICS	CO	12
D6	D1.2	Management Progress Report 1	DLR (AT-One)	R	CO	11

Any further SJU contribution resulting from further budget availability, will be implemented through a Grant Amendment as per Sections 2.4 and 2.5 of the SJU Single Programming Document 2019-2021, and will result in an update of the Maximum Grant amount in Article 5.1 of the Grant Agreement.

The Grant Amendment shall also modify article 21 of the Grant Agreement with an update of the pre-financing payment for the Action. The level of SJU contributions and pre-financing of the grant amendments will be established in accordance with the SJU Single Programming Document (SPD) as approved by the Administrative Board.

In the event of unavailability of further SJU Budget, beneficiaries may terminate their participation in the action as per article 50.2 and this shall not be regarded as a case of improper termination.

Acronym	Duration (months)	Number of participants	Total eligible costs	Requested EU contribution	Recommended EU contribution	1st Instalment	Prefinancing
PJ05-W2 DTT	37	31	17.477.436,50 €	9.530.666,45 €	9.530.666,45 €	6.150.284,22 €	3.690.170,53 €

## 4 Members of the consortium

### 4.1 Participants (applicants)

#### 4.1.1 Companies profile

##### 4.1.1.1 DEUTSCHES ZENTRUM FUER LUFT - UND RAUMFAHRT EV (DLR)

Organisation	1 DLR (AT-One)	Research
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 8000 employees at 20 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</p>	

friendly and reliable. In the field of air traffic management (ATM) and airports, the institute acts as a supplier of know-how and ideas while balancing the conflicting interests between fundamental research and applied science. As the largest German research facility for flight guidance, it strives to validate and deliver solutions to one of the greatest challenges in aviation – how to increase the efficiency and capacity of air transport in a safe and green way. Key tasks of the institute are to explore how the interplay of flight guidance on board and on the ground is optimized and how the complex interdependencies between the increasingly optimized aviation systems can be handled in a robust and resilient manner.

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.

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.

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.

AT-One Consortium is composed of its two members Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR) and Netherlands Aerospace Centre (NLR)

#### Previous experience

##### Publications:

[1] Jakobi, Jörn und Meixner, Kim Laura (2018) Effects of Unwanted Tracking Boxes in a Remote Tower Control Environment. International Journal For Traffic And Transport Engineering (ICTTE Belgrade 2018), 27.-28. Sep 2018, Belgrade. ISBN 978-86-916153-4-5 Volltext nicht online.

[2] Jakobi, Jörn und Hagl, Maria (2018) Effects of Lower Frame Rates in a Remote Tower Environment. The Tenth International Conference on Advances in Multimedia (MMEDIA 2018), IARIA, 22.-26. Apr.

2018, Athen, Griechenland. ISBN 978-1-61208-627-9 file

[3] Hagl, Maria und Friedrich, Maik und Papenfuß, Anne und Scherer-Negenborn, Norbert und Jakobi, Jörn und Rambau, Tim und Schmidt, Markus (2018) Augmented reality in a Remote Tower Environment based on VS/IR Fusion and optical tracking. Springer, Cham. 20th International Conference on Human-Computer Interaction, 15.-20. Jul. 2018, Las Vegas, Nevada. DOI: DOI: 10.1007/978-3-319-91122-9\_45 ISBN 978-3-319-91121-2 file

[4] Moehlenbrink, Christoph und Papenfuss, Anne (2014) Eye-data metrics to characterize tower controllers' visual attention in a Multiple Remote Tower Exercise. Paper presented at the ICRAT 2014, May 26-30, 2014, Istanbul, Turkey.

[5] Moehlenbrink, C., & Papenfuss, A. (2011). ATC-Monitoring When One Controller Operates Two Airports: Research for Remote Tower Centres. Paper presented at the HFES 55th Annual Meeting, Las Vegas.

[6] Möhlenbrink, C., Papenfuß, A., & Jakobi, J. (2012). The Role of Workload for Work Organisation in a Remote Tower Control Center. Air Traffic Control Quarterly, 20(1), 5-26.

[7] Helmke, H., Ohneiser, O., Buxbaum, J., and Kern, C. (2017) Increasing ATM Efficiency with Assistant Based Speech Recognition. Twelfth USA/Europe Air Traffic Management Research and Development Seminar (ATM2017), 27.-30.06.2017, Seattle, Washington, USA.

[8] Helmke, H., Slotty, M., Poiger, M., Ferrer Herrero, D., Ohneiser, O., Vink, N., Cerna, A., et al (2018) Ontology for Transcription of ATC Speech Commands of SESAR 2020 Solution PJ.16-04. 37th AIAA/IEEE Digital Avionics Systems Conference (DASC), 23.-27. Sept. 2018, London, UK.

#### List of relevant projects & activities

[1] MALORCA, 2016 – 2018, funded by H2020

[2] SESAR Wave 1 EXE-16.04-TRL4-TVALP-240.

[3] SESAR Wave 1 PJ05 – Remote Tower for Multiple Airports 2016-2019, funded by H2020.

[4] SESAR LOT 1 06.08.04, EXE-06.08.04-VP-638, EXE-06.08.04-VP-641

[5] RAiCe - Remote Airport Traffic Control Center, (2008 – 2012); funded by DLR

[6] “Virtual Control Tower Research Studies” VICTOR, 2009 – 2012) planning and conduction of validation trials; national funding via LuFo-IV research program iPort

[7] RapTOR: Remote Airport Tower Operation with Augmented Vision Videopanorama Human System Interface (2005 – 2007); funded by DLR



Entity Profile matching the task	<p>DLR (AT-One) intends to bring superb concept and validation know-how to PJ05-W2 DTT. As the first one, 2002 DLR (AT-One) introduced the Virtual Remote Tower concept. In 2005 the first prototype worldwide was running at DLR Braunschweig Airport and patented. After several concept verification and validation activities, DLR technology was transferred to the industry in 2014. Next steps are Multiple and Center remote tower solutions, now addressed by SESAR2020 to deploy them short-term. DLR (AT-One) has a very high interest in contributing to this SESAR 2020 initiative with its expertise.</p> <p>DLR (AT-One) intensively contribute to standardisation activities in function of the chairman of the EUROCAE WG100 “Remote and Virtual Tower”.</p> <p>Furthermore, DLR was the first to use Assistant Based Speech Recognition (ABSR), both in the approach and tower area. As command error rates were low and hypotheses quality high, this generated manifold interest for operationalisation of ABSR into modern Controller Working Positions.</p>
Contribution	<p>DLR (AT-One) takes over the Project Coordinator Role and all the related Management, communication, dissemination, and Ethic Requirements Tasks. DLR (AT-One) will participate with its Multiple Remote Tower modules in a Remote Tower Center simulator Platform in order to validate V3 of sol35 and TRL4 of sol97 dealing with HMI design, split&amp;merge procedures, supervisor role and Automatic Speech Recognition procedures, together with the manufacturing- and service industry B4, COOPANS, EUROCONTROL and FSP. DLR (AT-One) will contribute to concept design (OSED/SPR), e.g. integration of speech recognition and to the validation documentation and analysis (VALP/VALR).</p>

#### 4.1.1.2 *STICHTING NATIONAAL LUCHT- EN RUIMTEVAARTLABORATORIUM (NLR)*

Organisation	2 NLR (AT-One)	Research
Description	<p>Stichting Nationaal Lucht en Ruimtevaartlaboratorium (Netherlands Aerospace Centre) is participating in the AT-One Consortium, NLR (AT-One). The AT-One consortium is formed by the German Aerospace Center (DLR) and the Netherlands Aerospace Centre (NLR (AT-One)). AT-One combines the strength of DLR (AT-One) and NLR (AT-One) by joining their capabilities with respect to innovative and independent Air Traffic Management research and implementation support.</p> <p>NLR (AT-One) is the Netherlands Aerospace Centre for identifying, developing and applying advanced technological knowledge in the area of aerospace. NLR (AT-One) activities are relevant to society. They are market-oriented and carried out on a non-profit basis. NLR (AT-One) strengthens the innovativeness, competitiveness and effectiveness of government and business.</p> <p>The mission of NLR (AT-One) is to increase the sustainability, safety and efficiency of air transport. NLR (AT-One) is renowned for its leading expertise, professional approach and independent consultancy. NLR (AT-One) moreover possesses an impressive array of high quality research facilities. The activities of NLR (AT-One) span the full spectrum of Research Development Test &amp; Evaluation. NLR (AT-One) thereby bridges the gap between research and practical applications, while working for both</p>	

	<p>government and industry. Founded in 1919, and employing some 650 people.</p> <p>NLR (AT-One) is participating with two divisions in SESAR which are shortly introduced in the following:</p> <p>The division Aerospace Operations of NLR (AT-One) supports its customers – worldwide- with the realization of an excellent operation. With our extensive expertise and unique simulation facilities we contribute to the sustainable performance of air traffic: futureproof, safer, more efficient and more environmentally friendly. Through consultancy and R&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 (AT-One) is active in several domains: avionics technology, definition and flight testing of aircraft systems, application and testing of military systems, and application of space systems. Experts are active in the recent developments of RPAS technology, their certification and integration into non-segregated airspace. Furthermore the division is active in defining and facilitating experimental flight testing. The division has wide expertise in the certification of civil and military aircraft and systems. In the field of navigation NLR (AT-One) has deep expertise in GNSS.</p>
Previous experience	<p>Publications:</p> <p>[1] Sundberg, M., van Schaik, F.J. (2010). Advanced Remote Towers: Final Activity Report, Sixth European Commission Framework Programme, Research Area 4, Brussels.</p> <p>[2] Schaik, F.J. van, Roessingh, J.J.M., Lindqvist, G., Fält, K. (2010). Assessment of visual cues by tower controllers, with implications for a Remote Tower Control Centre, NLR (AT-One) Technical Paper, NLR (AT-One)-TP-2010-592, Amsterdam.</p> <p>List of relevant projects &amp; activities</p> <p>[1] Advanced Remote Tower (2007-2010), Sixth European Commission Framework Programme, Research Area 4</p> <p>[2] Field Tests with a Camera Surveillance Evaluation System for RWY 18R/36L at Schiphol Airport (2011)</p> <p>[3] Establishing System Requirements for a Camera Surveillance System for RWY 18R/36L at Schiphol Airport (2013)</p> <p>[4] SESAR Large Scale Demonstration 02.05: Demonstration Report Remote Tower Operations, Edition 2.0, 28-Oct-2016, SESAR-JU</p> <p>[5] SESAR Solution PJ.05-02: Validation Plan (VALP) for V3 - Part I, Edition 1.0, 21-Sep-2018</p> <p>[6] SESAR Solution PJ.05.02 Validation Report (VALR) for V2 - Part I, Edition 1.1, 24-May-2018, SESAR-JU</p>



	[7] SESAR Solution PJ.05-03: Validation Plan (VALP) for V2 - Part I, Edition 1.0, 19-Sep-2018
Entity Profile matching the task	<p>NLR (AT-One) will bring to the project decades of experience in setting up and performing very realistic real-time simulations with their validation platform NARSIM, the NLR (AT-One) ATC Research Simulator. NARSIM is owned by NLR (AT-One) but currently also in use by the German Aerospace Center (DLR (AT-One)), Swedish ANSP LFV/COOPANS and Nanyang Technological University in Singapore. One of the major advantages of this platform is the flexibility of its use and its scalability. NARSIM software development experts and validation experts from NLR (AT-One), who participated in several major European ATC research projects in recent years and also co-authored the European Operational Concept Validation Methodology (E-OCVM), will take part in this project. They will use the very adaptable NARSIM-Tower front end and a specifically developed NARSIM-RTO working position to contribute to Remote Tower Module simulations based on the experience gathered during the SESAR Large Scale Demonstrations (LSD) and the exercises in Wave-1 of SESAR 2020. NLR (AT-One) is the major partner of Dutch ANSP LVNL, who have been performing a SESAR LSD in 2016 with remote control of Groningen Airport Eelde and a simultaneous NARSIM simulation of Maastricht Airport Beek, which is set-up by NLR (AT-One). Furthermore, all training and technical testing has been prepared with support of ATC Operations, Human Factors, and Safety experts of NLR (AT-One). Their combined knowledge will not only help in carrying out multiple remote tower exercises with several airports combined in one Remote Tower Module (RTM), but will also provide an excellent environment for developing innovative solutions for controller support in multiple remote tower operations.</p>
Contribution	<p>NLR (AT-One) will continue working on further enhanced short-term planning tools for controllers and long-term planning tools for the RTC. These tools are specifically adapted to the different uses defined by the time horizon and the purpose of the planning. While the short-term planning tool is giving indications to controllers about the task load that can be expected at a remote-controlled airport within the upcoming hour, the long-term planning tool balances workload in different multiple RTMs and in case of remaining planning bottlenecks splits one or more aerodromes to available single RTMs. NLR (AT-One) will use their rapid prototyping platforms to support further development of such tools. If required, though, NLR (AT-One) would again contribute to the set-up of several RTMs with real-time and shadow-mode simulation platforms.</p> <p>In addition to abovementioned activities NLR will focus also on innovative technologies and their application in a Conventional Tower and a Multiple Remote Tower Module setting. Such technologies include a HoloLens and enhancements in a panorama view of an RTM. Topics to investigate will cover tracking labels, safety net applications, additional planning information and gap fillers. All these elements can be applied in both contexts.</p>

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

Organisation	3 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.</p>	

	<p>Covering rather small but very complex airspace, the company handled more than 850.000 flights in 2017 and more than 910.000 flights in 2018, 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 above-mentioned 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). 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>- BETA project, 2000-2002, Fifth RTD Framework Programme (EC)</li> <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> </ul> <p>General SESAR experience:</p> <p>ANS CR is actively involved in SESAR 2020 Wave 1 Solutions and has a lot of experience not only with the SESAR requirements and methodology, but also with various research and development topics being content of SESAR. Currently, ANS CR is actively involved in following solutions:</p> <p>PJ.01-02, PJ.01-3b, PJ.03a, PJ.03b, PJ.07-03, PJ.10-1b, PJ.10-2a, PJ.10-2b, PJ.16-03, PJ.16-04, PJ.18-06 and PJ.28.</p> <p>ANS CR has experience with contribution and development of all main project deliverables and also 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. ANS CR has also internal team of experts and well developed network of cooperating LTPs. This experience will be utilised in the Wave 2.</p> <p>Experience specific to the content of SOL 97:</p> <p>ANS CR was part of the team working on the MALORCA project, which was focused on the implementation of machine learning</p>

	<p>principles into the introduction of Automatic Speech Recognition in ATM systems for APP.</p> <p>ANS CR together with its LTPs INTEGRA is part of the team of SOL PJ16-04 (Workstation, Controller Productivity):</p> <ul style="list-style-type: none"> <li>- Project sponsored by Horizon 2020, 28 partners in different Activities, 2016-2019</li> <li>- ANS CR participate in the Activities – MTI (Multiple Touch Input device), UPMS (User Profile Management System) and ASR (Automatic Speech Recognition)</li> <li>- ASR activity – ANS CR participate in Exercise 220, together with Thales Air Systems, DLR, AustroControl and Integra (LTP of ANS CR)</li> <li>- ASR activity – ANS CR is responsible for Operational Concept, Requirements specification, preparation of validation scenarios, plans and trials.</li> <li>- Integra (LTP of ANS CR) is responsible for all Safety assessments and participate on HF assessments.</li> </ul>
Entity Profile matching the task	<p>Experience relevant to Solution 97 includes ATM Operational services, development, prototyping and operation of specific tools, Project and Quality management, prototype and operational validation, ATM Safety assessment (provided by LTP Integra).</p> <p>Additional to the abovementioned expertise and experience ANS CR can support Solution 97 by its knowledge in the areas of preparation of ATM Operational Concepts and Requirements. From previous ASM projects ANS CR has a lot of experiences with implementation of this technology into the ATM systems.</p> <p>During the exploratory research project MALORCA and works in PJ.16-04 in Wave 1, ANS CR (B4) gained considerable experience in automatic speech recognition in the APP environment, that could now be transferred to the TWR domain.</p>
Contribution	<p>In PJ.05-W2-97 solution, ANS CR (B4) will mainly concentrate on the Operational and Safety Aspects. ANS CR and their LTP Integra will provide the Safety Assessments expertise and taking the responsibility for Safety matters for Exercises 03 and 06 in this Solution. From the operation point of view, ANS CR will participate on the definition of necessary functionalities for ASR in the TWR environment.</p> <p>Specific expertise relevant for the project are :</p> <ul style="list-style-type: none"> <li>• Development and supervision of operational concepts;</li> <li>• Safety concepts &amp; Safety Assessments;</li> <li>• Automatic Speech Recognition usage in ATM</li> </ul>

#### 4.1.1.4 LETOVÉ PREVÁDZKOVÉ SLUŽBY SLOVENSKEJ REPUBLIKY ŠTÁTNY PODNIK

Organisation	4	LPS SR (B4)	Service Provider
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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>In 2017, compared to the previous year, an increase in traffic was seen in the FIR Bratislava, namely from 505,155 to 522,353 movements, i.e. by 3.4%. August 5 was the day with the highest number of movements; on that day LPS SR provided air navigation services to record-breaking 2,163 flights. The European-wide increase in air traffic is also reflected in the evolution seen in the Slovak airspace in the last decade when the total number of movements increased by 59%.</p> <p>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. The average delay was only 0.039 minutes per flight.</p> <p>LPS SR is a part of B4 Consortium, Member of SESAR Joint Undertaking.</p> <p>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	<p>Aside from continuous technological and operational improvements and upgrades realised through execution of in-house projects and/or projects in cooperation with domestic and/or international partners financed from user charges and in line with the company's investment plan (such as the RIMCAS project – development of a new surveillance surface movement system focusing on small and regional airports, the E2000 system upgrade, or the AIM systems development and operation), LPS SR has been also involved in implementation of projects co-financed with the EU funds.</p> <p>These include both the R&amp;D as well as the deployment kind of actions, where co-funding has been provided under the following instruments or institutions:</p> <ul style="list-style-type: none"> <li>• European GNSS Agency: <ul style="list-style-type: none"> <li>○ ACCEPTA</li> <li>○ IMPROWE</li> </ul> </li> <li>• SESAR 2020: <ul style="list-style-type: none"> <li>○ PJ.03b Airport Safety Nets</li> <li>○ PJ.04 Total Airport Management</li> <li>○ PJ.05 Remote Tower for Multiple Airports</li> <li>○ PJ.14 Essential and Efficient Communication Navigation and Surveillance Integrated System</li> <li>○ PJ.16 Controller Working Position / Human Machine Interface - CWP/HMI</li> </ul> </li> </ul>

	<ul style="list-style-type: none"> <li>○ PJ.17 SWIM Technical Infrastructure</li> <li>○ PJ.18 4D Trajectory Management</li> <li>● Connecting Europe Facility: <ul style="list-style-type: none"> <li>○ 2014 CEF Transport: <ul style="list-style-type: none"> <li>▪ Free Route Airspace from the Black Forrest to the Black Sea</li> </ul> </li> <li>○ 2015 CEF Transport (MAP Cohesion Call): <ul style="list-style-type: none"> <li>▪ NewPENS</li> <li>▪ AMAN LOWW initial</li> <li>▪ Synchronised Performance Based Navigation Implementation Cohesion Europe (SPICE)</li> </ul> </li> <li>○ 2016 CEF Transport Call (MAP General Call) <ul style="list-style-type: none"> <li>▪ Deploy SWIM Governance</li> <li>▪ DLS Implementation – Path 2</li> </ul> </li> <li>○ 2016 CEF Transport Call (MAP Cohesion Call) <ul style="list-style-type: none"> <li>▪ FAB CE Wide Implementation of DAM and STAM Study</li> </ul> </li> <li>○ 2017 CEF Transport MAP SESAR Call: <ul style="list-style-type: none"> <li>▪ SWIM Common PKI and policies &amp; procedures for establishing a Trust framework</li> </ul> </li> </ul> </li> </ul> <p>PRISME (PBN Regional Implementation and Sustained Monitoring of EGNOS Performance)</p>
Entity Profile matching the task	<p>LPS SR has a vast expertise in ATM operational and technical domains, performance management and analysis, business case, information management and ATM projects, based on know-how of Operational, Technical and Safety experts. LPS SR also has an expertise in design and implementation of innovative technologies, especially related to the Controller Working Position productivity and Safety supported by the use of the Development and Test Platform developed by the company's in-house SW development unit.</p> <p>LPS SR also has experience in the area of identification (authentication) system as it is good assumption and baseline to cover all the required Operational and Validation Procedures, even related to the UPMS (User Profile Management System) solution.</p> <p>Additional to the abovementioned expertise and experience, LPS SR can support Project PJ.10 by its knowledge in the areas of ATM Operational Concept, ATC and SESAR Programme objectives knowledge specific to the project. The validated results and experience gained from Wave 1 should be beneficial for input to solution #93 and #96 where LPS SR plans to participate in Wave 2.</p>
Contribution	LPS SR is not actively contributing to this project.

#### 4.1.1.5 VALSTYBES IMONE „ORO NAVIGACIJA

Organisation	5 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</p>	



	<p>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 controls the airspace of Republic of Lithuania and over the part of Baltic Sea (Vilnius FIR) of the total size of 76 126 km<sup>2</sup> and provides ATC services at four designated Lithuanian international airports.</p> <p>In 2018, compared to the previous year, an increase in air traffic was seen in the Vilnius FIR, namely from 243,022 to 265,919 IFR movements, i.e. by 9.4 %. The European-wide increase in air traffic is also reflected in the evolution seen in the airspace of Republic of Lithuania in the last decade when the total number of IFR movements increased by 47%. Each year providing safe and efficient air traffic control services to more than 250 thousand flights ON continues to maintain zero delays level and to meet users' expectations.</p> <p>ON 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 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 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>ON participates in 6 projects and 8 solutions (Workpackages (WPs)) under SESAR 2020 Programme in Wave 1 within the framework of Horizon 2020 Programme (EU Research and Innovation Programme). Currently, ON actively participates in the following SESAR 2020 Wave 1 projects:</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>and solutions (workpackages (WPs)):</p> <ul style="list-style-type: none"> <li>• PJ.05-02: Remotely Provided Air Traffic Service for Multiple Aerodromes</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</li> <li>• PJ.06-02: Management of Performance Based Free Routing in Lower Airspace</li> <li>• PJ.14-01: CNS Environment Evolution</li> <li>• PJ.19-04: Performance Management</li> <li>• PJ.20-02: Master Plan Maintenance</li> <li>• PJ.22-03: Maintenance of the Platform Development Methodology</li> </ul>

	<ul style="list-style-type: none"> <li>• PJ.22-04: Communalization of Validation Tools and Interoperability Solutions</li> </ul> <p>ON has experience in contribution and development of all main projects deliverables and performing solutions validation exercises. ON has a SESAR 2020 Programme Management team and an internal team of experts specializing in different ATM related fields.</p>
Entity Profile matching the task	<p>Working on Solution PJ.05-02 (Remotely Provided Air Traffic Service for Multiple Aerodromes) ON has provided input on Safety and Performance Requirements to the OSED, performed CBA, and prepared Validation Plan and Validation Report for validation exercise (PJ.05-02 RTS V2).</p> <p>ON has performed validation of Solution PJ.05-02 in Deutschen Zentrums für Luft- und Raumfahrt (DLR) focusing on one remote tower center (RTC) operating on common regional COM infrastructure covering human factor, remote ATS provision for GA/Rotorcraft, as well as MET provision including local weather, CWP enhancement issues to support RTC/RTM concept.</p> <p>Working on Solution PJ.05-03 (Remotely Provided Air Traffic Services from a Remote Tower Centre with a flexible allocation of aerodromes to Remote Tower Modules) ON has provided input on Safety and Performance Requirements to the OSED, inputs to the CBA according to the validation results, and prepared Validation Plan and Validation Report for validation exercise (PJ.05-03 RTS V2).</p> <p>ON has performed validation of Solution PJ.05-03 in Deutschen Zentrums für Luft- und Raumfahrt (DLR) addressing SDM-0210 and SDM-0209 and focussing on interconnection of at least 2 remote tower centres (RTC) via common regional COM infrastructure covering splitting and merging of aerodromes control, control responsibility transfer procedure, planning tools, human factor, infrastructures' technical and operational supervisions as well as CWP enhancement issues to support multi RTC/RTM concept with flexible allocation of several selected airports.</p> <p>ON has experience in cooperation with all partners (DLR, FREQUENTIS, PANSA HungaroControl, etc.) gained during SESAR 2020 Wave 1.</p>
Contribution	<p>ON intends to contribute to the following activities related to Solution 35 (Multiple Remote Tower and Remote Tower centre) and Solution 97 (HMI Interaction modes for Airport Tower):</p> <ul style="list-style-type: none"> <li>• Contribution to project concept design, project management and corresponding documents</li> <li>• Contribution to VALP / VALR / SAP / SAR</li> <li>• Contribution to validation exercises in terms of provision of ATCOs and experienced professionals</li> <li>• Expert review of all documents and deliverables</li> </ul> <p>ON intends to focus on the following issues related to Solution 35 (Multiple Remote Tower and Remote Tower centre) during validation exercises:</p> <ul style="list-style-type: none"> <li>• The RTC supervisor role and required support systems. This includes the development of tools and features for a flexible</li> </ul>

	<p>planning of all aerodromes connected to remote tower services, including effective planning tools in both short term and long term all managed by the supervisor</p> <ul style="list-style-type: none"> <li>• Transition aspects e.g. how to handle a handover (planned and urgent) and what are the operational / system support needs e.g. debriefing tool, RTC to RTC coupling transferring responsibility of an airport, etc.</li> <li>• Advanced automation functions to maintain ATCO situational awareness in operations involving multiple remote towers e.g. voice recognition, alerting and warnings for conflict detection and conflict resolution advisories, etc.</li> </ul> <p>ON intends to focus on the following issues related to Solution 97 (HMI Interaction modes for Airport Tower) during validation exercises:</p> <ul style="list-style-type: none"> <li>• Automatic speech recognition (ASR): enables the recognition and translation of spoken language e.g. ATCOs commands into the system reducing their workload and improving safety, e.g. reduce head down times of the controller</li> </ul> <p>Integration of artificial intelligence (AI) and machine learning algorithms for the intelligent data provision to the controllers on the HMI</p>
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#### 4.1.1.6 POLSKA AGENCJA ZEGLUGI POWIETRZNEJ

Organisation	6 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. Each year PANSA, being one of the biggest ANSPs in the Central and Eastern part of Europe, provides safe, effective and highly efficient air traffic control services. In 2018 PANSA handled over 830 thousands movements (IFR traffic). 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	Concept of service for two airports to work with use of Remote Tower	



experience	<p>system in 2018, including ConOps and initial system design.</p> <p>Further experience was gained through the design of the Alternative Ground Surveillance system, that is validated in the framework of SESAR 2020 PJ02-06 Solution. That applies to both system design and human-in-the-loop aspects.</p> <p>All above is well supported by extended reference visits in other Remote Tower Centres.</p> <p>The design of the Remote Tower system will take into account the internal contingency subsystem, in the event of loss of visual observation of the aerodrome and the manoeuvring field, eg. use surveillance data.</p>
Entity Profile matching the task	<p>PANSA is Air Navigation Services Provider that provides the aerodrome ATS for 15 Towers with different size and traffic mix. As an ANSP it gained proper experience in provision of modern and optimal services as well as in setting adequate CNS solutions.</p> <p>PANSA gained significant experience in R&amp;D projects and implementation of solutions aiming increased runway throughput. It includes, inter alia, operational needs defining, concept of operations, development of solutions, verification and validation processes.</p> <p>The profiles that PANSA offers to the Project PJ.05:</p> <ul style="list-style-type: none"> <li>- Tower/airport operational expertise</li> <li>- Human performance and safety expertise</li> <li>- Real time and fast time simulations expertise</li> <li>- Extensive knowledge in IT systems design and its requirements.</li> </ul>
Contribution	<p>PANSA will contribute with its resources to concept design &amp; validations. PANSA plans to support exercises with ATCOs and experienced professionals that will focus on transitions and handover aspects of RTCs, role of the supervisor and development of the CWP.</p> <p>As a part of contribution PANSA plans to use the experience gained through the validations of the safety nets based on Alternative Ground Surveillance (SESAR PJ03b-01).</p>

#### 4.1.1.7 AUSTRO CONTROL OSTERREICHISCHE GESELLSCHAFT FUR ZIVILLUFTFAHRT MBH (ACG)

Organisation	7 ACG/COOPANS	Service Provider
Description	<p>Austro Control is a state-owned limited liability company.</p> <p>Location: The headquarter is located in Vienna and subdivisions are situated in Linz, Salzburg, Klagenfurt, Graz and Innsbruck.</p> <p>Organizational setup: Two main divisions - Air Navigation Services (operational functions) comprising Air Traffic Management, Engineering Services, Meteorological Services and Aviation Agency (regulatory matters) supported by corporate services</p> <p>Governance structure: A Supervisory Board and a Management Board are responsible for the corporate governance. An audit committee is also established.</p>	

	<p>The primary business of the ANS part of Austro Control is the provision of air navigation services, pursuing the basic principle of a high level of air traffic safety in compliance with Single European Sky framework</p> <p>Austro Control is a member of COOPANS Consortium consisting of 5 Air Navigation Service Providers: Austro Control (ACG), Croatia Control (CCL), Irish Aviation Authority (IAA), Naviar and Luftfartsverket (LFV). 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>Austro Control has many years of experience in the delivery of Air Traffic Services, the design of concepts and in development, validation and implementation of Air Traffic Management tools.</p> <p>The enterprise is certified according to ISO 9001.</p>
Previous experience	<p>Austro Control has participated in SESAR via NORACON consortium in the following WPs:</p> <p>WP00 SESAR2020 preparation: 00.15</p> <p>WP3 Validation infrastructure adaptation and integration: 03.03.02, 03.03.03</p> <p>WP5 TMA Operations: 05.03.00, 05.06.02, 05.06.04, 05.06.07, 05.07.02, 05.09</p> <p>WP6 Airport Operations: 06.05.05, 06.06.01, 06.07.01, 06.08.08, 06.09.03</p> <p>WP7 Network Operations: 07.05.04</p> <p>WP8 Information Management: 08.01.01, 08.01.06, 08.03.03, 08.03.06, 08.03.10</p> <p>WP10 En-Route &amp; Approach ATM Systems: 10.02.01, 10.02.03, 10.03.01, 10.03.08, 10.07.01, 10.10.03</p> <p>WP12 Airport Systems : 12.02.01, 12.06.03</p> <p>WP13 Network Information Management Systems: 13.02.02</p> <p>WP14 SWIM Technical Architecture: 14.02.03, 14.04</p> <p>WP16 R&amp;D Transversal Areas: 16.01.01, 16.06.01, 16.06.01.b</p> <p>WP B Target Concept and Architecture Maintenance: B.04.05</p> <p>WP C: Master Plan Maintenance C.02, C.03</p> <p>Austro Control has participated in SESAR 2 Wave 1 in the following Projects, Solutions or VLDs:</p> <p>PJ.01-01</p> <p>PJ.02-01</p> <p>PJ.03a-01</p> <p>PJ.04-02</p> <p>PJ.05-02</p>

	<p>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</p>
Entity Profile matching the task	<p>During the exploratory research project MALORCA and the work in PJ.16 in Wave 1 Austro Control has gained substantial experience in Automatic Speech Recognition in an approach environment, which shall now be transferred into the airport (Tower) domain. Similarly, Austro Control has been working in the Remote Tower project PJ.05 in Wave contributing to the evolution of the concept and its validation.</p> <p>Specific expertise relevant for the project:</p> <ul style="list-style-type: none"> <li>• Development and supervision of operational concepts</li> <li>• Safety concepts &amp; Safety Assessments</li> <li>• Automatic Speech Recognition</li> <li>• Validation and Integration</li> <li>• Participation in European deployment activities (IDSG &amp; SDM)</li> <li>• Human Performance Assessment</li> </ul>
Contribution	<p>Austro Control will contribute to the project by providing ATM subject matter experts emphasizing on operational work, mainly providing input to the operational concepts and supporting the validations with the goal to:</p> <ul style="list-style-type: none"> <li>• Alleviate ATCOs of tedious and error-prone manual tasks thus reducing AC workload</li> <li>• Improving the safety due to automation</li> <li>• Rationalizing ATM operations</li> </ul>

#### 4.1.1.8 CROATIA CONTROL, CROATIAN AIR NAVIGATION SERVICES LTD (CCL)

Organisation	8 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: Air Traffic Management, Technical Division, Aeronautical Meteorology, Military Operations and Human Resources Management, Legal and Financial Affairs.</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.</p>	

	<p>The Supervisory Board monitors the activities of the organization. Supervisory Board appoints the Director General. 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> <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: Austro Control (ACG), Croatia Control (CCL), Irish Aviation Authority (IAA), Naviair and LFV. Cooperation between COOPANS partners goes beyond SESAR – partners has for a long time worked together with Thales under a common framework agreement in a joint program based on the incremental development of a common ATM platform. The overarching goal for COOPANS is to enable each individual ANSP to achieve financial savings through cost, resource, and competence sharing and to meet the EU objective of harmonizing ATM systems. This work is now expanded to Research &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 participated in SESAR 2020 Wave 1 as a member of COOPANS Consortium in the following projects, solutions or VLDs:</p> <p>PJ.01-01 PJ.04-02 PJ.05-02 PJ.05-03 PJ.06-01 PJ.09-02 PJ.10-02A PJ.10-02B PJ.10-05 PJ.15-09 PJ.16-03 PJ.16-04 PJ.18.02 PJ.18.04 PJ.18-06 PJ.19-CI02 PJ.19-CI05 PJ.20 PJ.24</p> <p>In project PJ.05, Croatia Control participated in validation exercises for solution PJ.05-02 and PJ.05-03 providing operation expertise and support.</p>
Entity Profile matching the task	<p>Croatia Control as a part of COOPANS has a long experience in cooperating with industry partner Thales at expert and management</p>

	<p>level for the development of core ATM system EUROCAT-E and Topsky since 2001. TopSky is one of the most modern ATM systems in the world, and Croatia Control together with COOPANS partners are continuing to develop the ATM system in anticipation of future European Mandates and SESAR in a cost efficient manner.</p> <p>Many of the Croatia Control's experts had been working in EUROCAT-E developments and implementation, and now are working with COOPANS partners and Thales on development of the functionalities in the TopSky. COOPANS has particular expertise in the development of common operational solutions, the development of ATM functions and ATC support tools and future concepts of operations.</p> <p>Croatia Control has experience in many areas related to this project, as for example:</p> <ul style="list-style-type: none"> <li>• Development and supervision of operational concepts</li> <li>• Safety concepts &amp; Safety Assessments</li> <li>• CWP design</li> <li>• Development and implementation of ATM systems and tools</li> <li>• Validation and Integration</li> <li>• HP Expert - Human Performance Assessment</li> <li>• ATM expert – Operations</li> <li>• ATFCM Expert – Operations</li> </ul> <p>ATC User Requirements</p>
Contribution	<p>Croatia Control will participate in solutions PJ.05-35 and solution PJ.05-97 with operational experts (ATCOs) with focus on operational issues, and with Human Performance expert providing Human Performance assessment in solution PJ.05-97.</p>

#### 4.1.1.9 IRISH AVIATION AUTHORITY (IAA)

Organisation	9 IAA/COOPANS	Service Provider
Description	<p>Irish Aviation Authority is a state-owned limited liability company</p> <p>Locations: The headquarter is located in Dublin and subdivisions are located in Shannon and Cork</p> <p>Divisions: Two main divisions - Operations and Strategy, Technology and Training supported by corporate services. Furthermore, Irish Aviation Authority has a Safety Regulation Directorate, as Irish Aviation Authority oversees and regulates the implementation of standards for the Irish civil aviation industry.</p> <p>Governance structure: Irish Aviation Authority has a Board of Directors having responsibility for the corporate governance.</p> <p>Irish Aviation Authority (IAA) is a member of COOPANS Consortium consisting of 5 Air Navigation Service Providers: Austro Control (ACG), Croatia Control (CCL), Irish Aviation Authority (IAA), Naviar and LFV. Cooperation between COOPANS partners goes beyond SESAR – partners has for a long time worked together with Thales under a common framework agreement in a joint program based on the incremental development of a common ATM platform. The</p>	

	<p>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>Irish Aviation Authority (IAA) has many years of experience, both in the delivery of Air Traffic Services; design of concepts and in development, validation and implementation of Air Traffic Management tools.</p> <p>The enterprise is certified ISO 9001.</p>
Previous experience	<p>Irish Aviation Authority (IAA) has participated in SESAR via NORACON consortium in the following WPs:</p> <p>WP5 TMA Operations (5.3, 5.6.1, 5.6.4, 5.6.7, 5.9), WP6 Airport Operations (6.7.1), WP 10 En-Route &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 has participated in SESAR 2020 wave 1 in the following projects: PJ.10, PJ.16, PJ.17, PJ.25 and PJ.27</p>
Entity Profile matching the task	IAA is not actively contributing to this project.
Contribution	IAA is not actively contributing to this project.

#### 4.1.1.10 *LUFTFARTSVERKET (LFV)*

Organisation	10 LFV/COOPANS	Service Provider
Description	<p>Luftfartsverket (LFV) is a state enterprise with headquarter located in Norrköping, Sweden. LFV has subdivisions located in 22 different sites, most important being in Stockholm (Arlanda) and Malmö (Sturup), where the two area control centres are located.</p> <p>LFV has three main divisions:</p> <ul style="list-style-type: none"> <li>- Operational Systems &amp; Development</li> <li>- ATM Operations</li> <li>- Sales</li> </ul> <p>All supported by corporate services.</p> <p>Governance Structure:</p> <p>LFV has a Board of Directors having responsibility for the corporate governance. The Director general is appointed by the Board of Directors.</p> <p>LFV is a member of COOPANS Consortium consisting of five Air Navigation Service Providers: Austro Control (ACG), Croatia Control (CCL), Irish Aviation Authority (IAA), Naviar, Navegação Aérea de Portugal (NAV Portugal) and Luftfartsverket (LFV). Cooperation between COOPANS partners goes beyond SESAR- partners has for a long time worked together with Thales under a common framework agreement in a joint program based on the incremental development of a common ATM platform. The overarching goal for COOPANS is to enable each individual ANSP to achieve financial savings through cost, resource, and competence sharing and to meet the EU objective of</p>	



	<p>harmonizing ATM systems. This work is expanded to Research &amp; Innovation by the establishment of the COOPANS Consortium.</p> <p>Luftfartsverket (LFV) has many years of experience, both in the delivery of Air Traffic Services; design of concepts and in development, validation and implementation of Air Traffic Management tools.</p> <p>LFV has an extensive experience and a close interaction with the industry and Swedish Transport Agency, developing new technology. The effect of this is a flexible product portfolio of functional and cost efficient solutions, like the development of Remote Tower Services (RTS) that went from idea to reality in record time.</p> <p>The enterprise is certified ISO 9001.</p>
Previous experience	<p>LFV has participated, contributing to and also been leading projects in SESAR 1 within NORACON Consortium in the following WPs:</p> <ul style="list-style-type: none"> <li>- <b>WP00 - SESAR2020 preparation:</b> 00.14, 00.15</li> <li>- <b>WP3 - Validation infrastructure adaptation and integration:</b> 03.01.01, 03.02.01, 03.02.02, 03.03.02, 03.03.03</li> <li>- <b>WP4 - En-route Operations:</b> 04.08.04, 04.10</li> <li>- <b>WP5 - TMA Operations:</b> 05.03.00, 05.06.01 (Lead), 05.06.02, 05.06.04, 05.06.07, 05.07.02, 05.09</li> <li>- <b>WP6 - Airport Operations:</b> 06.06.02, 06.07.01, 06.08.01, 06.08.02, 06.08.04, 06.08.08, 06.09.03(Lead)</li> <li>- <b>WP7 - Network Operations:</b> 07.05.02, 07.05.03, 07.05.04</li> <li>- <b>WP8 - Information Management:</b> 08.00 (Lead), 08.01.03, 08.01.04, 08.01.05, 08.01.06, 08.01.09, 08.03.00, 08.03.03, 08.03.04, 08.03.06, 08.03.10</li> <li>- <b>WP9 - Aircraft Systems :</b> 09.48</li> <li>- <b>WP10 - En-Route &amp; Approach ATM Systems:</b> 10.02.01, 10.02.03, 10.03.01, 10.03.08, 10.04.04, 10.07.01, 10.09.04, 10.10.03</li> <li>- <b>WP12 - Airport Systems :</b> 12.02.01, 12.04.06, 12.04.07, 12.04.08, 12.04.10</li> <li>- <b>WP14 - SWIM Technical Architecture:</b> 14.01.03, 14.04</li> <li>- <b>WP15 - Non-Avionic CNS System:</b> 15.01.06, 15.01.07, 15.02.04, 15.04.05.a, 15.04.05.b</li> <li>- <b>WP16 - R&amp;D Transversal Areas:</b> 16.01.02, 16.04.01, 16.04.03, 16.04.04, 16.05.04, 16.06.01.b</li> <li>- <b>WP B - Target Concept and Architecture Maintenance:</b> B.04.01, B.04.02, B.04.03, B.04.05</li> <li>- <b>WP C - Master Plan Maintenance:</b> C.02, C.03</li> </ul> <p>Of special relevance to this project is WP5.6.1 Ground and Airborne Capabilities to Implement Sequence, WP5.6.4 Tactical TMA and En-route Queue Management, WP5.6.7 Integrated Sequence Building/Optimization of Queues and WP6.8.4 Coupled AMAN-DMAN. The SWIM artifacts developed in WP 08.00 will be further explored in the concept.</p> <p>Through the engagement in WP B.04.02, LFV has been leading the ConOps development.</p> <p>In SESAR 2020, wave 1, LFV has contributed to and also been leading solutions via COOPANS Consortium in the following solutions:</p>



	<ul style="list-style-type: none"> <li>- <b>PJ.01-01</b> - Extended Arrival Management with overlapping AMAN operations and interaction with DCB</li> <li>- <b>PJ.01-03B</b> - Use of Arrival and Departure Management Information for Traffic Optimisation in the TMA</li> <li>- <b>PJ.02-08</b> - Traffic optimisation on single and multiple runway airports (lead)</li> <li>- <b>PJ.02-11</b> - Enhanced Terminal Area for efficient curved operation</li> <li>- <b>PJ.05-02</b> - Remotely Provided Air Traffic Service for Multiple Aerodromes (lead)</li> <li>- <b>PJ.05-03</b> - Remotely Provided Air Traffic Services from a Remote Tower Centre with a flexible allocation of aerodromes to Remote Tower Modules (lead)</li> <li>- <b>PJ.06-01</b> - Optimized traffic management to enable Free Routing in high and very high complexity environments</li> <li>- <b>PJ.10-01a</b> - High Productivity Controller Team Organisation</li> <li>- <b>PJ.10-02b</b> - Controller Automated Support Tools in En-Route Environment</li> <li>- <b>PJ.10-05</b> - IFR RPAS Integration</li> <li>- <b>PJ.15-09</b> - Data Centre Service for Virtual Centres Service</li> <li>- <b>PJ.16-03</b> - Virtual Centre Concept</li> <li>- <b>PJ.16-04</b> - Workstation, Controller productivity</li> <li>- <b>PJ.18-02</b> - Integration of trajectory management processes</li> <li>- <b>PJ.19-CI01</b> - ATM operations</li> <li>- <b>PJ.19-CI02</b> - Systems and services</li> <li>- <b>PJ.19-CI04</b> - Support and Evolution of the Content Integration Framework</li> <li>- <b>PJ20</b> - Masterplan maintenance</li> <li>- <b>PJ.25</b> - E-AMAN VLD</li> <li>- <b>PJ.27</b> - Flight Object Interoperability VLD</li> <li>- <b>PJ.31</b> - Initial Trajectory Information Sharing VLD</li> </ul> <p>From SESAR 2020, wave 1, it is of special relevance to this project, LFV's engagement in solution PJ.01-01 - Extended Arrival Management with overlapping AMAN operations and interaction with DCB, where LFV was responsible for and validated thread 3.</p> <p>LFV has many years of experience with arrival/departure management through the adaptation, implementation and operation of the Maestro arrival manager, which is now an integrated part of the ATM-system.</p>
Entity Profile matching the task	<p>An AoR with many airports and with several major airports close to each other and close to AoR boundaries has given LFV extensive experience in optimization of arrival and departure management. Expertise is present in the company in many areas:</p> <ul style="list-style-type: none"> <li>• Remote airport ATC</li> <li>• Development and supervision of operational concepts</li> <li>• Safety concepts &amp; Safety Assessments</li> <li>• Airport safety support tools</li> <li>• Collaborative Decision Making</li> <li>• Air traffic forecast/Capacity planning incl. runway capacity</li> </ul>

	<p>enhancement</p> <ul style="list-style-type: none"> <li>• CWP design</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>• Integration, validation and analysis of test result</li> <li>• Extended lab environment including NARSIM</li> <li>• Participation in European deployment activities (IDSG)</li> </ul> <p>Human performance assessment</p>
Contribution	<p>LFV will contribute to operational concept development and also plan to host validation on COOPANS validation platform, NARSIM, by means of its workforce containing operational experts (ATCOs), validation experts and platform development experts.</p>

#### 4.1.1.11 NAVIAIR

Organisation	11 NAVIAIR/COOPANS	Service Provider
Description	<p>Naviar is a 100% state owned company originating in “Statens Luftfartsvæsen” founded in 1938. Headquarter is located in Copenhagen (TWR/APP/En-route) and subdivisions are located in Roskilde, Billund, Århus, Rønne and Ålborg (TWR/APP) and in Vagar &amp; Nuuk (FIS/FIC).</p> <p>Naviar has three main divisions - Operations, Technical Maintenance and ATM Projects &amp; Engineering supported by Corporate Services. Naviar is a member of COOPANS Consortium consisting of 5 Air Navigation Service Providers: Austro Control (ACG), Croatia Control (CCL), Irish Aviation Authority (IAA), Luftfartsverket (LFV) and Naviar. Cooperation between COOPANS partners goes beyond SESAR – partners has for a long time worked together with Thales under a common framework agreement in a joint program based on the incremental development of a common ATM platform.</p> <p>The overarching goal for COOPANS is to enable each individual ANSP to achieve financial savings through cost, resource, and competence sharing and to meet the EU objective of harmonizing ATM systems. This work is now expanded to Research &amp; Innovation by the establishment of the COOPANS Consortium.</p> <p>Naviar 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 has participated in SESAR via NORACON consortium in the following WPs:</p> <ul style="list-style-type: none"> <li>• WP00 SESAR2020 preparation 00.14, 00.15</li> </ul>	

	<ul style="list-style-type: none"> <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 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.16-4 CWP Virtual Centre concept - Solution Workstation, Controller Productivity (Advanced Speech Recognition)</li> <li>• PJ.18-2 Trajectory Management Process</li> <li>• PJ.18-6 Performance Based Trajectory Prediction</li> <li>• PJ.19 CI1/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	<p>Expertise is present in the company 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>• Airport safety support tools</li> <li>• Collaborative Decision Making</li> </ul>

	<ul style="list-style-type: none"> <li>• Air traffic forecast/Capacity planning incl. runway capacity enhancement</li> <li>• CWP design</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>
Contribution	Naviar will participate with operational expertise (ATCO) with focus on concepts and operational issues

#### 4.1.1.12 DFS DEUTSCHE FLUGSICHERUNG GMBH (DFS)

Organisation	DFS	Service Provider
Description	<p>DFS DEUTSCHE FLUGSICHERUNG GMBH (DFS) is responsible for air traffic control in Germany and is headquartered in the town of Langen, near Frankfurt. It is a company organised under private law and is wholly owned by the Federal Republic of Germany.</p> <p>The main business of air navigation services provided by DFS is defined by the tasks set out in Section 27c of the German Aviation Act (LuftVG). DFS provides air traffic services as a sovereign function, coordinates the air traffic flow and manages airspace utilisation (as a company entrusted with State functions). For this purpose, it develops and operates air traffic service systems as well as communications, surveillance and navigation systems. DFS operates control centres in Langen, Bremen, Karlsruhe and Munich as well as 16 control towers at Germany's designated international airports. With its approximately 5,400 operational and administrative staff, DFS ensures that approximately three million flights under instrument flight rules (IFR) reach their destinations safely and on time each year.</p>	
Previous experience	<p><b>Previous experience in projects related to Remote Tower:</b></p> <p>SESAR 1 (2010-2016):</p> <p>DFS contributed to OFA 06.03.01 Remote Tower by leading several validation exercises. The exercises were related to single as well as to multiple remote tower and were run as realtime simulation as well as passive shadow mode trials ( EXE-06.08.04-VP-638, EXE-06.08.04-VP-639, EXE-06.08.04-VP-640, EXE-06.08.04-VP-641).</p> <p>DFS has provided the validation platform and prototypes for these exercises together with FRQ (FSP) and DLR (AT-One).</p> <p>Based on the experience gained in these exercises DFS contributed to development of OSED /Safety and Performance Report / Human</p>	

	<p>Performance Report which were developed in close cooperation with NORACON.</p> <p>Based on the work provided for OFA 06.03.01 (P06.08.04), DFS contributed to the demonstration 2.5 LSD-RTO within the consortium of ANSPs, Industry and Airspace Users.</p> <p>SESAR 2020 (2017 – 2019)</p> <p>DFS contributes to PJ05 solution 03 as solution leader and as exercise leader for a V2 realtime validation. DFS has provided the validation platform and prototypes for these exercises together with FRQ (FSP). Based on the experience gained in previous development DFS contributed to e.g. development of OSED /Safety and Performance Report as well as Validation Plan and Validation Reports in close cooperation with the project partners.</p> <p>Standardisation and Regulation:</p> <p>DFS has been contributing to standardisation (EUROCAE WG100) and regulation (EASA RMT62).</p> <p><b>Previous experience in projects related to Surveillance:</b></p> <p>The DFS has the knowledge and expertise to develop/extend sensor data trackers and multi-sensor data fusion for various cooperative and non-cooperative sensors. Along with tracking systems there is also the knowhow to develop and extend data simulators, test data generators, and working positions for statistical and computational analysis of tracker performance.</p> <p>This expertise has been proven in many internal ATC solution deliveries for tower control and ACCs as well as for surveillance engineering solutions and scientific projects. Beyond that DFS has participated in international commercial projects to deliver tracker solutions based on the PHOENIX products and in funded projects such as the German LUFO and the SESAR 1 and SESAR 2020 programme.</p> <p><b>Publications:</b></p> <p>K. Pourvoyeur, A. Desmond-Kennedy, A. Mathias, R. Heidger: "The Challenges and Opportunities of Integrating New Types of Non-Cooperative Surveillance Sensors in to the ATM Infrastructure", Proc. Enhanced Surveillance of Aircraft and Vehicles (ESAVS), April 7–8, 2016, Berlin, Germany.</p> <p>K. Pourvoyeur, R. Heidger: "Secure ADS-B Usage in ATC Tracking", Proc. Tyrrhenian International Workshop on Digital Communications / Enhanced Surveillance of Aircraft and Vehicles (TIWDC/ESAV), Sept. 15–16, 2014, Rom, Italy.</p>
Entity Profile matching the task	<p>DFS provides Air Traffic Services at 16 international German Airports ranging from small airports to major hub airports. DFS endeavours to keep cost for this Service at a minimum while fully providing the required service. Supporting this goal DFS has set up a project for</p>

	implementing Single Remote Tower Services at the small airports already and intends to continue this strategy with Multiple Remote Tower Services.
Contribution	<p>DFS will provide a contribution to the advanced multiple remote tower concept as part of the remote tower center. DFS will be part of the content integration team of PJ05.</p> <p>DFS intends to further develop the concept as well as to develop and validate the multiple remote tower prototype including the low cost surveillance which was already provided to PJ05 and PJ14 in SESAR 2020 wave 1.</p> <p>DFS intends to focus on development of the CWP considering human performance aspects and providing automation support in order to reduce ATCO monitoring workload and increase situation awareness. DFS will contribute to solution 87 with a V3 validation addressing SDM-0210 where DFS will provide the validation platform (Real-time Simulator as well as Shadow Mode Trial) and develop the prototypes for electronic flightstrip and radar system with all required extensions to these systems. DFS will lead the integration of the system components. DFS ATCOs that have experience with single remote tower will assess the concept in the validation runs. DFS will lead the validation activities and contribute to the development of validation Report. DFS will contribute also to other documents that will be developed for the V3 datapack for solution 87</p>

#### 4.1.1.13 ENAIRE

Organisation	13 ENAIRE	ANSP
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 7 En-route/TMA ATC Centres and 22 Control Towers, being one of the major Air Navigation Service Providers in Europe.</p> <p>Airspace under ENAIRE control includes the Peninsula Ibérica (except Portugal), Balearic and Canary Island, and part of North Atlantic, West Mediterranean and West Sahara.</p> <p>ENAIRE is a major European company in ATM, R&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. As a quantitative illustration of this commitment, the more</p>	



	<p>than ninety SESAR projects in which ENAIRE has been involved up to the present could be mentioned, playing a leading role in sixteen of them.</p> <p>As a services provider and also as owner of related systems and infrastructure, proactive promoter of research and development activities which are at the leading edge and highly experienced executor of validation and system integration processes, ENAIRE expects to maintain its participation in the SJU as one of its major members in those areas of activity where its technical and managerial expertise and know-how, systems and projects can bring the most added value to the deployment of the European ATM Master Plan. 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 7 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> <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 is the company designated by the Spanish State to provide air traffic services in the en-route and approach phases. As part of an extensive ANSP work, 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. In addition, ENAIRE has defined several requirements in order to develop and improve the trajectory management within and among different ACCs. ENAIRE also participates in the definition and specification of the iTEC flight plan processing systems, besides the definition of its interoperability requirements to be compatible with other service provider initiatives.</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 2.19 MN 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</p>



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.

This activity as Service Provider has been combined with several research and deployment projects. Actually, 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 Target Network and the associated 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.

Participation in SESAR 1 projects:

- WP3 – Validation infrastructure adaptation and management
- WP4 – En route Operations
- WP5 - TMA Operations
- WP6 – Airport Operations (taking the leadership of the work package)
- WP7 – Network Operations
- WP8 – Information Management
- WP10 – En-Route & Approach ATC Systems
- WP12 – Airport system
- WP13 – Network Information Management System
- WP15 – Non-Avionics Communication, Navigation, Surveillance (CNS) System
- WP16 – R&D Transversal Areas
- WPB – Target Concept and Architecture Maintenance
- WPC – Master Plan Maintenance

Within these projects, ENAIRE has participated in the operational concept development and has been also responsible for the execution of several validations.

Participation in SESAR 2020 Wave 1:

- PJ01: Enhanced Arrivals and Departures
- PJ02: Increased Runway and Airport Throughput
- PJ03a: Integrated Surface Management
- PJ04: Total Airport Management
- PJ06: Trajectory based Free Routing
- PJ07: Optimised Airspace Users Operations
- PJ08: Advanced Airspace Management
- PJ09: Advanced DCB
- 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

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:

- EPISODE 3, Single European Sky Implementation support through validation, FP6, 2004-2010, Key Performance Targets for the future ATM system.
- GATE TO GATE, Validation of a European ATM gate to gate operational concept for 2005 – 2010, FP5, 2002-2005, operational concept development and validation.

Regarding deployment activities, the Spanish Automated Air Traffic Control System (SACTA) has been continuously evolved. One example could be the following TENT-T project:

- FRASAI, TENT-T, 2014, Free Routing concept implementation in Santiago – Asturias sector.

In addition to these projects, ENAIRE is currently carrying out the following research projects related to RPAS:

- DOMUS

	<ul style="list-style-type: none"> <li>• SAFEDRONE</li> </ul> <p>As well as the contribution, through any of ENAIRE's Linked Third Parties, to TERRA, IMPETUS and the advisory board of CORUS.</p> <p>ENAIRE, through its LTP, has also participated in other projects related with the solution within the Experimental Research:</p> <ul style="list-style-type: none"> <li>• RETINA</li> </ul>
Entity Profile matching the task	<ul style="list-style-type: none"> <li>• Operational expert</li> <li>• ATC system expert</li> <li>• Air Traffic Controllers</li> <li>• Environment expert</li> <li>• Performance expert</li> <li>• Platform integration/maintenance</li> </ul>
Contribution	<p>ENAIRE will be involved in PJ.05-W2-35 as minor contributor attending and supporting these activities to initiate contact with RTC and MRT ATS provision.</p> <p>In PJ.05-W2-97 solution, ENAIRE will be involved in the development of the Operational Concept, the Operational Requirements, and perform a V2 RTS validation activity to address the concepts ability to identify aircraft and couple the related flight information onto the moving image. ENAIRE aims to design a preliminary benchmark for the initial integration of ADS-B signal and augmented reality visual systems to support Low Visibility OPS.</p>

#### 4.1.1.14 ENAV SPA (ENAV)

Organisation	14 ENAV S.p.A.	ANSP
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's 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</p>	

the company, in particular:

- ✓ “En route” services: handling of air traffic crossing Italian airspace managed from 4 Areas Control Centres located in Rome, Milan, Padua and Brindisi;
- ✓ “Terminal” services: assistance during the phases of approach, takeoff and landing from 45 Control Towers located throughout Italy and divided into 3 charging zones.

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.

ENAV provides also supporting services to other ANSP on a commercial basis, forming an independent source of revenue which is not regulated.

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.

As in all high complexity sectors, a constant and consistent technological innovation has to be placed side by side to human skill 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 it 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.

ENAV Group consists of:

- Techno Sky, responsible for the operational management, the support, the maintenance and the hardware/software development of entire range of systems and equipment used to provide flight assistance services;
- 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 compliancy with the ICAO and EUROCONTROL mandates for Aeronautical Data Quality (ADQ);
- D-flight is the first public-private partnership created by ENAV and its partners for the timely development and deployment of U-space, in order to safely and seamlessly integrate complex drones 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;
- 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

	<p>essential air navigation services;</p> <ul style="list-style-type: none"> <li>• ENAV North Atlantic is a company established in USA on 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 supplied 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>• Air Space 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 by supporting technical developments for fully interconnected and interoperable systems at European level.</p> <p>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 programs with international organisations (e.g. SESAR Joint Undertaking, EUROCONTROL, European Commission, ESSP) and foreign countries, aiming at contributing to the advancement of ATM technology and processes and at improving the service level provided.</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 researches, developments and validations.</p> <p>ENAV has been participating in SESAR Programme since its very</p>

	<p>beginning (SESAR 1 and SESAR 2020 Wave 1) 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>• SESAR 1 (2009-2016): WPB, WPC, WP3, WP4, WP5, WP6, WP7, WP8, WP10, WP12, WP13, WP14, WP15, WP16</li> <li>• SESAR 1 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>• SESAR 2020 Wave 1 IR Projects (H2020, 2016-2019): PJ01, PJ02, PJ03a, PJ03b, PJ05, PJ06, PJ08, PJ09, PJ10, PJ15, PJ16, PJ18, PJ19, PJ20, PJ22</li> <li>• SESAR2020 Wave 1 VLD PJ31 (H2020, 2016-2020)</li> <li>• DIODE VLD (SJU/CEF2017, 2018-2020)</li> <li>• CORUS ER (H2020, 2017-2019)</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>• Software and System engineer</li> <li>• Air Traffic Controller</li> <li>• Pseudo-pilot</li> <li>• KPA expert</li> <li>• Project manager</li> <li>• Validation expert and engineer</li> </ul> <p>All those skills will be made available by ENAV to support the project developments and conduct validation activities.</p>
Contribution	<p>In continuity with the work done in SESAR 2020 Wave 1 PJ.05, ER RETINA and LSD RACOON, ENAV will continue its commitment towards the Digital Tower thread.</p> <p>ENAV is proposing to participate in both the two Project solutions: SOL#35 (WP02) and SOL#97 (WP03).</p> <p>In both the WPs Enav will contribute to the solutions work by supporting the concept development and data pack elaboration with its technical and operational expertise as well as by preparing and executing specific validation exercises on multiple Remote TWR services and HMI</p>



interaction modes for Airport TWR over Italian operational scenarios.

Additionally, ENAV is proposed to lead the SOL#97 workstream.

#### 4.1.1.15 **EUROCONTROL - EUROPEAN ORGANISATION FOR THE SAFETY OF AIR NAVIGATION**

Organisation	15 EUROCONTROL	Intergovernmental Organisation
Description	<p>EUROCONTROL, the European Organisation for the Safety of Air Navigation, is an intergovernmental Organisation with 41 Member States, committed to building, together with its partners, a Single European Sky that will deliver the ATM performance required for the 21st century. EUROCONTROL employs more than 1,900 highly qualified professionals spread over four European countries. Their expertise is deployed to address ATM challenges in a number of key roles:</p> <ul style="list-style-type: none"> <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>	
Previous experience	<p><b>Publications:</b></p> <ul style="list-style-type: none"> <li>• M.ELLEJMI, Sara Bagassi (2018): Evaluation of Augmented Reality Tools for the provision of Tower Air Traffic Control using An Ecological Interface Design, Aviation 2018</li> <li>• M.ELLEJMI, R.Lane (2017): Impacts of <b>Guidance function</b> on Air Traffic Controller situation awareness, Aviation 2017</li> <li>• M.ELLEJMI, R.Lane (2017): A EUROCONTROL tower simulator to validate SESAR Routing, Guidance and Airport Safety Nets concepts, SciTech 2017</li> <li>• M.ELLEJMI, R.Lane (2016): Evaluation of SESAR concepts for <b>Airport Guidance function</b> in live trial environment, ICNS 2016, April 2016</li> <li>• M.ELLEJMI, R.Lane (2015): Integration of a <b>Routing Tool in an Advanced Airport Controller Working Position</b>, AIAA</li> </ul>	



	<p>Aviation2015, July 2015</p> <p>Previous R&amp;D projects:</p> <ul style="list-style-type: none"> <li>• SESAR 1 (2009-2016): <ul style="list-style-type: none"> <li>○ Operational Projects: 6.7.1, 6.7.2, 6.7.3 (A-SMGCS), 6.9.2 (A-CWP), 6.9.3 (Remote Tower,</li> <li>○ Technical Projects: 12.3.2, 12.3.3, 12.5.4 (A-CWP)</li> </ul> </li> <li>• RETINA (H2020, 2016-2018)</li> </ul> <p>Current R&amp;D projects:</p> <ul style="list-style-type: none"> <li>• SESAR 2020 Wave 1 IR Projects (H2020, 2016-2019): PJ02, PJ03a, PJ03b, PJ05</li> </ul>
Entity Profile matching the task	<p>EUROCONTROL profiles matching the tasks include:</p> <ul style="list-style-type: none"> <li>• ATM Operational expert</li> <li>• Air Traffic Management Engineer</li> <li>• Human Factor Experts</li> <li>• Safety Experts</li> <li>• RTS &amp; Validation experts</li> <li>• R&amp;D Experts</li> </ul> <p>All those skills will be made available by EUROCONTROL to support the project developments and conduct validation activities.</p>
Contribution	<p>Based on its experience in RETINA projects and all SESAR projects related to this subject, EUROCONTROL will provide its expertise in:</p> <ul style="list-style-type: none"> <li>- research &amp; innovation development,</li> <li>- safety,</li> <li>- human performance,</li> <li>- simulation and validation experts.</li> </ul> <p>All experts will work together with EUROCONTROL airport and ATM operational experts to deliver a digital tower position prototype for solution 97.</p> <p>EUROCONTROL proposes to use its Real Time Simulation facilities and tower validation platform composed of an advanced controller working position used in different SESAR validations.</p> <p>EUROCONTROL will develop the operational concept of digital tower and lead a V2 validation using its Tower platform that will be enhanced with new equipment and new functionalities.</p>

#### 4.1.1.16 ATOS BELGIUM SA/NV

Organisation	16 ATOS (FSP)	Ground Industry
Description	<p>Atos Belgium is a company within Atos SE (Societas Europaea) group. Atos is a leader in digital services with 2014 pro forma annual revenue of €10 billion and 86,000 employees in 66 countries. Serving a global client base, the Group provides Consulting &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</p>	

	<p>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 HUNGAROCONTROL MAGYAR LEGIFORGALMI SZOLGALAT ZARTKORUEN MUKODO RESZVENYTARSASAG and Frequentis AG and was founded in 2014 for the main purpose of joining SESAR2020 activities. Frequentis SESAR Partners is member of the SESAR Joint Undertaking.</p> <p>The consortium is comprised of companies having a variety of complementary capabilities. Having former SESAR1 experience within its framework, an ANSP whose expertise will result in early feedback loops during certain projects, and the wide range IT, data management and security expertise of the consortium forming entities, Frequentis SESAR Partners believes in the high added value of its participation in SESAR2020 efforts.</p>
Previous experience	Atos (FSP) is participating in PJ04, PJ07, PJ08 and PJ09 in the S2020 wave implementation.
Entity Profile matching the task	Not applicable, ATOS (FSP) initially will not participate directly in this action.
Contribution	Support to participating members of Frequentis SESAR Partners if required.

#### 4.1.1.17 FREQUENTIS AG

Organisation	17 FRQ (FSP)	Ground Industry
Description	<p>Frequentis AG, member of SESAR1, is an international expert for communication and information systems for control centres with safety-critical tasks. Frequentis AG maintains a worldwide network of subsidiaries and local representatives in more than 50 countries to ensure closeness to our customers.</p> <p>Frequentis AG successfully designs and supplies systems and solutions for the domains of communication, networks, SWIM, aeronautical information management, and airport traffic optimization, both in service and infrastructure as well as in the visualisation part of the independent CWP; based on service oriented and open, standardised architecture. In SESAR1 we have demonstrated remarkable achievements towards the next generation ATM system architecture. Special interest is given to the users of ATM systems. Our expertise and tooling guarantees early indications of the future user acceptance. Frequentis AG is member of the Frequentis SESAR Partners consortium together with the companies HUNGAROCONTROL MAGYAR LEGIFORGALMI SZOLGALAT ZARTKORUEN MUKODO RESZVENYTARSASAG and Atos Belgium and was founded in 2014 for the main purpose of joining SESAR2020 activities. Frequentis SESAR Partners is member of the SESAR Joint Undertaking.</p> <p>The consortium is comprised of companies having a variety of complementary capabilities. Having former SESAR1 experience within its framework, an ANSP whose expertise will result in early feedback loops during certain projects, and the wide range IT, data management</p>	

	and security expertise of the consortium forming entities, Frequentis SESAR Partners believes in the high added value of its participation in SESAR2020 efforts.
Previous experience	<p>FRQ (FSP) has successfully implemented ATM related projects in more than 100 countries worldwide with about 25,000+ installed working positions.</p> <p>Another international market success is the Frequentis tower flight data management (smartStrips™) and integrated data display (smartTools™), which were sold e.g.: in Hong-Kong for over 20+ positions.</p> <p>FRQ (FSP) was also active in the area of Remote Tower / Video based surveillance over the last 5 years, including an implementation project for rollout of single remote tower solution with DFS in Germany.</p> <p>FRQ (FSP) was participating in various projects in SESAR 1; in the field of Remote Tower in SESAR Projects 12.4.6 and 12.4.7.</p> <p>Within S2020 W1 contribution to PJ05-02 covering the validation of multiple remote tower modules for three airports with higher traffic volumes.</p> <ul style="list-style-type: none"> <li>• Validation exercise V2 for one runway at three APTs based on integrated FRQ prototype in a AT-ONE real-time simulation validation platform in Braunschweig</li> <li>• Validation exercise V3 for one runway at two APTs based on integrated prototype and HC (FSP) validation platform (passive shadow mode) at Budapest airport.</li> <li>• Executing one additional exercise that was not planned but has been taken over from other industry partner in support of ANSP ON, Lithuania.</li> </ul> <p>Contribution to PJ05-03 together with DFS aiming to enlarge the scope of multiple remote tower concept with increased traffic that can be simultaneously controlled from one multi remote tower addressing advanced automation function.</p> <ul style="list-style-type: none"> <li>• Support of two validation exercises and one additional exercise that was taken over unplanned in support of ANSP ON, Lithuania.</li> </ul>
Entity Profile matching the task	<p>FRQ (FSP) will bring the following expertise profiles:</p> <p>Comprehensive experience with remote tower applications and its concept based on substantial contribution to SESAR 2020 wave1 projects, in continuation of SESAR1.</p> <ul style="list-style-type: none"> <li>• Experience and technical know-how in development of safety critical systems for air traffic control towers (user interfaces and backend services)</li> <li>• Short term planning feature for remote tower applications</li> <li>• Safety expertise</li> <li>• Service oriented architecture</li> <li>• Expertise in IT infrastructure and cyber-security</li> </ul>
Contribution	<p>Frequentis contributions for Wave 2 will be based on the working results achieved in Wave 1 and will continue the successful cooperation with the validation partners from Wave 1 (DLR, DFS, HC, Pansa).</p> <p>Validation activities will be organized in two validation streams with dedicated focus topics.</p> <p>In a validation stream together with our partners DLR, HC, B4, Frequentis will contribute parts of the real-time simulation platform in</p>

Braunschweig, in particular planning and support tools. The focus of this validation is the supervisor role and related support functions as well as transition aspects in terms of airport handover handlings and coordination.

In a second validation stream together with our partner DFS, Frequentis will provide a live validation platform at a German airport for validation of an advanced automation functions (in particular a safety alerting function based on a video and surveillance based safety net for multi remote tower). Moreover, Frequentis will contribute elements for the DFS real time simulation platform in Langen for validation of further improvements of the integrated multi remote tower CWP concept.

#### 4.1.1.18 **HUNGAROCNTRAL MAGYAR LEGIFORGALMI SZOLGALAT ZARTKORUEN MUKODO RESZVENYTARSASAG**

Organisation	18 HC (FSP)	Air Navigation Service Provider
Description	<p>HUNGAROCNTRAL MAGYAR LEGIFORGALMI SZOLGALAT ZARTKORUEN MUKODO RESZVENYTARSASAG is a state-owned company in Hungary, which provides air navigation services in the Hungarian airspace and (on a NATO assignment) in the upper airspace over Kosovo, trains air control personnel and conducts air navigation research and development.</p> <p>HC (FSP) is member of the Frequentis SESAR Partners consortium together with the companies Atos Belgium and Frequentis AG and was founded in 2014 for the main purpose of joining SESAR2020 activities. Frequentis SESAR Partners is member of the SESAR Joint Undertaking.</p> <p>The consortium is comprised of companies having a variety of complementary capabilities. Having former SESAR1 experience within its framework, an ANSP whose expertise will result in early feedback loops during certain projects, and the wide range IT, data management and security expertise of the consortium forming entities, Frequentis SESAR Partners believes in the high added value of its participation in SESAR2020 efforts.</p>	
Previous experience	<p>HungaroControl Zrt. has participated in SESAR 2020 Wave 1 as a member of FSP Consortium in the following projects, solutions or VLDs:</p> <ul style="list-style-type: none"> <li>PJ.03-A</li> <li>PJ.05-02</li> <li>PJ.05-03</li> <li>PJ.10-01B</li> <li>PJ.16-03</li> <li>PJ.16-04</li> <li>PJ.28 (as a linked third-party)</li> </ul> <p>SESAR Exploratory research - USIS project</p>	
Entity Profile matching the task	<p>Air Navigation Service Providers including the profiles:</p> <ul style="list-style-type: none"> <li>• ATM Operational expertise,</li> </ul>	

	<ul style="list-style-type: none"> <li>• ATM System expertise,</li> <li>• Simulation expertise (Simulation HUB)</li> <li>• Tower Air Traffic Controllers,</li> <li>• Human Factors expertise,</li> <li>• Safety expertise</li> </ul> <p>Experience relevant to the project: In PJ05, HungaroControl performed V2 (simulation) and V3 (simulation and passive shadow trial) validations of Solution 2 in collaboration with Frequentis. The validations were aimed at assessing how a single ATCO can control 3 airports at the same time from a single working position. The 3 airports involved in the project were Budapest RWY 1 (13R/31L), Debrecen and Pápa Military Airbase. The V2 and V3 level simulations were carried out in DLR's simulator in Braunschweig, Germany, while the passive shadow trial took place on HungaroControl premises in Budapest, Hungary.</p>
Contribution	<p>HungaroControl Zrt. (as member of FSP) will contribute to the solution 35 and 97 together with INDRA SISTEMAS SA and FREQUENTIS AG.</p> <p>Main equipment invest by HungaroControl to build the surveillance system for Budapest Remote tower center validation (2-3 airports, Sol 35), which include:</p> <ul style="list-style-type: none"> <li>• Implementation of cameras (fixed &amp; PTZ)</li> <li>• 1 CWP and 1 supervisor position</li> <li>• LAN infrastructure, CWP Displays &amp; Console</li> <li>• Microwave connections</li> </ul> <p>Contribution of HungaroControl Zrt., as ANSP, will be:</p> <ul style="list-style-type: none"> <li>• Support with ATCOs</li> <li>• ATM system experts</li> <li>• Human Factor expertise</li> <li>• Safety expert</li> </ul>

#### 4.1.1.19 INDRA SISTEMAS SA (INDRA)

Organisation	19 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 focus and with a high 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,</p>	



	<p>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. Recent 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), as well as playing a key role in many projects under WP14 (SWIM), WP15 (Non-Avionics CNS) and WP13 (NIMS). 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 and 31, being Project Coordinator in PJ15 and PJ18. We have also participated in other SESAR related projects (VLDs and RPAS).</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</p>

	and facilities to perform the R&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. 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.
Contribution	<p>The main contribution of Indra, as Ground Industry Supplier, will be:</p> <ul style="list-style-type: none"> <li>• Support to the elaboration of the operational concepts, from the industrial perspective</li> <li>• Specification, development and testing of the Industry Base Platforms to be used by the ANSPs to perform the Validations</li> <li>• Support to the ANSPs in the Validations and in the elaboration of the conclusions</li> </ul>

#### 4.1.1.20 LEONARDO – SOCIETA PER AZIONI

Organisation	20 LDO	Airborne Industry 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. Gianni De Gennaro has been the President since 4 July 2013 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> </ul>	



	<ul style="list-style-type: none"> <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.</p> <p>These are: the US subsidiary DRS Technologies, which deals with the supply of products, services and integrated support for the military, intelligence agencies and defence companies; ATR, the joint venture established with Airbus Group for the manufacture of regional aircraft; MBDA, the joint venture established with BAE Systems and Airbus Group for missile systems; Telespazio and Thales Alenia Space, the two joint ventures established with Thales as part of the Space Alliance, for satellite services and the manufacture of satellites and orbiting infrastructures, respectively.</p>
Previous experience	<p>The main previous experience can be clustered in two main areas:</p> <ul style="list-style-type: none"> <li>- <b>ATM core business activities</b> that provide an overview of the proven experience gained by the involved divisions mainly in the SESAR partnership as well as in other ATM initiative;</li> <li>- <b>Project management experience</b> necessary to manage the relevant Project and Solutions activities.</li> </ul> <p><b>ATM core business Experience</b></p> <p>Involvement of Leonardo in the ATC domain extends to the participation several programs; among others:</p> <ul style="list-style-type: none"> <li>• SESAR several projects within WP 3, 4, 5, 6, 8, 10, 12, 14, 15</li> <li>• SESAR 2020 Wave 1 projects pj01, pj02, pj03a, pj03b, pj04, pj05, pj06, pj10a, pj10b, pj11, pj14, pj16.</li> <li>• EMMA – Preoperational validation of A-SMGCS level 1, 2 (ICAO Spec.)</li> <li>• SWIM-SUIT – A European program carried out by a Consortium led by Finmeccanica S.p.A. for the technical implementation of the System Wide Information Management (SWIM) concept, i.e. the information sharing among different actors (Air Navigation Service Providers, Aircraft Operators, Airport Companies, CFMU, etc.)</li> <li>• HLM – High Level Modeling for ATM system design through advanced modeling technique</li> </ul>
Entity Profile	Leonardo Electronics Division has a long history in the development of

matching the task	<p>advanced user interfaces for control systems, both in the civil and in the military market, as long as advanced HMIs for civil and military vehicles (aircrafts, helicopters, tanks).</p> <p>The range of products developed during the years comprises advanced HMIs for ATM and VTMS traffic control Systems, C<sup>2</sup> and C<sup>4</sup> battlefield and strategic systems, vehicle control, demonstrating the skills of the Company in the design, production/development, deployment and validation of systems with advanced HMI capabilities. Leonardo Electronics Division is an Industrial global player in the high-tech sector, including job profiles of system engineer, software engineer, integration and architecture specialists, validation and platform experts, HMI specialists.</p>
Contribution	<p>Leonardo Electronic Division will continue to increase experience and expertise in the advanced HMI interaction domain for ATM, already explored in SESAR 2020 Wave 1 and other research projects.</p> <p>LEONARDO will participate in the analysis and development of the prototype and the technical requirements foreseen in solution 35 and 97 and the related validation platform.</p> <p>For each solution (35 and 97) LEONARDO will set up a realistic validation environment, representative of the target ATM solution, through which to perform validation exercises aimed at validating the feasibility and assessing the adequateness of the procedures, technologies, and human resources issues proposed.</p> <p>As for the solution 35 validation activities, Leonardo will sub-contract activities to UKSATE for ATCO supporting in validating the operation concepts</p>

#### 4.1.1.21 AIRTEL ATN LTD. (AIRTEL)

Organisation	21 AIRTEL (NATMIG)	Ground Industry
Description	<p>AIRTEL ATN LTD is a part of North European ATM Industry Group (NATMIG) Consortium. NATMIG is a member of SESAR 1. The NATMIG consortium consists of Airtel ATN (SME - Ireland), SAAB AB (multinational industrial concern - Sweden) and 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</p>	

	include organisations in China. It is also providing Data Link networking equipment in collaboration with Russian companies. 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.
Previous experience	AIRTEL (NATMIG) is not actively contributing to this project.
Entity Profile matching the task	AIRTEL (NATMIG) is not actively contributing to this project.
Contribution	AIRTEL (NATMIG) is not actively contributing to this project.

#### 4.1.1.22 SAAB AKTIEBOLAG

Organisation	22 SAAB (NATMIG)	Ground Industry
Description	<p>SAAB AKTIEBOLAG is part 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). 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> <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. SAAB AKTIEBOLAG's main areas of interest are:</p> <ul style="list-style-type: none"> <li>• RPAS</li> <li>• Remote Tower</li> </ul>	
Previous experience	<p><u>SAAB (NATMIG)</u></p> <ul style="list-style-type: none"> <li>• Remotely Operated Tower (ROT), Proof-of-concept project in collaboration with LFV at Ängelholm airport controlled from</li> </ul>	

#### Malmö airport, 2006-2009

- The Advanced Remote Tower (ART) project with 4 other partners (LFV, NLR, Equipe and LYYN) at Ängelholm airport controlled from Malmö airport, 2007-2009

#### Remote tower projects in SESAR1

SAAB (NATMIG) is participating in the operational remote tower project (6.9.3) in SESAR and is in the lead of three technical remote tower projects in SESAR:

12.4.6 – Remotely Operated Tower Technology Enablers

12.4.7 – Remotely Operated Tower Multiple Controlled Airports

12.4.8 – Remotely Operated Tower Contingency

Single Aerodromes:

- TWR validation 1 in Ängelholm/Sweden 2011
- TWR validation 2 in Ängelholm/Sweden 2012
- AFIS validation in Værøy/Norway 2013

Multiple Aerodromes:

- Multiple TWR/AFIS simulation 2013-2014
- Multiple TWR validation Sundsvall&Örnsköldsvik/Sweden 2014
- Multiple TWR validation Røst&Værøy/Norway 2014

Contingency:

- Validation 1 in Gothenburg/Sweden 2013
- Validation 2 in Gothenburg/Sweden 2014

Other SESAR remote tower validations:

- LSD, Gällivare AFIS, 2015
- LSD, Cork and Shannon from Dublin, 2017
- LSD, Groningen from Amsterdam, 2017

#### **Remote Tower activities in SESAR 2020, wave 1**

- **PJ.05-02** - Remotely Provided Air Traffic Service for Multiple Aerodromes  
V3 platform with validations in 2019  
TS, Technical Specification (lead)  
Security assessment
- **PJ.05-03** - Remotely Provided Air Traffic Services from a Remote Tower Centre with a flexible allocation of aerodromes to Remote Tower Modules (lead)  
V2 platform with validations in 2019

	<p>TS, Technical Specification (lead) Security assessment</p> <p><u>Other remote tower validations</u></p> <ul style="list-style-type: none"> <li>• Australia, Alice Springs controlled from Adelaide (1500km) 2013</li> <li>• Remote runway surveillance (Polderbahn) at Schiphol, operational 2015</li> <li>• Ongoing validations in US, Leesburg executive airport</li> </ul> <p>SAAB (NATMIG) participates actively in the standardisation committee for remote towers, EUROCAE WG-100.</p>
Entity Profile matching the task	<p>SAAB (NATMIG) intends to bring the long experience with platforms and validation in to PJ.05 Wave 2</p> <p>By the end of October 2014 LFV got the operational approval for commencing Remote Tower Services from the Remote Tower Centre (RTC) in Sundsvall, serving Örnsköldsvik airport 150 km away. In April 2015 the operation started on a H24 basis and the current tower became unmanned. The first remote controlled airport in the world, the start of a new generation of air traffic control.</p>
Contribution	<p><u>PJ05 Wave 2 Solution 35</u></p> <p>Based on the V3 multiple platform from PJ05-02 and the V2 multiple platform for flexible allocation. 02 SAAB (NATMIG) will contribute to the Remote Tower Centre (RTC) with a flexible allocation of aerodromes to Remote Tower Modules (RTM) that addresses the flexible use of the human resources “Air traffic Controller” by a flexible and dynamic allocation of airports connected to different RTM:s. Development of tools and features for a flexible planning of all aerodromes connected to remote tower services. The need for the role of a RTC supervisor, technical aspects (e.g. network, like a seamless integration of air/ground multi sensor tracking).</p>

#### 4.1.1.23 SINTEF AS

Organisation	23 SINTEF (NATMIG)	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 organization 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</p>	

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.

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 SINTEF's aeronautical research portfolio outside SESAR. 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 & Gas, Space, Health & Medicine, Constructions, Energy, Marine, Railway, Roads, Harbours, and Resilience etc.

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).

SINTEF is represented by the following groups in PJ.05:

The Geometry Group, Mathematics & Cybernetics Dept., has a long experience of developing tools for applying geometric modelling to many different tasks. Over the past decades the group has been involved in many international projects including leading roles in EU FP7, Horizon 2020 and SESAR projects. Through these projects it has built a strong international research network of both industrial and academic partners.

The Software Engineering, Safety and Security Dept. has extensive experience in leading and participating in EU FP7 and Horizon 2020 projects, including SESAR. Domains of research have included the development and evaluation of user-centred technology, safety and security assessments, and improvement of processes to better include safety and security issues in the development phases of technological solutions.

Previous  
experience

Publications:

1. O.J.D. Barrowclough, H.E. Swendgaard, T. Dokken & O. Andersen (2015): Geometric modelling for 3D support to remote tower air traffic control operations. In 5th International Air Transport and Operations Symposium (ATOS).
2. K. Bernsmed, C. Frøystad, P.H. Meland & T.A. Myrvoll (2017): Security requirements for SATCOM datalink systems for future air traffic management. In Digital Avionics Systems Conference (DASC), 2017 IEEE/AIAA 36th, pp. 1-10. IEEE, 2017.
3. M. Branlat, R. Woltjer, L. Save, O. Cohen, I. Herrera (2017): Supporting resilience management through useful guidelines. In Proceedings of the 7th Resilience Engineering Association Symposium. Liège, Belgium, 2017.
4. V. Skytt, O.J.D. Barrowclough & T. Dokken (2015): Locally refined spline surfaces for representation of terrain data. In



	<p>Computers &amp; Graphics, 49, 58-68.</p> <p>Projects:</p> <ul style="list-style-type: none"> <li>• Project SESAR 12.04.09: this project, which was managed by SINTEF. In the project we developed two prototypes for integrating 3D models into remote tower operations. One was based on enhancing tracking technology with 3D information (e.g. velocity, direction etc.) whilst the other provided a platform for increasing 3D depth perception.</li> <li>• Project SESAR 16.06.01: SINTEF participated in the development of a Resilience Assessment Method to complement SESAR's Safety Reference Material. The method was developed and tested with a few transformative technologies initiated in SESAR projects, including the Remote Tower concept.</li> <li>• Project SESAR 2020 W1, PJ.05: in this project the main focus was on developing and maturing the work from P12.04.09 and P16.06.01. A working relationship with SAAB (NATMIG) and LFV was established for closer connection to the operational research.</li> <li>• Project H2020 DARWIN: this project, managed by SINTEF, produced resilience management guidelines aimed at critical infrastructures to improve their management of crises. These were evaluated and adapted in the domains of healthcare and ATM.</li> <li>• Project SESAR/H2020 (grant agreement No 699306) PACAS, the main objective was to better understand, model and analyse changes at different layers of the ATM system to coordinate organisational, security and safety impacts.</li> </ul>
Entity Profile matching the task	<p>SINTEF (NATMIG) will bring forward results and experience particularly from P12.04.09, P16.06.01 and from PJ.05 Wave 1, which provided background on the use of 3D technologies in remote tower as well as resilience management. These will be used to support the development of advanced automation functions to maintain ATCO situational awareness with a special focus on alerts and warnings for conflict detection. We will continue developments on the SINTEF (NATMIG) 3D platform developed in Wave 1 to achieve a higher TRL. The Geometry Group will continue to work closely with both NATMIG partner SAAB (NATMIG) and COOPANS partner LFV, by participating in the relevant validation activities.</p>
Contribution	<p>SINTEF (NATMIG) will contribute to the project on several fronts: The Geometry Group will contribute with technologies based on 3D information. By coupling 3D models with remote tower video, a range of advanced spatial and temporal queries can be made, which can help improve situational awareness and can also support automation of runway incursion alarms.</p>

#### 4.1.1.24 AEROPORTS DE PARIS (ADP)

Organisation	24 ADP (SEAC2020)	Service Provider
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Description	<p>Groupe ADP (formerly Aéroports de Paris) manages the 3 Paris airports:</p> <ul style="list-style-type: none"> <li>• Paris-Charles de Gaulle, 2nd largest airport in Europe and 10th worldwide,</li> <li>• Paris-Orly, 2nd largest airport in France, dedicated to point to point traffic,</li> <li>• Paris-le Bourget, the leading business airport in Europe.</li> </ul> <p>and 10 aerodromes in the Paris area plus one heliport. Paris airports welcomed 101,5 million of passengers in 2017 and 105,3 million of passengers in 2018, serving more than 3570 destinations. ADP (SEAC2020) also manages directly or indirectly 26 airports worldwide (228,2 million of passengers in 2017) and exports its know-how and expertise to 4 continents.</p> <p>According to the latest study conducted by the BIPE (bureau for economic information and forecast) in 2011, the overall economic activity generated by the Paris airport system was 5.8% of the one of Ile-de-France (Paris region) GDP, i.e. 1.7% of the French GDP. With 340,300 jobs, the economic activity generated by the presence of the Paris airports represents 8.3% of paid employment in Ile-de-France, i.e. 2% of paid employment in France. The direct employment associated with companies present at the airports represents 1/3 of these jobs, i.e. 115,400 jobs, of which 96% are long-term contracts.</p>
Previous experience	<p>Previous projects:</p> <ul style="list-style-type: none"> <li>- SESAR 1 WP06: P6.5.4 project manager (APOC definition), contribution to P6.7.1/P6.3.1 (RWSL aspects) and to 9 individual project in WP06; OFA.05.01.01 Core Team (Airport Operations Management).</li> <li>- SESAR 1 WPC: contributions to cost benefit analysis (C.2),</li> <li>- SESAR 1 WP16: contribution on environmental aspects addressed by WP16 (P16.3.1 and P16.3.2).</li> <li>- SESAR 2020 W1 (PJ04): Project coordinator, contribution to solutions PJ.04-01 and PJ.04-02.</li> <li>- SESAR 2020 W1 (PJ03b): Project contributor to PJ.03b-06</li> </ul>
Entity Profile matching the task	Not applicable, Groupe ADP (ADP(SEAC2020)) initially will not participate directly in this action.
Contribution	Support to participating SEAC2020 members when required.

#### 4.1.1.25 AVINOR AS (AVINOR)

Organisation	25 Avinor (SEAC2020)	Service Provider
Description	Avinor AS (AVINOR(SEAC2020)) is a state-owned limited liability company tasked with facilitating safe, environmentally friendly, and efficient aviation across Norway. Operations encompass a network of	

	<p>45 airports and air navigation services throughout Norway.</p> <p>53 million passengers travelled to or from Avinor's airports (scheduled, charter, and offshore) in 2017. There was a total of 697,000 movements (take-offs and landings) at Avinor's airports in 2017. Oslo airport is the hub of Norwegian aviation and a transit airport for traffic between Norway and the rest of the world. The profit generated by Oslo airport is crucial for the financing of the network of airports spread across the rest of Norway. 27.5 million passengers used Oslo airport in 2017.</p> <p>Avinor AS (AVINOR(SEAC2020)) has built world-leading expertise in its development and operation of a network of many small and large airports in a challenging climate and topography. The company is used to implementing multi-airport solutions in a cost-efficient way.</p>
Previous experience	<p>Avinor AS (AVINOR(SEAC2020)) has participated in multiple projects during SESAR 1 and SESAR 2020 Wave 1:</p> <ul style="list-style-type: none"> <li>- SESAR 1 06.05.04 –Airport Operations Centre Definition (VALP, VAL EXE, VALR),</li> <li>- SESAR 1 06.06.02 –Integration of airport - airline/ground handlers - ATC processes (incl. turnaround) in ATM (SPR, VALP, VAL EXE).</li> <li>- SESAR 2020 W1 (PJ04): Project contribution to solutions PJ.04-01 and PJ.04-02.</li> <li>- SESAR 2020 W1 (PJ02): Project contributor to PJ02-11 (OSD task lead)</li> </ul>
Entity Profile matching the task	Not applicable, Avinor AS (Avinor(SEAC2020)) initially will not participate directly in this action.
Contribution	Support to participating SEAC2020 members when required.

#### 4.1.1.26 HEATHROW AIRPORT LIMITED (HAL)

Organisation	26 HAL (SEAC2020)	Service Provider
Description	<p>Heathrow is the UK's premier international airport and one of the world's major hub airports flying people for business, tourism and to visit friends and relatives around the world. We provide the infrastructure and services for over 80 airlines flying 80 million passengers a year to over 204 destinations worldwide. Heathrow is also an important national economic asset for London and the UK, supporting our capital city and contributing an estimated £3.3 billion annually to the UK economy. As one of the largest single site employers, there are over 76,500 people working at Heathrow for over 400 companies, and we are the UK's largest port by value too, with around £86 billion of UK goods exported annually through the airport. Heathrow sits within the largest long-haul travel market in the world connecting business and people across the UK to growing economies around the world and is the UK's gateway for international tourism and travellers. We offer excellent passenger service through our two newest Terminals – Terminal 5 and Terminal 2 – and through upgrades to Terminals 3 and 4. We are currently voted by passengers through</p>	

	<p>Skytrax to have the world's best airport terminal for terminal 2, and to have the World's best airport shopping, to be the best airport in Western Europe and to be in the World's top 10 airports. We are commitment to be a responsible airport, being a good neighbour to our local communities and taking a lead on environmental measures, giving passengers a strong reason to keep choosing Heathrow. The UK government have recently approved Heathrow's expansion plans with 70% of MPs in support of the development.</p>
Previous experience	<p>Along with its airport partners in SEAC, Heathrow Airport Limited (HAL (SEAC2020)) referred to as HAL in this section, demonstrated a substantial involvement in the SESAR 1 programme and showed strong leadership particularly in developing the Airport Operations Management concept.</p> <p>HAL participated in eight WP6 "Airport Operations" projects addressing topics such as the integration of airport processes including the turnaround phase, definition and development of the APOC, integrated validation activities for the airport in the ATM environment, GBAS operational implementation and collaborative airport planning. Additionally, HAL provided effort to the WP6 management (06.00) and federating (06.02) projects to ensure consistency of results being passed to transversal documents, performance goals and other ATM stakeholders. HAL provided leadership to OFA05.01.01 (Airport Operations Management) to develop new solutions for testing, validation and eventual deployment into live airport operations. HAL developed innovative concepts such as the Airport Operations Plan (AOP) and Airport Operations Centre (APOC), which have now been introduced into the current baseline for Airport Collaborative Decision Making (A-CDM). The APOC and AOP are successfully operating at Heathrow and will be used in Wave 1 as part of the VLD PJ24 to validate Target Time of Arrival Management (TTA) using Demand Capacity Balance (DCB) tools. User Driven Prioritisation (UDPP) has also been developed in the AOP. HAL is involved therefore in practical AOP/NOP data exchanges to facilitate a seamless integration of airports into the Network. In SESAR 2020 Wave 1 HAL has further developed the concept contributing to PJ04 Solution 1 New Operating Methods and Solution 2 concept development.</p> <p>HAL also participated in transversal projects in PJ20 and contributed to all aspects of the development of the ATM Master Plan 2018.</p>
Entity Profile matching the task	Not applicable, Heathrow Airport Limited HAL (SEAC2020) initially will not participate directly in this action.
Contribution	Support to SEAC2020 members when required.

#### 4.1.1.27 FLUGHAFEN MÜNCHEN GMBH (MUC)

Organisation	27 MUC (SEAC2020)	Service Provider
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Description	<p>Flughafen München GmbH (MUC (SEAC2020)) is the operating company of Munich Airport. Within just a few years of opening in 1992, the airport's outstanding growth performance elevated it to join the ranks of Europe's busiest passenger airports. Munich Airport is a 26-year success story. It has a track record for steady growth, from 12 million to 46 million passengers per year, and from an airport to a self-contained city.</p> <p>Our company has significantly expanded its business activities: We're not only an international hub, but rather an urban center offering a wide range of goods and services. More and more, we're marketing the airport as a world of experience as well as offering real estate and consulting services. Services are offered far beyond Munich.</p> <p>The essence of our brand, Living ideas – Connecting lives, sums up everything that Munich Airport stands for and is an ideal expression of the multifaceted character of the airport. We connect people in every sense of the word: As an international hub we connect people on every continent. As a high-efficiency cargo airport we connect global markets. Together with our partners we connect strengths, competencies and innovations. And internally we are connected within the airport family. But Living ideas – Connecting lives means more than that: The core of our brand stands for a spirit of partnership in dealings with external parties, not only with our business partners, but also with the airport's neighbors and the residents of Munich. It also stands for the commitment of all employees to the way we, as the FMG Group, intend to behave in the future, both internally and externally – to an inner attitude.</p>
Previous experience	<p>Flughafen München GmbH (MUC (SEAC2020)) was involved in SESAR 1 with a focus on concept development and validation activities. This is reflected with a participation in the 6.2, operational concept definition where we have put an emphasis on Validation Strategy and DoD. Furthermore we participated in 6.5.2, Airport Operations Plan Validation and 6.5.4, APOC Definition. Another strong focus was projects 6.6.1, CDM in adverse conditions and 6.7.2/6.7.3 ASMGCS Routing, Planning and Guidance. The main focus, however, was in 6.3 projects on validation, where we had placed most of our effort. In April 2015 we have hosted our own validation exercise on “Follow-the-Greens” (FtG) which turned out to be very successful with FtG established as a standard solution in the ATM Masterplan later on. Particular attention was also made to transversal activities with participation in C2 in various work packages and being the airport representative in the Masterplan campaign.</p> <p>In SESAR 2020 we have been involved as contributor mainly in PJ04 TAM, PJ03a ASMGCS and PJ20 Masterplan Update.</p>
Entity Profile matching the task	Not applicable, Flughafen München GmbH (SEAC2020) initially will not participate directly in this action.
Contribution	Support to participating SEAC2020 members when required.

#### 4.1.1.28 SCHIPHOL NEDERLAND B.V. (SNBV)

Organisation	28 SNBV (SEAC2020)	Service Provider
Description	<p>Schiphol Nederland B.V. is the operator of Schiphol Airport; one of the busiest and largest hub airports in Europe. Started in 1916 as a small military airfield, Schiphol Airport has evolved towards a world class airport by continuous adaption to and initiation of new and innovative process developments in the Air Transport Industry.</p> <p>In 2018 Schiphol Airport welcomed over 71 million passengers, using almost 500.000 flights to/from 322 destinations worldwide. For this Amsterdam Airport consists of a complex system of terminals, concourses, aircraft parking aprons and runways.</p> <p>Schiphol Airport has a complex infrastructure lay-out consisting of six runways, many of them converging or even crossing. The operating environment is unique in such that runway combination changes take place 15 to 20 times a day. Not only dictated by a pronounced demand asking the full capacity of three runways simultaneously (2 landing + 1 take-off runway during inbound peak periods and 1 landing + 2 take-off runways during outbound peak periods), but also dictated by strict environmental regulations limiting the use of certain runways.</p> <p>Schiphol Nederland B.V. is part of the Schiphol Group. Next to Schiphol Airport, the smaller Dutch airports of Rotterdam, Eindhoven and Lelystad are part of the group. Schiphol Group also operates the International terminal T-4 at New York JFK airport.</p>	
Previous experience	<p>Schiphol Nederland has a strong involvement in the SESAR 1 program, being involved in 10 projects of Work Package 6 “Airport Operations”. Among a long list of contributions and activities this includes:</p> <ul style="list-style-type: none"> <li>• Project management of P6.5.1 (Airport Operations Plan Definition); AOP</li> <li>• Contributor to P6.5.3 (Airport Capacity and Flow Management); Airport -DCB</li> <li>• Contributor to P6.5.4 (Airport Operations Centre definition); APOC</li> <li>• Contributor to the development of the OFA 05.01.01 “Airport Operations Planning” guidance documents OSED and INTEROP.</li> <li>• Contributor to the development of the validation plans (VALP) for different validation exercises for AOP, APOC and Airport-DCB (RMAN – Runway Manager),</li> <li>• Contributor to the execution of validation exercises for AOP, APOC and Airport-DCB (RMAN).</li> <li>• Task-leader / co-writer activities for multiple tasks within projects of Work Package 6 including P6.2 - Initial Detailed Operational Description – DOD step 1 and P6.5.4 APOC Initial Operational Concept.</li> </ul> <p>In SESAR2020 Wave 1 Schiphol Nederland B.V. continued the work from SESAR1 and took the task lead for the SPR-INTEROP/OSED together with NLR. The projects Schiphol Nederland B.V. was involved in SESAR2020 are:</p>	



	<ul style="list-style-type: none"> <li>• Task Lead for SPR-INTEROP/OSED PJ04-01 TAM</li> <li>• Contributor in PJ04-02 TAM</li> <li>• Contributor in PJ-09 DCB</li> <li>• Contributor in PJ-20 Masterplan</li> </ul>
Entity Profile matching the task	Not applicable, Schiphol Nederland b.v. (SEAC2020) initially will not participate directly in this action.
Contribution	Support to participating SEAC2020 members when required.

#### 4.1.1.29 SWEDAVIA AB

Organisation	29 Swed (SEAC2020)	Service Provider
Description	<p>Swedavia AB (Swedavia (SEAC2020)) task is to own, operate and develop ten strategically located airports all over Sweden. Together, the airports constitute a network that links Sweden's regions together, while also serving as a bridge to and from the world beyond. Swedavia's vision is "Together we bring the world closer". That means Swedavia shall help to make air travel and cargo transport – regionally, but also to and from Sweden – as accessible, efficient and attractive as possible.</p> <p>In 2018, Swedavia AB (Swedavia (SEAC2020)) had a net revenue of SEK 5.9 billion and some 3,000 employees. The Swedavia group of airports served in 2018 around 42 million passengers.</p> <p>Stockholm-Arlanda Airport is Sweden's largest airport (26,7 million passengers and 916 000 aircraft movements in 2018) and acts as an important domestic and international hub for the Stockholm region and for Scandinavia - owing to flights to 180 destinations around the globe, and good ground transportation to and from other parts of the Stockholm region.</p> <p>Stockholm-Arlanda Airport operates three runways which are subject to strict environmental conditions. Capacity is in 2018 84 aircraft movements per hour. In total some 20,000 people work at the airport.</p>	
Previous experience	<p>Swedavia AB (Swedavia (SEAC2020)) has been involved since SESAR1 as a member of NORACON. Swedavia AB (Swedavia (SEAC2020)) was an active in a number of Work Package 6 projects both as project leader and as project contributor. Swedavia AB (Swedavia (SEAC2020)) has also been involved in validation exercises under the SJU/AIRE umbrella. Examples of various Swedavia (SEAC2020) engagement below:</p> <ul style="list-style-type: none"> <li>• WP6.6.2 as Project Leader for "Integration of Airport/Airline/Ground Handlers/ATC.</li> </ul> <p>Swedavia AB (SEAC2020) has been contributing to:</p> <ul style="list-style-type: none"> <li>• WP6.7.1 "Airport safety support tools",</li> <li>• WP6.8.8 "Enhanced arrival procedures to "reduce occupancy time using GBAS &amp; P03 - Curved Approach based on GBAS,</li> </ul>	

	<ul style="list-style-type: none"> <li>• WP6.9.3 “Remote &amp; Virtual tower.</li> </ul> <p>Swedavia AB (Swedavia (SEAC2020)) airports (Stockholm-Arlanda airport / Göteborg-Landvetter airport) have been participating in SJU/AIRE exercises “Green Connections”, “MINT” and “VINGA”.</p> <p>Swedavia AB (Swedavia (SEAC2020)) have been involved as consortium member and as contributor in two FP7 financed projects “MANaging System Change in Aviation, MASCA” and project “PROactive Safety PERFORMANCE for Operations, PROSPERO</p> <p>In SESAR2020 Swedavia AB (Swedavia (SEAC2020)) joined the SEAC consortium where Swedavia AB (Swedavia (SEAC2020)) have contributed in:</p> <ul style="list-style-type: none"> <li>• PJ02/11 – EARTH</li> <li>• PJ04 – TAM</li> <li>• PJ05 – Remote Tower</li> <li>• PJ20 – ATM Masterplan</li> </ul> <p>Within PJ04, Swedavia AB (Swedavia (SEAC2020))) have focused on assisting other partners with operational expertise and personal for validation activities.</p>
Entity Profile matching the task	<p>Swedavia AB (Swedavia (SEAC2020)) operates large, medium-sized and small regional airports. As such Swedavia AB (Swedavia (SEAC2020)) has extensive experience in cooperating with various other airport stakeholders, such as local ANSPs, Ground Handlers and Airspace Users, to provide a smooth and safe aircraft ground handling processes. Swedavia AB (Swedavia (SEAC2020)) is engaged in Airports Council International (‘ACI Europe’) and it is through a relationship with both the SEAC2020 Consortium and ACI that communication and consultation will be achieved for the airports outside of the formal Consortium arrangements.</p> <p>Examples of unique skills, knowledge and experience with respect to airport operations and ATM at Airports, includes:</p> <ul style="list-style-type: none"> <li>• Operating large, medium and regional airports,</li> <li>• Airside &amp; Landside Operations,</li> <li>• Winter operations at airports of different sizes,</li> <li>• Capacity Management &amp; Enhancement,</li> <li>• Strategic Planning &amp; Forecasting,</li> <li>• Performance Management,</li> <li>• Information Technology,</li> <li>• Safety Management,</li> <li>• Environmental Management in varying weather conditions,</li> </ul> <p>Contingency &amp; Crisis Management.</p> <p>Swedavia is currently implementing Remote Tower Services (RTS) at</p>



	four of its airports and has extensive knowledge of how implementation of RTS is effected by and how it affects airport infrastructure and operations.
Contribution	Swedavia will contribute with its knowledge to review the OSED and the CBA plan and assessment. When possible, Swedavia will also contribute to the development of these documents.

#### 4.1.1.30 FLUGHAFEN ZUERICH AG (ZRH)

Organisation	30 ZRH (SEAC2020)	Service Provider
Description	<p>According to the terms agreed with the Swiss Confederation in 2001, Flughafen Zürich AG (SEAC2020) has the right and obligation to operate Zurich Airport and maintain its infrastructure for the duration of the 50-year concession. The 2004 aviation policy report summarised the Federal Council's position: "Because Zurich Airport is a key infrastructure, it is vital for Switzerland that it runs smoothly. It must continue to provide the infrastructure that airlines need to maintain the best possible direct connections between Zurich and Europe and the world's major cities and to thereby satisfy the needs of the market". Flughafen Zürich AG (SEAC2020) has around 1,600 employees across four business areas. The company focuses on its core activities: national and international airport operator, operation of the commercial centres in the landside and airside areas, as well as income-oriented management and further development of real estate at the Zurich location.</p> <p>In the formulation and implementation of its strategy, Flughafen Zürich AG (SEAC2020) underpins the three aspects of cost-efficiency, environment and social responsibility. In this way it aims to increase the company's competitiveness and credibility and achieve sustainable value creation. It constantly has to strike a balance between capacity, complexity and noise activities.</p>	
Previous experience	<p>Flughafen Zürich AG (SEAC2020) participates to SESAR through the SESAR European Airports Consortium and was mainly involved in WP6 Projects; 6.8.4 Coupled AMAN DMAN, 6.5.3 Airport-DCB, 6.5.1 Airport Operations Plan Definition, 6.5.4 Airport Operations Centre definition and the OFA 5.1.1, as well as in the projects 6.7.1. and 6.7.2 and the Validations of 6.3.1 and 6.3.2.</p> <p>Additionally Flughafen Zürich AG (SEAC2020) provided effort to the management of WP6 and to the federating 6.2 project to ensure consistency of results being passed to transversal documents to determine performance goals and inform other ATM stakeholders.</p> <p>Additionally Flughafen Zürich AG (SEAC2020) took part in WP12 "Airport Systems" project 12.06.02 Airport Operations Plan and several environmental projects. Furthermore Flughafen Zürich AG (SEAC2020) has been involved in the BAFO III project 6.8.8 and in several AIRE projects (AIRE 1 and AIRE 2) covering ground aspects and the LSD projects iStream &amp; AAL.</p>	

Entity Profile matching the task	Not applicable, Flughafen Zürich AG (SEAC2020) initially will not participate directly in this action.
Contribution	Support to participating SEAC2020 members when required.

#### 4.1.1.31 THALES LAS FRANCE SAS

Organisation	31 THALES AIR SYS	Ground Industry
Description	<p>Thales ATM, from take-off to touchdown and everything in between. 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 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 main 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. DSNF will enjoy a new generation ATM system to respond to the increasing complexity and density of air traffic, integrating a new advanced flight data processing system (CoFlight)with Thales's latest generation human machine interface (TopSky - Controller HMI)</p>	

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 DSNA 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, LFV, Naviair, Austro Control 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

## MODERNISATION INITIATIVES

### NextGen

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.

Thales is a key contributor to NextGen

Member of RTCA NextGen Advisory Committee

Key technology provider for ADS-B program

Enabling data comm with Thales automation platform

Providing analysis work with the areas of safety and security

### ICAO ASBUs

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.
Entity Profile matching the task	<p>Thales Deutschland GmbH</p> <p>With its extensive range of activities Thales is a world leader in air traffic management and provides a full range of airport and air traffic solutions of which Thales Deutschland GmbH (TES) offers the navigation and surveillance systems and airport solutions used by Civil Aviation Authorities and airports around the world.</p> <p>The product range encompasses the area approach and landing aids, en-route navigation systems, precision navigation, surveillance systems and aircraft monitoring. Top priorities are development and implementation of navigation, surveillance &amp; monitoring systems, system integration, research and concept development, built-in testing and data processing technology to meet the highest available standards with our ground based systems, complemented of course with technical and logistical support, including documentation and spares &amp; repairs management. Today TES provides a significant contribution to support national and international customers in the areas of navigation, surveillance and air traffic monitoring, information systems, communication systems, training, technical information and data processing technology.</p> <p>With its main location near Stuttgart, TES is represented in an important industrial area in southwest Germany. We offer our customers a wide range of services for the complete life cycle of our COTS (Commercial Off-The-Shelf) products. Even with the products being market oriented and undergoing continuous improvement, the incorporation of customer specific requirements occurs. This can begin with feasibility studies and starting out in concept design, development, and prototyping phase and test phase. The series production, qualification, system installation (integration) and setting-to-work are also among our core tasks. For the entire life of our products, we offer maintenance, repair and technical service. The continuous development, life extension and adaptation of innovative ability of our products and services under the highest quality standards lead to optimal use by our customers.</p> <p>In SESAR 2020 Wave 2, TES will collaborate with Thales Air Systems in Pj05 and PJ14, specifically in the surveillance solution.</p>
Contribution	<p>PJ05 Wave 2 Solution 35:</p> <p>THALES will contribute to solution #35 in Pj05 mainly with respect to ground surveillance aspects of Multiple Remote Tower Control intending to ensure the consistency with the technical development performed in Pj14-04-03 T04. The contributions to solution #35 are related to:</p> <ul style="list-style-type: none"> <li>- Technical aspects of the concept development</li> <li>- Technical Specification</li> <li>- Validation plan</li> <li>- Validation report</li> </ul>

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

- Project Manager
  - **Jörn Jakobi (AT-One) (♂)**: Diploma in Psychology (1999). Since 2000 he is as a human factors expert with DLR institute of flight guidance where he works in the domain of airport airside traffic management with the focus on A-SMGCS and Remote Tower concept operations and validation. Since 2010 he additionally works as a business developer for DLR with main focus on remote tower operations. In 2014 he became chairman of the EUROCAE WG100 “Remote & Virtual Tower”. Since 2016 he acts as SESAR2020“PJ05 Remote Tower” Project Manager.
- Solution 35 Leader
  - **Marcus Filipp LFV/COOPANS (♂)**: Diploma from Swedish Military High school (2000, former military officer), Air Traffic Controller License (since 2003). Operative expert in the implementation program of LFVs Remote Tower Centre, responsible of HMI presentation from camera to screen. At the same time operative expert in the P.06.09.03 program and responsible of development of the multiple remote tower concept (SDM-0205), which got a V3 approval from SJU during 2015. The role as operative expert in the remote development included many tasks related to remote tower such as managing the DoW for PJ.05, Large Scale Demo program and internal studies of future possibilities for remote technology. Since spring 2015 manager of LFVs, newly started, remote technology research program including remote tower and remotely piloted aircrafts.
- Solution 97 Leader
  - **Ramona Santarelli (ENAV) (♀)**: Ramona Santarelli has a Master Degree in Aeronautical Engineering, specialised in Flight Guidance, Navigation and Control Systems from La Sapienza, University of Rome and works at ENAV Research Activities Unit. She has experience in flight guidance and control systems and testing of light Unmanned Aerial vehicles as system engineer and in satellite navigation research program for civil aviation applications as sub-system engineer. She has experience in the Air Traffic Management domain in the area of research project management. In the framework of SESAR 1 Programme, she has fulfilled the role of Leader of Work Package 3 “Validation Infrastructure Adaptation and Integration”, a transversal thread focused on engineering activities, from the design through development until integration, aimed at the final verification and acceptance of IBPs/V&VPs, in line with projects V&V Needs. Chair of SESAR 1 System Engineering Reviews, aimed to the assessment of European Validation and Verification Platforms readiness for the execution of all SESAR validation exercises addressing E-OCVM V3 maturity. In the context of SESAR 2020, Work Package Leader in the frame of “Validation and Demonstration Engineering” Project, leading the definition, developments and implementation of the System Engineering Data Management Framework (SE-DMF), in the context of SESAR Programme, to support the coherence and delivery of all SESAR Solutions.

## 4.2 Third parties involved in the project (including use of third party resources)

### 4.2.1 Linked to DEUTSCHES ZENTRUM FUER LUFT - UND RAUMFAHRT EV (DLR)

#### Objective

Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	N
No third parties involved	
Does the participant envisage that part of its work is performed by linked third parties <sup>3</sup>	N
No third parties involved	
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	

#### 4.2.2 Linked to STICHTING NATIONAAL LUCHT- EN RUIMTEVAARTLABORATORIUM (NLR)

Objective	
Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	N
Does the participant envisage that part of its work is performed by linked third parties <sup>4</sup>	N
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
Does the participant envisage that part of the work is performed by International Partners <sup>5</sup> (Article 14a of the General Model Grant Agreement)?	N

#### 4.2.3 Linked to RIZENI LETOVEHO PROVOZU CESKE REPUBLIKY STATNI PODNIK

Objective
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<sup>3</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>4</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>5</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.



Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	N
Does the participant envisage that part of its work is performed by linked third parties <sup>6</sup>	Y
<p><b>INTEGRA (ANS CR LTP):</b></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.</p> <p>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.</p> <p>Integra Consult's key assets are our high profile consultants, many with a background from an ANSP, national authority, EU or other relevant institutions or defence organisations. Its unique experience and continuously updated knowledge of recent regulations, programs and best practices are available to our customers. A key element of Integra Consult's strategy is to provide independent, flexible and high-quality consultancy services that generate added value to our customers at a reasonable cost.</p> <p>INTEGRA will participate in following activities for SOL 97:</p> <ul style="list-style-type: none"> <li>▪ leading of Safety related parts IN THE Exercises 03 and 06, using the experience from current PJ.16-04 Solution (SAP; SAR)</li> <li>▪ contribution to CBA, VALP and VALR documents</li> <li>▪ expert review of deliverables using the experience from current PJ.16-04 Solution</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
Does the participant envisage that part of the work is performed by International Partners <sup>7</sup> (Article 14a of the General Model Grant Agreement)?	N

<sup>6</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>7</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.



#### 4.2.4 **Linked to LETOVÉ PREVÁDZKOVÉ SLUŽBY SLOVENSKEJ REPUBLIKY ŠTÁTNY PODNIK**

Objective	
Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	N
<i>No</i>	
Does the participant envisage that part of its work is performed by linked third parties <sup>8</sup>	N
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
Does the participant envisage that part of the work is performed by International Partners <sup>9</sup> (Article 14a of the General Model Grant Agreement)?	N

#### 4.2.5 **Linked to VALSTYBES IMONE „ORO NAVIGACIJA**

Objective	
Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	N
<i>No</i>	
Does the participant envisage that part of its work is performed by linked third parties <sup>10</sup>	N
<i>No</i>	

<sup>8</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>9</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>10</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 the use of contributions in kind provided by third parties (Articles 11 and 12 of the General Model Grant Agreement)	N
<i>No</i>	
Does the participant envisage that part of the work is performed by International Partners <sup>11</sup> (Article 14a of the General Model Grant Agreement)?	N
<i>No</i>	

#### 4.2.6 Linked to POLSKA AGENCJA ZEGLUGI POWIETRZNEJ

Objective	
Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	N
Does the participant envisage that part of its work is performed by linked third parties <sup>12</sup>	N
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
Does the participant envisage that part of the work is performed by International Partners <sup>13</sup> (Article 14a of the General Model Grant Agreement)?	N

<sup>11</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>12</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>13</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.

#### 4.2.7 Linked to AUSTRO CONTROL OSTERREICHISCHE GESELLSCHAFT FÜR ZIVILLUFTFAHRT MBH (ACG)

Objective	
Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	Y
<p>Austro Control will subcontract the update and delivery of the required speech recognition engine to</p> <ul style="list-style-type: none"> <li>• IDIAP (Centre du Parc, Rue Marconi 19, CH - 1920 Martigny, Switzerland)</li> </ul> <p>and to</p> <ul style="list-style-type: none"> <li>• University of Saarland (Universität des Saarlandes, Campus, D-66123 Saarbrücken, Germany)</li> </ul> <p>These 2 organizations have developed the speech recognition engine in the funded exploratory research project MALORCA. This engine shall be updated according to the latest requirements and then made available to the project for the validation exercises. The project focuses mainly on the operational use of speech recognition; the engine is a mandatory component of the validation exercise, but not a core project task.</p> <p>IDIAP (Centre du Parc, Rue Marconi 19, CH - 1920 Martigny, Switzerland)</p> <p>Update of the speech recognition component of the ACG/COOPANS contribution to based on content provided by Austro Control experts. For this update and delivery estimated costs of € 45.000- are calculated.</p> <p>University of Saarland (Universität des Saarlandes, Campus, D-66123 Saarbrücken, Germany)</p> <p>Update of the speech recognition component of the ACG/COOPANS contribution to based on content provided by Austro Control experts. For this update and delivery estimated costs of € 45.000- are calculated.</p> <p>Austro Control intends to subcontract parts of the document work (particularly VALP and VALR) to Think Research. This company has sound knowledge and specific expertise in technical and operational aspects of ATM. While the core content-related expertise will be delivered by Austro Control experts, Think Research will be responsible for the actual drafting and consolidation of the documents or parts of them.</p> <p>In particular the following tasks will be subcontracted to Think Research:</p> <ol style="list-style-type: none"> <li>1. Elaboration of the ACG/COOPANS contribution to the TS/IRS based on content provided by Austro Control experts. Estimated cost € 4000,-</li> <li>2. Elaboration of the ACG/COOPANS contribution to the TVALP based on content provided by Austro Control experts. Estimated cost € 10000,-</li> <li>3. Elaboration of the ACG/COOPANS contribution to the TVALR based on content provided by Austro Control experts. For this document the participation of Think Research staff as observers to the validation exercise is planned. Estimated cost € 17339,-</li> </ol> <p>Organizational Data: Think Research Ltd. Suite 3 Branksome Park House, Branksome Business Park,</p>	

Bourne Valley Rd, Bournemouth, BH12 1ED.	
Does the participant envisage that part of its work is performed by linked third parties <sup>14</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>15</sup> (Article 14a of the General Model Grant Agreement)?	N
No	

#### 4.2.8 Linked to CROATIA CONTROL, CROATIAN AIR NAVIGATION SERVICES LTD (CCL)

Objective	
Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	N
No	
Does the participant envisage that part of its work is performed by linked third parties <sup>16</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	

<sup>14</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>15</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>16</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>17</sup> (Article 14a of the General Model Grant Agreement)?	N
No	

#### 4.2.9 Linked to IRISH AVIATION AUTHORITY (IAA)

Objective	
Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	N
No	
Does the participant envisage that part of its work is performed by linked third parties <sup>18</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>19</sup> (Article 14a of the General Model Grant Agreement)?	N
No	

#### 4.2.10 Linked to LUFTHARTSVERKET (LFV)

Objective	
Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	N
No	

<sup>17</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>18</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>19</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.

Does the participant envisage that part of its work is performed by linked third parties <sup>20</sup>	N
<i>No</i>	
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
<i>No</i>	
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
<i>No</i>	

#### 4.2.11 Linked to NAVIAIR

Objective	
Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	N
Does the participant envisage that part of its work is performed by linked third parties <sup>22</sup>	N
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
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

<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).

<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.

#### 4.2.12 Linked to DFS DEUTSCHE FLUGSICHERUNG GMBH (DFS)

Objective	
Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	N
NO	
Does the participant envisage that part of its work is performed by linked third parties <sup>24</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>25</sup> (Article 14a of the General Model Grant Agreement)?	N
NO	

#### 4.2.13 Linked to ENAIRE

Objective	
Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	No
N/A	
Does the participant envisage that part of its work is performed by linked third parties <sup>26</sup>	Yes
<p><u>CRIDA</u></p> <p>CRIDA A.I.E. (Reference Center for Research, Development and Innovation in ATM) is a non-profit joint venture between ENAIRE, The Polytechnic University of Madrid and Ineco. CRIDA's mission is to improve the performance of the Spanish ATM management system.</p>	

<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).

<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.

<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).



As an integral part of the global system, CRIDA intends to increase the safety, capacity, environmental and economic impact of ATM through ideas and R&D+i projects. CRIDA's investigative priorities revolve around three main lines in which CRIDA leverages its proven experience and solid international reputation:

- System monitoring and diagnostics to identify problems and their causes. This continuous system observation is realized through systematic performance quantification;
- Analysis and validation of R&D+i solutions, viability studies and quantification of the benefits in terms of system performance improvements;
- Collaboration in the development and subsequent deployment of those solution alternatives that provide the best system benefit.

CRIDA will participate in the development of the Operational Concept in Solution #35 and in Solution #97 in the development of the Operational Concept, the Operational Requirements, and perform a V2 RTS validation activity to address the concepts ability to identify aircraft and couple the related flight information onto the moving image.

Does the participant envisage the use of contributions in kind provided by third parties (Articles 11 and 12 of the General Model Grant Agreement)	No
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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)?	No
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N/A

#### 4.2.14 Linked to ENAV SPA (ENAV)

##### Objective

Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	N
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N/A

Does the participant envisage that part of its work is performed by linked third parties <sup>28</sup>	Y
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ENAV contribution in the project is complemented by the following LTPs: Techno Sky, UNIBO, Deep Blue, IDS AIRNAV, NAIS and BIP.

<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.

<sup>28</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).

## **Techno Sky**

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&D activities.

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&D following the transfer of competences and experts coming from SICTA, the former ATM R&D branch of ENAV Group.

The acquisition of ATM R&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.

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. 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 Wave 1 Programme as ENAV LTP by complementing ENAV activities and expertise in 14 W1 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 contribution to this project is intended to be provided in all activities where ENAV has expressed interest, with special emphasis on the operational validation of the concepts developed within the project solutions.

Specifically, for Solutions #35 and #97, transversal contribution to the tasks for the concept, procedures and requirements definition; for structuring and organising all validation activities as well as for executing and reporting related to all validation exercises envisaged to be performed within this project.

In addition, Techno Sky will contribute to solution #35 by offering platform and development capabilities to support ENAV expected validation exercise.

## **Alma Mater Studiorum – University of Bologna (UNIBO)**

The Alma Mater Studiorum, the oldest university in the Western world, paves the way for

innovation through an increasingly rich programme catalogue, cutting-edge research and a constant and increasingly broad international perspective.

Based in five campuses (Bologna, Cesena, Forlì, Ravenna, Rimini), with a branch in Buenos Aires, it offers a teaching catalogue diversified and tailored to the needs of present-day society: over 200 degree programmes among its 32 Departments and 11 Schools are offered to over 81,000 students. 5,000 graduates are enrolled in PhDs and 3rd cycle programmes.

As a **comprehensive research university** Alma Mater invests in the multidisciplinary cross-cultural approach and in the inseparable connection between research and teaching. One of the most active universities leading and participating in **European research** and academic cooperation projects, Bologna has formed knowledge alliances with industry and public/private organizations.

In **Horizon 2020**, UNIBO is so far involved in 195 funded projects (52 as coordinator) with more than 78 ML Euros of funding. UNIBO is also partner of the EIT Knowledge & Innovation and many of the most important EU initiatives related to the Horizon 2020 framework program, including **SESAR** and Clean Sky.

Since 1992, a full set of resources and assets in **aerospace engineering** were established and gathered together in the Forlì Campus. The campus of the Aerospace Engineering Degree and Master Degree is located alongside the Airport, nearby Francesco Baracca Aviation High School and **ENAV Academy**. Thanks to the ideal location and because of mutual interest in the ATM research, ENAV and University of Bologna have been actively **collaborating for both teaching and researching purposes**. This cooperation enables University of Bologna's staff to easily access all the ATM expertise that only an experienced ANSP can provide, covering key aspects of SESAR objectives such as human factors, safety, validation, and interface requirements definition.

Notably, the **SESAR ER1 RETINA** project was positively closed last year under the coordination of the University of Bologna, with a major contribution of ENAV as partner of the RETINA consortium. Moreover, ENAV contributed as subcontractor of the University of Bologna to the success of **SESAR ER1 MINIMA** project.

In continuity with ER experience, with special focus on RETINA being it the precursor of SOL#97, UNIBO will contribute to that solution by offering platform and development capabilities to support ENAV expected validation exercises. UNIBO will also support ENAV in management, communications and disseminations activities.

### **Deep Blue**

Deep Blue is an Italian research and consultancy SME specialised in safety, human factors, validation and dissemination. The company operates in the domain of transportation dealing with the design, analysis and evaluation of interactive systems, especially in Aviation and Air Traffic Management (ATM).

The company's main area of activity is the analysis and evaluation of interactive complex systems, with particular focus on interactions, integration and allocation of functions between humans, procedures and equipment. Deep Blue services range from concept design to system evaluation and validation.

Deep Blue research activity is concentrated on the following main areas:

- Evaluation and validation of air traffic and aviation concepts and systems;
- Evaluation of dependability of interactive systems;
- Methodologies and techniques for design, analysis and validation of air traffic and aviation concepts and systems.

A highly qualified multidisciplinary team skilled in Cognitive Science, Psychology, Safety, Engineering, Interaction Design, Computer Science and Mathematics leads Deep Blue in

delivering innovative and highly professional results. Deep Blue's staff is highly qualified and research-oriented and about 70% of the personnel own a PhD and many of them collaborate with or teach in Italian Universities. The research activity is carried out mainly through the participation in cooperation projects both at a national and international level which are co-funded by public organisations and through the involvement in some of the most important Research Networks in the domains of interest.

Finally, Deep Blue is currently participating in SESAR 2020 Wave 1 as ENAV LTP by supporting ENAV work and validation activities on ATM performance assessment. Particularly, workload, situation awareness, need for training, usage and requirements identification of new tools are the areas of investigation, applying a wide range of both-standard and tailored methodologies.

Coherently with its Wave 1 involvement as ENAV LTP, Deep Blue will ensure KPA expertise (HP, SAF, SEC and CBA) to support Enav in concept developments, validations execution and relevant performance assessments in the framework of both SOL#35 and SOL#97.

### **IDS AIRNAV SRL**

IDS AIRNAV SRL (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 compliancy with the ICAO and EUROCONTROL mandates for Aeronautical Data Quality (ADQ).

Developed in close partnership with its customers, and continually supported and updated to adapt to changing and more stringent requirements, IDS AIRNAV portfolio now comprises a comprehensive ADQ compliant solution for Aeronautical Information Management (AIM), which can cover the whole process from data collection to publication as well as a system for Air Traffic Flow Management (ATFM) and collaborative decision making (CDM).

IDS AIRNAV network of services and support teams provide assistance for its solutions, consultancy and a wide range of professional services. These include ICAO recognized flight procedure design services along with ground-based validation, flyability evaluations, R&D activities, risk assessments and mitigation recommendations. Amongst other tailored services IDS AIRNAV can also provide communication, navigation and surveillance (CNS) performance evaluation, NAVAID siting analysis and electromagnetic interference evaluation, as well as terrain and obstacle acquisition and chart design.

IDS AIRNAV, an high tech integrated solutions services company, is now recognised as a leading solution provider to Air Navigation Service Providers, Airports Authorities, aviation agencies, Government and private entities that manage Air Traffic in both the civil and military markets.

In line with the ENAV Group work in W1 on airport domain, IDS AIRNAV will support ENAV activity in SOL#35 by complementing ENAV platform developments and capabilities, with special focus on the virtual OTW to be used for the planned ENAV RTS exercise on multiple remote TWR solutions.

### **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 currently participating in SESAR 2020 Wave 1 as ENAV LTP and is supporting with its technical and management expertise the ENAV work in W1 projects PJ01, PJ02, PJ03a, PJ05 and PJ16, with special focus on validation activities and KPA assessment.

Notably, NAIS will provide its contribution to the PJ05-Solution 35 and in particular for SW developments aspects.

## **BIP**

Bip is the major Italian consulting firm, and one of the largest players in the European management consulting. Fourteen years after its foundation, with more than 1.500 professionals, more than 175 clients and an annual consolidated turnover of more than € 130 million in 2016, Bip is regarded as a true success story in European strategy and management consulting and as an ideal business advisor for its quality, innovation, efficiency, expertise in modernisation and development, delivered to large Corporations, Public Institutions and Agencies and International Corporations.

Bip possesses distinctive capabilities in designing and realising tangible consulting projects, merging coherently Clients' strategic vision, business model, and operational deployment, while fully preserving their corporate culture. Bip consultants are recognised for deep business knowledge, significant reliability and superior capacity to deliver tailor-made solutions for performance improvements. Moreover, Bip is an independent business advisor, with no conflicts of interest of sort, such as those potentially arising from advisory / auditing or advisory / software providers.

In particular, Bip is recognised as a major player and thought leader in the following competence areas:

- Strategic and organisational consulting for Public Customers and Private large international companies;
- Economic and financial areas of excellence in economic and business due diligence, financial assessment, development of alternative economic scenarios, Cost-Benefit Analysis, Sensitivity analysis, What-If analysis, business cases delivery and execution;
- Capability to run effectively complex international projects, with the involvement of several stakeholders



- over different countries;
- Information Technology strategy and operational governance, where Bip professionals developed
- Innovative methodologies, frameworks and best practices

Bip has a long experience in Aviation sector and has matured a unique experience as a quality strategic partner for important ANSP at national and international level.

More than 10 years ago BIP has started a long and fruitful collaboration with ENAV in the governance of different initiatives that go from operations, participation to SESAR JU and to SESAR Deployment Manager, strategy, organization, human resources, and commercial and international development. Such experience has allowed BIP to create a solid and specific competence in the aviation industry, and ENAV to gain a partner that can provide a useful and trusted support in the execution of studies, business cases, reports and governance activities.

Specifically, BIP contribution in the project is required to support ENAV in CBA task of PJ05-Solution 35.

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>29</sup> (Article 14a of the General Model Grant Agreement)?	N
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N/A

#### 4.2.15 Linked to EUROCONTROL - EUROPEAN ORGANISATION FOR THE SAFETY OF AIR NAVIGATION

##### Objective

Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	Y
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The provision of the simulation platform(s) will be subcontracted: EUROCONTROL do not develop software internally and all software developments related to the simulations are subcontracted.

Data analysis, Big data and Machine learning development will be subcontracted. Validation support.

Subcontracting is based on open call that is managed by the EUROCONTROL PMO  
The cost of subcontracting is estimated to 700 000€

Does the participant envisage that part of its work is performed by linked third parties <sup>30</sup>	N
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<sup>29</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>30</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 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>31</sup> (Article 14a of the General Model Grant Agreement)?	N
N/A	

#### 4.2.16 Linked to ATOS BELGIUM SA/NV

Objective	
Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	N
Does the participant envisage that part of its work is performed by linked third parties <sup>32</sup>	N
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
Does the participant envisage that part of the work is performed by International Partners <sup>33</sup> (Article 14a of the General Model Grant Agreement)?	N

#### 4.2.17 Linked to FREQUENTIS AG

Objective
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<sup>31</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>32</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>33</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.



Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	Y
<p><b>Avionix Engineering sp. z.o.o.</b>, located in Krakow, Poland will be subcontracted for a contribution value of EUR 100.000. Avionix will contribute to solution PJ05-35 with software development and prototyping tasks for user interface for the planning and supervisor tools. The subtasks of Avionix will complement the Frequentis task for prototype and platform validation where it is in the leading role (exercise with DLR).</p> <p><b>Austrian Institute of Technology GmbH</b> (AIT) will be subcontracted for a contribution of EUR 40.000. The subtask of AIT will cover specialised expertise in the area of image processing and will contribute to the improvement of video based object detection and surveillance based safety net. The contribution will complement the Frequentis development task (validation exercise with DFS).</p> <p><b>Mission Embedded GmbH</b>, located in Vienna, will be subcontracted for a contribution of EUR 75.000. The assigned subtask will cover the expertise in hardware/camera integration to complement the Frequentis prototype and platform development task (validation exercise with DFS).</p>	
Does the participant envisage that part of its work is performed by linked third parties <sup>34</sup>	Y
<p><b>Frequentis Comsoft GmbH</b> is an affiliate of Frequentis AG. The task for Comsoft will be the software development for the video surveillance and Safety Net Service as part of the two validation exercises with Frequentis contribution (validation exercise with DFS and exercise with DLR). Hence the Comsoft contribution is linked to the two development tasks.</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
Does the participant envisage that part of the work is performed by International Partners <sup>35</sup> (Article 14a of the General Model Grant Agreement)?	N

#### 4.2.18 Linked to HUNGAROCONTROL MAGYAR LEGIFORGALMI SZOLGALAT ZARTKORUEN MUKODO RESZVENYTARSASAG

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.	

<sup>34</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>35</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.

Does the participant envisage that part of its work is performed by linked third parties <sup>36</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>37</sup> (Article 14a of the General Model Grant Agreement)?	N
N.A.	

#### 4.2.19 Linked to INDRA SISTEMAS SA (INDRA)

Objective	
Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	N
No	
Does the participant envisage that part of its work is performed by linked third parties <sup>38</sup>	Y
<p><b>1. <u>Indra Navia AS</u></b></p> <p>Indra Navia AS (henceforth Indra Navia) is a wholly-owned subsidiary of the Spanish company Indra Sistemas, S.A.</p> <p>Based in Asker, Norway, with sales offices in France, China, Malaysia, and the United Arab Emirates, the company designs, produces, and integrates ground-based systems for the Air Traffic Control, including Communication, Navigation, and Surveillance (CNS) technology for the world's leading airports and air traffic control organizations.</p> <p>Ranging from individual airport installations to countrywide, multiple-site turnkey integrated system solutions, the company works in 111 countries, and more than 1200 airports around the world rely on Indra Navia products, amongst them the major European hubs such as Paris Charles de Gaulle, Brussels, London Heathrow and Amsterdam Schiphol.</p> <p>Through continuous technological development, Indra Navia facilitates the modernisation of air traffic management capabilities and ensures state-of-the-art technology. The company</p>	

<sup>36</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>37</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>38</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).

uses its ongoing experience with over 1,000 diverse customers to adapt and enhance effective support to meet all customers' needs. Compliance with ISO9001 reflects the company's high quality management system, placing the customer first at all times.

Indra Navia has decades of experience in supplying highly safety critical equipment, and thereby in-depth knowledge and understanding of the applicable regulations and requirements, in particular related to safety assessment and process/verification requirements to various levels of safety critical equipment development and implementation. Indra Navia therefore has a very good fundament for understanding the implications of bringing new equipment through approval processes to the market in the ATM domain.

Indra Navia, as SESAR1 partner through the North European ATM Industry Group AS (NATMIG), has participated in projects 12.03.02 “Enhanced Surface Safety Nets”, 12.03.03” Enhanced Surface Routing” and 12.03.04 “Enhanced Surface Guidance” defining and implementing new air traffic control tools.

In SESAR 2020 Wave 1, Indra Navia participated in projects PJ03a, PJ03b, PJ05, PJ14 and PJ28.

Intuitive HMI provides a clear picture of the airport surface with complete control of air traffic movements, on and around the airport through a fully integrated Advanced-Surface Movement Guidance and Control System (A-SMGCS) and a modern, configurable Electronic Flight Strip System (EFSS).

In the framework of this project, Indra Navia will enrich the natural role of Indra as a ground industry manufacturer, complementing technical work for better support SESAR 2020 solutions.

Indra Navia will analyse, design and develop the Advanced Controller Working Position, based on the SESAR 2020 Wave 1 CWP, which will be the used for multiple remote tower modules.

Indra Navia (with the support of Indra) will centralize and manage the work and the documentation to be produced related the prototypes produced in the project. The development of the platform will be shared between Indra Sistemas and Indra Navia AS.

## **2. Avinor Flysikring AS (Avinor ANS)**

Avinor Flysikring AS (henceforth Avinor ANS) is a state-owned limited company that operates most of the civil airports in Norway.

Avinor was created on 1 January 2003, by the privatization of the Norwegian Civil Aviation Administration known as Luftfartsverket. Its head office is in Bjørvika, Oslo, located on the seaside of Oslo Central Station.

Avinor is responsible for the 46 state-owned airports in Norway, fourteen in association with the Royal Norwegian Air Force, and is responsible for air traffic control services for civilian and military aviation in Norway. In addition to the 46 airports, it operates three Area Control Centers: Bodø Air Traffic Control Center, Stavanger Air Traffic Control Center and Oslo ATCC. This network links Norway together – and links Norway to the world.

Avinor ANS is a driving force in environmental work in aviation and a driving force to reduce the combined greenhouse gas emissions from Norwegian aviation. The company has a leading role in the work on developing and delivering biofuel for aircraft. Every year Avinor ANS contributes to safe and efficient travel for around 50 million airline passengers. Around half travel to and from Oslo Airport.

More than 3,000 employees are responsible for planning, developing and operating airports and air navigation services. Avinor ANS is funded by aviation fees and commercial sales at

<p>the airports.</p> <p>In the frame of the Wave 2 project, Avinor ANS will complement Indra Sistemas and Indra Navia with an operational view. The goal of the participation in this proposal is to provide experts for the preparation, execution and post-processing of results from validation activities as well as in the drafting and delivery of contractual documentation.</p> <p>Avinor has participated in SESAR 1 through NATMIG, and in SESAR 2020 Wave 1 as a LTP to Indra.</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
Does the participant envisage that part of the work is performed by International Partners <sup>39</sup> (Article 14a of the General Model Grant Agreement)?	N

#### 4.2.20 Linked to LEONARDO – SOCIETA PER AZIONI

Objective	
Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	Y
<p><i>The subcontracting costs are estimated around 240.000€ and it will be utilized for the involvement of UKSATSE during the three years of the project. Sub-contracting activities will cover the involvement of ATCO experts for:</i></p> <ul style="list-style-type: none"> <li><i>• executing the validation exercises;</i></li> <li><i>• contributing the definition of operational concepts in the OSED and SPR, as well as INTEROP;.</i></li> <li><i>• contributing to the validation report on behalf of Leonardo.</i></li> </ul> <p><i>Costs are expected to be split in €80.000 per year.</i></p>	
Does the participant envisage that part of its work is performed by linked third parties <sup>40</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	

<sup>39</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>40</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>41</sup> (Article 14a of the General Model Grant Agreement)?	N
N.A.	

#### 4.2.21 Linked to AIRTEL ATN LTD. (AIRTEL)

Objective	
Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	N
Does the participant envisage that part of its work is performed by linked third parties <sup>42</sup>	N
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
Does the participant envisage that part of the work is performed by International Partners <sup>43</sup> (Article 14a of the General Model Grant Agreement)?	N

#### 4.2.22 Linked to SAAB AKTIEBOLAG (SAAB)

Objective	
Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	Y
Human-Factors-Consultant GmbH and Click-Aero GmbH will provide SAAB AB with their	

<sup>41</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>42</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>43</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.

product MasterMAN to be used as a baseline for an ATCO Planning tool and a RTC Planning tool within the solution 35. The estimated cost is €65000.	
Does the participant envisage that part of its work is performed by linked third parties <sup>44</sup>	Y
SAAB Kockums AB is a wholly-owned subsidiary of SAAB AB and a SAAB AB LTP. SAAB Kockums AB will contribute with simulations and verification in the solution 35.	
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
Does the participant envisage that part of the work is performed by International Partners <sup>45</sup> (Article 14a of the General Model Grant Agreement)?	N

#### 4.2.23 Linked to SINTEF AS

Objective	
Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	N
Does the participant envisage that part of its work is performed by linked third parties <sup>46</sup>	N
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
Does the participant envisage that part of the work is performed by International Partners <sup>47</sup> (Article 14a of the General Model Grant Agreement)?	N

<sup>44</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>45</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>46</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>47</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.

#### 4.2.24 Linked to AEROPORTS DE PARIS (ADP)

Objective	
Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	N
Does the participant envisage that part of its work is performed by linked third parties <sup>48</sup>	N
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
Does the participant envisage that part of the work is performed by International Partners <sup>49</sup> (Article 14a of the General Model Grant Agreement)?	N

#### 4.2.25 Linked to AVINOR AS (AVINOR)

Objective	
Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	N
Does the participant envisage that part of its work is performed by linked third parties <sup>50</sup>	N

<sup>48</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>49</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>50</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 the use of contributions in kind provided by third parties (Articles 11 and 12 of the General Model Grant Agreement)	N
Does the participant envisage that part of the work is performed by International Partners <sup>51</sup> (Article 14a of the General Model Grant Agreement)?	N

#### 4.2.26 Linked to HEATHROW AIRPORT LIMITED (HAL)

Objective	
Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	N
Does the participant envisage that part of its work is performed by linked third parties <sup>52</sup>	N
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
Does the participant envisage that part of the work is performed by International Partners <sup>53</sup> (Article 14a of the General Model Grant Agreement)?	N

<sup>51</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>52</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>53</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.

#### 4.2.27 **Linked to FLUGHAFEN MÜNCHEN GMBH (MUC)**

Objective	
Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	N
Does the participant envisage that part of its work is performed by linked third parties <sup>54</sup>	N
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
Does the participant envisage that part of the work is performed by International Partners <sup>55</sup> (Article 14a of the General Model Grant Agreement)?	N

#### 4.2.28 **Linked to SCHIPHOL NEDERLAND B.V. (SNBV)**

Objective	
Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	N
Does the participant envisage that part of its work is performed by linked third parties <sup>56</sup>	N
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>54</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>55</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>56</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>57</sup> (Article 14a of the General Model Grant Agreement)?	N

#### 4.2.29 Linked to SWEDAVIA AB

Objective	
Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	N
Does the participant envisage that part of its work is performed by linked third parties <sup>58</sup>	N
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
Does the participant envisage that part of the work is performed by International Partners <sup>59</sup> (Article 14a of the General Model Grant Agreement)?	N

#### 4.2.30 Linked to FLUGHAFEN ZUERICH AG (ZRH)

Objective
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<sup>57</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>58</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>59</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.

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>60</sup>	N
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
Does the participant envisage that part of the work is performed by International Partners <sup>61</sup> (Article 14a of the General Model Grant Agreement)?	N

#### 4.2.31 Linked to THALES LAS FRANCE SAS

Objective	
Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	N
Does the participant envisage that part of its work is performed by linked third parties <sup>62</sup>	Y
THALES Deutschland GmbH will be involved as linked third party and will contribute to Pj 05 WP 02 on Multiple Remote tower surveillance. Thales Deutschland is involved in the development of a surveillance sensor in support of Multiple Remote Tower control. The contribution in Pj05 intends to ensure the consistency of technical development with the operational need.	

<sup>60</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>61</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>62</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 the use of contributions in kind provided by third parties (Articles 11 and 12 of the General Model Grant Agreement)	N
Does the participant envisage that part of the work is performed by International Partners <sup>63</sup> (Article 14a of the General Model Grant Agreement)?	N

## 5 Ethics and Security

### 5.1 Ethics

All participants of the PJ05-W2 DTT 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
- General Data Protection Regulation (EU) 2016/679 (GDPR) on the protection of individuals with regard to the processing of personal data and on the free movement of such data

PJ05-W2 Coordinator will support the process of ethical compliance. This means that PJ05-W2 Coordinator presents ethical guidelines in the following section for all PJ05-W2 DTT Remote Tower partners. The guidelines are in compliance with the ethics summary report and cover the topics Humans and Protection of personal data. The PJ05-W2 DTT is following European ethical rules and the ethical rules of the concerned country. Furthermore PJ05-W2 Coordinator will provide support for all WPs regarding ethical issues.

During project Kick-off Meeting, PJ05-W2 Coordinator will conduct an information session in order to draw attention to, and inform partners of all relevant ethical issues.

In the following sub-section the ethical guidelines are given for the self-assessment presented in the Proposal Submission Forms “Ethics issue table”. This is to provide an explanation for the necessary guidelines that have to be implemented in the WP to handle the research activities in the PJ05-W2 DTT in conduct of the ethical standards.

#### 5.1.1 Humans

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.	Examples of “informed consent form”
<b>If YES:</b> Are they volunteers for social or human sciences research?		X		
Are they persons unable to give informed consent (including children/minors)?		X		
Are they vulnerable		X		

<sup>63</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.

Section: Humans	YES	NO	Information to be provided	Documents to be provided
individuals or groups?				
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		

In PJ05-W2 DTT project, experimental studies will be conducted to achieve the required maturity for all Operational Improvements addressed by the project, and in particular to gain knowledge about human-machine interaction.

These activities will involve Air Traffic Controllers, Pilots or other operational staff of the entities participating to the project. Participants will be from the consortium, depending on the requirements for the specific validation exercise (e.g. air traffic controller licence for specific sectors or type of airspace).

### Identify/recruit participants' guideline

The general identification of participants uses the top down approach, notifying all interested people that could work as participants. Considering the project structure, the following two methods, including ethical implications, are considered:

- Approach employees as participants.** Thus the participants are normally provided by partners within the consortium, this is the standard method that will be most common for the project. The recruitment to the possible participant by the consortium partner:
  - has to be performed anonymously for the participants, e.g. by advertisements via mailing list.
  - has not to be performed by a supervisor, preferably.
  - has to be performed without pressure or the implication of negative consequences if the participants decline.
- Approach additional participants.** In case that more participants are needed, then provided by the consortium, external advertisement should be performed. Examples are emails posted in public newsgroups or magazine ads. The advertisement has to fulfil the ethical standards of the country they are present.

The recruitment of the research participants will be done by advertising the PJ05-W2 DTT validation exercises several months before the event via the staff-department of the involved partner. All staff that shows interest to become a research participant will be clearly informed about the project, validation and research goals, the methodology of anonymity and data protection, and possible adverse events. To ensure that participants are aware of the study's purpose and their rights, they will be given an information sheet and informed consent form to sign prior to the study. Based on this information, each candidate participant will be able to understand his/her role within the exercise and can make an informed decision whether or not to participate. The operational staffing department will then make sure that operational shifts are properly planned to allow for the volunteers to participate to the exercise. According to the declaration of Helsinki, subjects are free to leave any validation activities 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.

### **Informed consent procedures guideline**

Within these activities, observations, instantaneous self-assessments and interviews may be conducted in all PJ05-W2 DTT solutions. Informed consent is a legal procedure to ensure that the participants are aware of all the potential risks involved in the procedure. The elements of informed consent include informing the participant of the nature of the research and the potential risks and benefits of the research.

The ethical standards for PJ05-W2 DTT consider the following points to be necessary for a valid consent:

- The participant must be competent, and the consent should be given voluntarily.
- The participant must give their consents before the experiment.
- The participant must be informed about the purpose of the research.
- The participant must know that they can decline or withdraw from the experiment at any time.
- Participants must be exempt of any possible consequences of declining or withdrawing from the study.
- Participants must be made aware of the potential benefits of the research.
- Any limitations on confidentiality must be disclosed.
- Any incentives for participation should be clearly identified.
- The participants must be informed about the data that is obtained in connection with their participation.

The information sheet will contain the following kind of information. General Information to be included in each information sheet, regardless of the kind of validation exercise:

- A description of the project (summary of objectives and methodology).
- Purpose of the concerned validation exercise.
- The role of the volunteer participants within the trial.
- Use of interview techniques and questionnaires.
- Confidentiality aspects.
- Procedure and policy to share the results.
- How to withdraw from the activity.
- Personal Data Protection procedures including anonymization of data.
- Contact details of data protection officer (DPO)
- Contacts details of exercise leader
- Template of the informed consent sheet to be signed in a second step, if they decide to participate in the exercise.

The following document example should be used as template for the project PJ05 Remote Tower. It is to be considered as an initial approach that has to be updated in relation to each validation exercise.

<p><b>Participant Agreement Form</b></p> <p><b>SESAR 2020 Validation/Demonstration activities</b></p> <p><b>Full title of project/solution:</b></p> <p><b>Full title of validation/demonstration activity and dates:</b></p> <p><b>Name and contact details of exercise leader:</b></p>	<p>Please Initial or</p>
---	--------------------------



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 entirely voluntary. I can refrain from participating in the trial at any time, without any penalty or prejudice.		
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 without any penalty or prejudice.		
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. Any data that will be transferred will be anonymous.		
I have the right to request to have my personal data deleted at any time by contacting the Data Protection Officer (contact details to be included). I understand that retention period for all personal data related to the project is 5 years after end of the project. After this 5-year period, all personal data concerning the volunteer participants will be destroyed.		
Some picture/video could be taken during the validation and may be published in the project website for communication and dissemination purposes. I give authorization to use my image only for these purposes.		
I will not receive any compensation or incentive for having taken part in this validation exercise.		
I agree to take part in the above validation/demonstration activity.		
<hr/> <div> <div>Name of Participant</div> <div>Date</div> <div>Signature</div> </div> <hr/> <div> <div>Name of Exercise Leader</div> <div>Date</div> <div>Signature</div> </div>		

*This form should be signed and dated by all parties after the participant has received a copy of the participant information sheet and any other written information provided to the participants. The original copies of the signed and dated participant agreement form are kept with the Exercise Leader, and must be kept in a secure location. The participant will receive a copy, and they will also be made available to the SESAR JU (via the project lead beneficiary) if requested.*

### 5.1.2 Protection of Personal Data

Section: Protection of Personal Data	YES	NO	Information to be provided	Documents to be provided
Does your research involve personal data collection and/or processing?	X			
If YES: Does it involve the collection or processing of sensitive personal data (e.g. health, sexual lifestyle, ethnicity, political opinion, religious or philosophical conviction)?		X		
Does it involve processing of genetic information?		X		
Does it involve tracking or observation of participants (e.g. surveillance or localization data, and WAN data such as IP address, MACs, cookies, etc.)?		X		
Does your research involve further processing of previously collected personal data (secondary use) (including use of pre-existing data sets or sources, merging existing data sets, sharing data with non-EU member states)?		X		

All partners in the consortium confirm compliance with the General Data Protection Regulation (GDPR (EU) 2016/679) and with respective national legal framework(s). Data Protection Officers (DPO) are appointed and their contact details are made available to all data subjects involved in the research.

Personal data collected during experiments will be protected regarding article 8 – protection of personal data – of the European Charter of Fundamental Rights and the Treaty on the Functioning of the European Union. These personal data will be collected and processed fully in accordance with the General Data Protection Regulation (GDPR (EU) 2016/679).

#### Data Security Guideline

Due to the numerous validation exercises performed within PJ05-W2 DTT a set of requirement for collection, storage, protection, retention and destruction are defined. The following personal data will be collected and processed by the Exercise Leader for each validation exercise research participant:

Name and surname, Type of ATC-licenses, corporate email address and corporate telephone number.

This data will solely be used for the purpose and in the context of the PJ05-W2 DTT validation exercises and will not be shared with any other party. The Exercise Leaders will record this information into a document to which only they have access. They will assign a unique identifier (e.g. participant John Smith has number 10) to each individual participant. This unique number will be used for all the information collected during the validation exercises execution, i.e. the on-line

questionnaires during the exercise runs, post-run questionnaires and feedback given during debriefing sessions and interviews with individual participants.

After the initial post-processing of the collected data, the mapping between the personal details of the research participants and their unique identifier will be destroyed, thus ensuring the anonymization of all data collected from the research participants during a validation exercise. Only this anonymized data will be used in the validation reports and any other documents of the work package. In particular, only anonymized data will be transferred between beneficiaries. The names of the research participants and their non-sensitive, corporate contact details will be kept for the retention period of 5 years after the end of the project, and will be destroyed right afterwards.

The Exercise Leaders will take appropriate technical and organisational measures to ensure that the personal data will be stored in a secure place with a controlled access, thus preventing unauthorised access and protecting the personal data against any potential data protection breaches. In this task, they will be supported by the DPO of the respective beneficiary organisations in order to ensure that the treatment of personal data will be done in accordance with EU regulation 2016/679.

This section provides requirements for all validation exercise to fulfil and therefore implement a data security concept. If a validation cannot fulfil this requirement the validation leader have to request a requirement update.

DLR's data security guidelines propose that the following items should be addressed in a data security concept:

ID	Requirement Name	Requirement Description	Expected Document
D4.2 - 4.4 - 010	Validation objectives	The validation objective and the connection to the captured data have to be stated clearly.	VALP
D4.2 - 4.4 - 020	Data elements and Data category	All types of data have to be classified. The following information per data type have to be provided: <ul style="list-style-type: none"> <li>• Needed why</li> <li>• Connection to personal data</li> <li>• The source of data</li> <li>• Category of data</li> <li>• Consortium partner that stores and accesses the data</li> <li>• Period of time data is needed</li> <li>• After project usage of data</li> </ul>	VALP
D4.2 - 4.4 - 030	Involved personnel groups	The personal groups that help to create, have access, and delete the data, have to be defined.	VALP
D4.2 - 4.4 - 040	Description of the data generation process	The process of how the data is acquired has to be described in detail.	VALP
D4.2 - 4.4 - 050	Data security measures with respect to Anonymization / pseudonymization	The measures to anonymization have to be described in detail.	VALP
D4.2 - 4.4 - 051	Data security measures with respect to Agreement of involved persons	The requirement D4.1 - 2.2 and D4.1 - 2.3 concerning the information of consent have to be implemented.	
D4.2 - 4.4 - 052	Data security measures with respect to Publication	Only derived data and no individual performances may be published anonymously.	

### 5.1.3 Other Ethics Issues

As proposed by the ethics summary report the project was checked against the applicability of the Ethics guidelines for trustworthy AI developed by the High-Level Expert Group on AI (issued by the EC on 8 April 2019). As the methods used within PJ05-W2 DTT are machine learning algorithms we updated the wording and replaced AI with the more precise term. It has to be taken also in consideration that the machine learning algorithms are used to generate an assistant system that the participants could decide to ignore or use as less as required. Nevertheless, the check against the three principles of Respect for human autonomy; Prevention of harm; and Fairness was conducted and resulted into the conclusion that these are not applicable to PJ05-W2 DTT. The principle of explicability is necessary and will be considered during the experiments as the machine learning algorithms are used to train assistance systems, and the participants need to be informed about the behaviour of the system in order to raise their acceptance of the system. This is also part of the necessary guidelines that have to be implemented in the WP with machine learning to handle the research activities in the PJ05-W2 DTT in conduct of the ethical standards. In order to satisfy the the two requirements “Technical robustness” and “Transparency”, which are applicable to PJ05-

W2 DTT, the guidelines demand flow of information from the technical WP developing the machine learning to the WP conducting the experiments. For both requirements information material will be provided to the experimenter, in order to get the participants to interact with the system.

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<sup>64</sup>

Section: Security	YES	NO	Information to be provided	Documents to be provided
Are activities planned or results expected raising security issues?		X	n.a.	n.a.
Are 'EU-classified information' as background or results foreseen?		X		

<sup>64</sup> Article 37.1 of the Model Grant Agreement: *Before disclosing results of activities raising security issues to a third party (including affiliated entities), a beneficiary must inform the coordinator — which must request written approval from the Commission/Agency. Article 37.2: Activities related to 'classified deliverables' must comply with the 'security requirements' until they are declassified. Action tasks related to classified deliverables may not be subcontracted without prior explicit written approval from the Commission/Agency. The beneficiaries must inform the coordinator — which must immediately inform the Commission/Agency — of any changes in the security context and — if necessary — request for Annex 1 to be amended (see Article 55).*

## 6 Abbreviations

This list extends the list given in the Call documents].

AI	Artificial Intelligence
ATS	Air Traffic Services
ATCO	Air Traffic Controller
ATM	Air Traffic Management
CWP	Controller Working Position
EC	European Commission
EPMB	Extended Project Management Board
ER	Exploratory Research
EU	European Union
H2020	HORIZON 2020 (research and innovation programme of the EU, 2014-2020)
HMI	Human Machine Interface
IP	Internet Protocol
IR	Industrial Research project
MAWP	Multi Annual Work Programme [2]
PCIL	Project Content Integration Lead
PCIT	Project Content Integration Team
PEG	Programme Execution Guidance [4]
PJ00-W2	Project No. 00 described in [2] corresponds to the Topic of the call
PJ00-W2-01	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
RPAS	Remotely Piloted Aircraft System
RTC	Remote Tower Centre
MRTM	Multiple Remote Tower Module
SJU	SESAR Joint Undertaking
SL	Solution Leader
TA	Transversal Action
VFR	Visual Flight Rule
VLD	Very Large Demonstration
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	<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	
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													
<i>[A.6 Personnel for providing access to research infrastructure]</i>						<i>[D.4 Costs of large research infrastructure]</i>											
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	<i>[e]</i>	f	Total g	h = 0,25 x (a +b+c+f+g + <i>[i1]</i> <sup>13</sup> + <i>[i2]</i> <sup>13</sup> -n)	j = a+b+c+d + <i>[e]</i> +f+g+h + <i>[i1]</i> + <i>[i2]</i>	k	l	m	n	Yes/No		
1. DLR (AT-One)	494 823.00	0.00	0.00	0.00	0.00	0.00	88 000.20	0.00	145 705.80	728 529.00	70.00	509 970.30	329 091.51	0.00	No	n/a	
2. NLR (AT-One)	64 429.00	0.00	0.00	0.00	0.00	0.00	12 000.00	15 000.00	22 857.25	114 286.25	70.00	80 000.38	51 625.46	0.00	No	n/a	
3. ANS CR (B4)	80 400.00	0.00	0.00	0.00	0.00	0.00	15 000.00	0.00	23 850.00	119 250.00	70.00	83 475.00	53 867.69	0.00	No	n/a	
- Integra	129 600.00	0.00	0.00	0.00	0.00	0.00	15 000.00	0.00	36 150.00	180 750.00	70.00	126 525.00	81 648.51	0.00	No	n/a	
Total beneficiary	210 000.00	0.00	0.00	0.00	0.00	0.00	30 000.00	0.00	60 000.00	300 000.00		210 000.00	135 516.20	n/a	n/a	0.00	
4. 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	
5. ON (B4)	278 300.00	0.00	0.00	0.00	0.00	0.00	41 700.00	0.00	80 000.00	400 000.00	70.00	280 000.00	180 688.27	0.00	No	n/a	
6. PANSa (B4)	182 675.00	0.00	0.00	0.00	0.00	0.00	63 808.00	0.00	61 620.75	308 103.75	70.00	215 672.63	139 176.84	0.00	No	n/a	
7. ACG/ COOPANS	115 470.00	0.00	0.00	0.00	121 338.50	0.00	27 591.90	0.00	35 765.48	300 165.88	70.00	210 116.12	135 591.13	0.00	No	n/a	
8. CCL/COOPANS	36 600.00	0.00	0.00	0.00	0.00	0.00	35 400.00	0.00	18 000.00	90 000.00	70.00	63 000.00	40 654.86	0.00	No	n/a	
9. 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	
10. LFV/ COOPANS	440 160.00	0.00	0.00	0.00	0.00	0.00	103 568.00	0.00	135 932.00	679 660.00	70.00	475 762.00	307 016.47	0.00	No	n/a	
11. Naviair/ COOPANS	60 000.00	0.00	0.00	0.00	0.00	0.00	12 000.00	0.00	18 000.00	90 000.00	70.00	63 000.00	40 654.86	0.00	No	n/a	
12. DFS	691 518.00	0.00	0.00	0.00	0.00	0.00	21 600.00	0.00	178 279.50	891 397.50	70.00	623 978.25	402 662.68	0.00	No	n/a	
13. ENAIRE	120 000.00	0.00	0.00	0.00	0.00	0.00	8 000.00	0.00	32 000.00	160 000.00	70.00	112 000.00	72 275.31	0.00	No	n/a	
- CRIDA	260 000.00	0.00	0.00	0.00	0.00	0.00	28 000.00	0.00	72 000.00	360 000.00	70.00	252 000.00	162 619.44	0.00	No	n/a	
Total beneficiary	380 000.00	0.00			0.00	0.00	36 000.00	0.00	104 000.00	520 000.00		364 000.00	234 894.75	n/a	n/a	0.00	
14. ENAV	266 399.88	0.00	0.00	0.00	0.00	0.00	29 600.32	0.00	74 000.05	370 000.25	70.00	259 000.18	167 136.76	0.00	No	n/a	
- UNIBO	216 000.00	0.00	0.00	0.00	0.00	0.00	24 000.00	0.00	60 000.00	300 000.00	70.00	210 000.00	135 516.20	0.00	No	n/a	
- NAIS	57 600.00	0.00	0.00	0.00	0.00	0.00	6 400.00	0.00	16 000.00	80 000.00	70.00	56 000.00	36 137.65	0.00	No	n/a	
- DEEP BLUE	72 000.00	0.00	0.00	0.00	0.00	0.00	8 000.00	0.00	20 000.00	100 000.00	70.00	70 000.00	45 172.07	0.00	No	n/a	
- IDS AIRNAV	77 829.12	0.00	0.00	0.00	0.00	0.00	8 647.68	0.00	21 619.20	108 096.00	70.00	75 667.20	48 829.20	0.00	No	n/a	
- BIP	108 000.00	0.00	0.00	0.00	0.00	0.00	12 000.00	0.00	30 000.00	150 000.00	70.00	105 000.00	67 758.10	0.00	No	n/a	
- TECHNO SKY	252 000.00	0.00	0.00	0.00	0.00	0.00	28 000.00	0.00	70 000.00	350 000.00	70.00	245 000.00	158 102.24	0.00	No	n/a	
Total beneficiary	1 049 829.00	0.00	0.00	0.00	0.00	0.00	116 648.00	0.00	291 619.25	1 458 096.25		1 020 667.38	658 652.22	n/a	n/a	0.00	
15. 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	3 843 446.25	
16. 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	
17. FRQ (FSP)	532 993.00	0.00	0.00	0.00	215 000.00	0.00	121 500.00	0.00	163 623.25	1 033 116.25	70.00	723 181.38	466 679.97	0.00	No	n/a	
- FCO	142 282.00	0.00	0.00	0.00	0.00	0.00	27 000.00	0.00	42 320.50	211 602.50	70.00	148 121.75	95 585.22	0.00	No	n/a	
Total beneficiary	675 275.00	0.00			215 000.00	0.00	148 500.00	0.00	205 943.75	1 244 718.75		871 303.13	562 265.19	n/a	n/a	0.00	



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 x (a +b+c+f+g + <i>[i1]</i> <sup>13</sup> + <i>[i2]</i> <sup>13</sup> -n)	j = a+b+c+d + <i>[e]</i> +f+g+h + <i>[i1]</i> + <i>[i2]</i>	k	l	m	n	Yes/No	
18. HC (FSP)	54 329.00	0.00	0.00	0.00	0.00	0.00	261 033.00	0.00	78 840.50	394 202.50	70.00	275 941.75	178 069.41	0.00	No	n/a
19. INDRA	467 746.00	0.00	0.00	0.00	0.00	0.00	24 618.00	0.00	123 091.00	615 455.00	70.00	430 818.50	278 013.74	0.00	No	n/a
- INDRA NAVIA	1 574 421.00	0.00	0.00	0.00	0.00	0.00	82 864.00	0.00	414 321.25	2 071 606.25	70.00	1 450 124.38	935 787.37	0.00	No	n/a
- AVINOR	19 000.00	0.00	0.00	0.00	0.00	0.00	1 000.00	0.00	5 000.00	25 000.00	70.00	17 500.00	11 293.02	0.00	No	n/a
Total beneficiary	2 061 167.00	0.00			0.00	0.00	108 482.00	0.00	542 412.25	2 712 061.25		1 898 442.88	1 225 094.13	n/a	n/a	0.00
20. LDO	1 187 966.00	0.00	0.00	0.00	240 000.00	0.00	197 138.00	0.00	346 276.00	1 971 380.00	70.00	1 379 966.00	890 513.09	0.00	No	n/a
21. AIRTEL (NATMIG) <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
22. SAAB (NATMIG)	363 713.00	0.00	0.00	0.00	65 000.00	0.00	230 000.00	0.00	148 428.25	807 141.25	70.00	564 998.88	364 602.39	0.00	No	n/a
- Saab Kockums	35 000.00	0.00	0.00	0.00	0.00	0.00	5 000.00	0.00	10 000.00	50 000.00	70.00	35 000.00	22 586.03	0.00	No	n/a
Total beneficiary	398 713.00	0.00			65 000.00	0.00	235 000.00	0.00	158 428.25	857 141.25		599 998.88	387 188.42	n/a	n/a	0.00
23. SINTEF (NATMIG)	0.00	217 682.00	0.00	0.00	0.00	0.00	21 000.00	0.00	59 670.50	298 352.50	70.00	208 846.75	134 771.99	0.00	No	n/a
24. ADP (SEAC2020) <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. AVINOR-SEAC2020 <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. HAL (SEAC2020) <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. MUC (SEAC2020) <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. SNBV (SEAC2020) <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. SWED(SEAC2020) <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	18 750.00
30. ZRH (SEAC2020) <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
31. THALES AIR SYS	17 209.89	0.00	0.00	0.00	0.00	0.00	688.40	0.00	4 474.57	22 372.86	70.00	15 661.00	10 106.28	0.00	No	n/a
- THALES-DE	161 816.00	0.00	0.00	0.00	0.00	0.00	26 000.00	0.00	46 954.00	234 770.00	70.00	164 339.00	106 050.46	0.00	No	n/a
Total beneficiary	179 025.89	0.00			0.00	0.00	26 688.40	0.00	51 428.57	257 142.86		180 000.00	116 156.74	n/a	n/a	0.00
Total consortium	8 560 279.89	217 682.00		0.00	641 338.50	0.00	1 586 157.50	15 000.00	2 594 779.85	13 615 237.74		9 530 666.45	6 150 284.22			3 862 196.25

<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.

ESTIMATED BUDGET FOR THE ACTION

<sup>6</sup> See Article 5 for the forms of costs.

<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

**STICHTING NATIONAAL LUCHT- EN RUIMTEVAARTLABORATORIUM (NLR (AT-One))**, 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 ('2')**

**in Grant Agreement No 874470 ('the Agreement')**

**between** DEUTSCHES ZENTRUM FUER LUFT - UND RAUMFAHRT EV **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

**for the action entitled** 'PJ05-W2 Digital Technologies for Tower (PJ05-W2 DTT)'.

**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, Czechia, VAT number: CZ699004742, ('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** 874470 ('the Agreement')

**between** DEUTSCHES ZENTRUM FUER LUFT - UND RAUMFAHRT EV **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

**for the action entitled** 'PJ05-W2 Digital Technologies for Tower (PJ05-W2 DTT)'.

**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 ('4')**

**in Grant Agreement No 874470 ('the Agreement')**

**between** DEUTSCHES ZENTRUM FUER LUFT - UND RAUMFAHRT EV **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

**for the action entitled** 'PJ05-W2 Digital Technologies for Tower (PJ05-W2 DTT)'.

**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 RODUNIOS KEL 2, VILNIAUS 02188, Lithuania, VAT number: LT100604610, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

**hereby agrees**

**to become beneficiary** No ('5')

**in Grant Agreement No** 874470 ('the Agreement')

**between** DEUTSCHES ZENTRUM FUER LUFT - UND RAUMFAHRT EV **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

**for the action entitled** 'PJ05-W2 Digital Technologies for Tower (PJ05-W2 DTT)'.

**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 ('6')

**in Grant Agreement No** 874470 ('the Agreement')

**between** DEUTSCHES ZENTRUM FUER LUFT - UND RAUMFAHRT EV **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

**for the action entitled** 'PJ05-W2 Digital Technologies for Tower (PJ05-W2 DTT)'.

**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 FÜR 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 ('7')**

**in Grant Agreement No 874470 ('the Agreement')**

**between DEUTSCHES ZENTRUM FÜR LUFT - UND RAUMFAHRT EV and the Single European Sky ATM Research Joint Undertaking ('the JU'),**

**for the action entitled 'PJ05-W2 Digital Technologies for Tower (PJ05-W2 DTT)'.**

**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 ('8')**

**in Grant Agreement No 874470 ('the Agreement')**

**between** DEUTSCHES ZENTRUM FUER LUFT - UND RAUMFAHRT EV **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

**for the action entitled** 'PJ05-W2 Digital Technologies for Tower (PJ05-W2 DTT)'.

**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 ('9')**

**in Grant Agreement No 874470 ('the Agreement')**

**between** DEUTSCHES ZENTRUM FUER LUFT - UND RAUMFAHRT EV **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

**for the action entitled** 'PJ05-W2 Digital Technologies for Tower (PJ05-W2 DTT)'.

**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 ('10')

**in Grant Agreement No** 874470 ('the Agreement')

**between** DEUTSCHES ZENTRUM FUER LUFT - UND RAUMFAHRT EV **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

**for the action entitled** 'PJ05-W2 Digital Technologies for Tower (PJ05-W2 DTT)'.

**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 ('11')

**in Grant Agreement No** 874470 ('the Agreement')

**between** DEUTSCHES ZENTRUM FUER LUFT - UND RAUMFAHRT EV **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

**for the action entitled** 'PJ05-W2 Digital Technologies for Tower (PJ05-W2 DTT)'.

**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 ('12')

**in Grant Agreement No** 874470 ('the Agreement')

**between** DEUTSCHES ZENTRUM FUER LUFT - UND RAUMFAHRT EV **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

**for the action entitled** 'PJ05-W2 Digital Technologies for Tower (PJ05-W2 DTT)'.

**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 ('13')

**in Grant Agreement** No 874470 ('the Agreement')

**between** DEUTSCHES ZENTRUM FUER LUFT - UND RAUMFAHRT EV **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

**for the action entitled** 'PJ05-W2 Digital Technologies for Tower (PJ05-W2 DTT)'.

**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 ('14')

**in Grant Agreement No** 874470 ('the Agreement')

**between** DEUTSCHES ZENTRUM FUER LUFT - UND RAUMFAHRT EV **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

**for the action entitled** 'PJ05-W2 Digital Technologies for Tower (PJ05-W2 DTT)'.

**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 ('15')

**in Grant Agreement No** 874470 ('the Agreement')

**between** DEUTSCHES ZENTRUM FUER LUFT - UND RAUMFAHRT EV **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

**for the action entitled** 'PJ05-W2 Digital Technologies for Tower (PJ05-W2 DTT)'.

**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 ('16')

**in Grant Agreement No** 874470 ('the Agreement')

**between** DEUTSCHES ZENTRUM FUER LUFT - UND RAUMFAHRT EV **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

**for the action entitled** 'PJ05-W2 Digital Technologies for Tower (PJ05-W2 DTT)'.

**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 ('17')

**in Grant Agreement No** 874470 ('the Agreement')

**between** DEUTSCHES ZENTRUM FUER LUFT - UND RAUMFAHRT EV **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

**for the action entitled** 'PJ05-W2 Digital Technologies for Tower (PJ05-W2 DTT)'.

**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 ('18')**

**in Grant Agreement No 874470 ('the Agreement')**

**between DEUTSCHES ZENTRUM FUER LUFT - UND RAUMFAHRT EV and the Single European Sky ATM Research Joint Undertaking ('the JU'),**

**for the action entitled 'PJ05-W2 Digital Technologies for Tower (PJ05-W2 DTT)'.**

**and mandates**

**the coordinator** to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

## ANNEX 3

### ACCESSION FORM FOR BENEFICIARIES

**INDRA SISTEMAS SA (INDRA)**, established in AVENIDA DE BRUSELAS 35, ALCOBENDAS MADRID 28108, Spain, VAT number: ESA28599033, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

**hereby agrees**

**to become beneficiary** No ('19')

**in Grant Agreement No** 874470 ('the Agreement')

**between** DEUTSCHES ZENTRUM FUER LUFT - UND RAUMFAHRT EV **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

**for the action entitled** 'PJ05-W2 Digital Technologies for Tower (PJ05-W2 DTT)'.

**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 (LDO)**, 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 ('20')

**in Grant Agreement No** 874470 ('the Agreement')

**between** DEUTSCHES ZENTRUM FUER LUFT - UND RAUMFAHRT EV **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

**for the action entitled** 'PJ05-W2 Digital Technologies for Tower (PJ05-W2 DTT)'.

**and mandates**

**the coordinator** to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

## ANNEX 3

### ACCESSION FORM FOR BENEFICIARIES

**AIRTEL ATN LIMITED (AIRTEL (NATMIG))**, 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 ('21')

**in Grant Agreement No** 874470 ('the Agreement')

**between** DEUTSCHES ZENTRUM FUER LUFT - UND RAUMFAHRT EV **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

**for the action entitled** 'PJ05-W2 Digital Technologies for Tower (PJ05-W2 DTT)'.

**and mandates**

**the coordinator** to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary



## ANNEX 3

### ACCESSION FORM FOR BENEFICIARIES

**SAAB AKTIEBOLAG (SAAB (NATMIG))**, 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 ('22')

**in Grant Agreement No** 874470 ('the Agreement')

**between** DEUTSCHES ZENTRUM FUER LUFT - UND RAUMFAHRT EV **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

**for the action entitled** 'PJ05-W2 Digital Technologies for Tower (PJ05-W2 DTT)'.

**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 (NATMIG))**, 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 ('23')

**in Grant Agreement No** 874470 ('the Agreement')

**between** DEUTSCHES ZENTRUM FUER LUFT - UND RAUMFAHRT EV **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

**for the action entitled** 'PJ05-W2 Digital Technologies for Tower (PJ05-W2 DTT)'.

**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

**AEROPORTS DE PARIS SA (ADP (SEAC2020))**, established in 1 RUE DE FRANCE, TREMBLAY-EN-FRANCE 93290, France, VAT number: FR33552016628, ('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** 874470 ('the Agreement')

**between** DEUTSCHES ZENTRUM FUER LUFT - UND RAUMFAHRT EV **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

**for the action entitled** 'PJ05-W2 Digital Technologies for Tower (PJ05-W2 DTT)'.

**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

**AVINOR AS (AVINOR-SEAC2020)**, established in DRONNING EUFEMIAS GATE 6, OSLO 2061, Norway, ('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** 874470 ('the Agreement')

**between** DEUTSCHES ZENTRUM FUER LUFT - UND RAUMFAHRT EV **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

**for the action entitled** 'PJ05-W2 Digital Technologies for Tower (PJ05-W2 DTT)'.

**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

**HEATHROW AIRPORT LIMITED (HAL (SEAC2020))**, established in NELSON ROAD THE COMPASS CENTRE HOUNSLOW, LONDON TW6 2GW, United Kingdom, VAT number: GB927365404, ('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 874470 ('the Agreement')**

**between DEUTSCHES ZENTRUM FUER LUFT - UND RAUMFAHRT EV and the Single European Sky ATM Research Joint Undertaking ('the JU'),**

**for the action entitled 'PJ05-W2 Digital Technologies for Tower (PJ05-W2 DTT)'.**

**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

**FLUGHAFEN MUNCHEN GMBH (MUC (SEAC2020))**, established in NORDALLEE 25, MUNCHEN 85326, Germany, VAT number: DE129352365, ('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** 874470 ('the Agreement')

**between** DEUTSCHES ZENTRUM FUER LUFT - UND RAUMFAHRT EV **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

**for the action entitled** 'PJ05-W2 Digital Technologies for Tower (PJ05-W2 DTT)'.

**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

**SCHIPHOL NEDERLAND B.V. (SNBV (SEAC2020))**, established in EVERT VAN DE BEEKSTRAAT 202, LUCHTHAVEN SCHIPHOL 1118CP, Netherlands, VAT number: NL810336406B01, ('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 874470 ('the Agreement')

**between** DEUTSCHES ZENTRUM FUER LUFT - UND RAUMFAHRT EV **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

**for the action entitled** 'PJ05-W2 Digital Technologies for Tower (PJ05-W2 DTT)'.

**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

**SWEDAVIA AB (SWED(SEAC2020))**, established in SWEDAVIA, STOCKHOLM ARLANDA 190 45, Sweden, VAT number: SE556797081801, ('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** 874470 ('the Agreement')

**between** DEUTSCHES ZENTRUM FUER LUFT - UND RAUMFAHRT EV **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

**for the action entitled** 'PJ05-W2 Digital Technologies for Tower (PJ05-W2 DTT)'.

**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

**FLUGHAFEN ZURICH AG (ZRH (SEAC2020))**, established in FLUGHAFEN KLOTEN, ZURICH 8058, Switzerland, VAT number: CHE101921104MWST, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

**hereby agrees**

**to become beneficiary** No ('30')

**in Grant Agreement No** 874470 ('the Agreement')

**between** DEUTSCHES ZENTRUM FUER LUFT - UND RAUMFAHRT EV **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

**for the action entitled** 'PJ05-W2 Digital Technologies for Tower (PJ05-W2 DTT)'.

**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 ('31')

**in Grant Agreement No** 874470 ('the Agreement')

**between** DEUTSCHES ZENTRUM FUER LUFT - UND RAUMFAHRT EV **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

**for the action entitled** 'PJ05-W2 Digital Technologies for Tower (PJ05-W2 DTT)'.

**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

**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 3 **RIZENI LETOVEHO PROVOZU CESKE REPUBLIKY STATNI PODNIK (ANS CR (B4))**, established in JENEC NAVIGACNI 787, JENEC 252 61, Czechia, 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 874470 (PJ05-W2 DTT), 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 13 **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 874470 (PJ05-W2 DTT), 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**

**TECHNO SKY S.R.L. (TECHNO SKY)**, established in VIA DEL CASALE CAVALLARI 200, ROMA 00156, Italy, VAT number: IT08428031002, ('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 14 **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 874470 (PJ05-W2 DTT), 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**

**ALMA MATER STUDIORUM - UNIVERSITA DI BOLOGNA (UNIBO)**, established in VIA ZAMBONI 33, BOLOGNA 40126, Italy, VAT number: IT01131710376, ('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 14 **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 874470 (PJ05-W2 DTT), 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**

**INDRA NAVIA AS (INDRA NAVIA)**, established in HAGALOKKVEIEN 26, ASKER 1383, Norway, VAT number: NO914785200MVA, ('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 19 **INDRA SISTEMAS SA (INDRA)**, established in AVENIDA DE BRUSELAS 35, ALCOBENDAS MADRID 28108, Spain, VAT number: ESA28599033, ('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 874470 (PJ05-W2 DTT), 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**

**THALES DEUTSCHLAND GMBH (THALES-DE)**, established in THALESPLATZ 1, DITZINGEN 71254, Germany, VAT number: DE812331104, ('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 31 **THALES LAS FRANCE SAS (THALES AIR SYS)**, established in AVENUE GAY LUSSAC 2, ELANCOURT 78990, France, VAT number: FR15319159877, ('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 874470 (PJ05-W2 DTT), 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.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;

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<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(2019)7261330 - 25/11/2019

[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>	<p>7) The amount of additional remuneration paid corresponded to the Beneficiary's usual remuneration practices and was consistently paid whenever the same kind of work or expertise was required.</p>	
		<p>8) The criteria used to calculate the additional remuneration were objective and generally applied by the Beneficiary regardless of the source of funding used.</p>	
		<p>9) The amount of additional remuneration included in the personnel costs charged to the action was capped at EUR 8,000 per FTE/year (up to the equivalent pro-rata amount if the person did not work on the action full-time during the year or did not work exclusively on the action).</p>	
	<p><i>Additional procedures in case "unit costs calculated by the Beneficiary in accordance with its usual cost accounting practices" is applied:</i></p> <p>Apart from carrying out the procedures indicated above to confirm standard factual findings 1-5 and, if applicable, also 6-9, the Auditor carried out following procedures to confirm standard</p>	<p>10) The personnel costs included in the Financial Statement were calculated in accordance with the Beneficiary's usual cost accounting practice. This methodology was consistently</p>	

Ref	Procedures	Standard factual finding	Result (C / E / N.A.)
	<p>factual findings 10-13 listed in the next column:</p> <ul style="list-style-type: none"> <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>	<p>activities irrespective of the source of funding.</p> <p><i>For option I concerning unit costs and if the Beneficiary applies a methodology not approved by the Commission:</i></p> <p>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.	
	<p><i>ONLY THE HOURS WORKED ON THE ACTION CAN BE CHARGED. ALL WORKING TIME TO BE CHARGED SHOULD BE RECORDED THROUGHOUT THE DURATION OF THE PROJECT, ADEQUATELY SUPPORTED BY EVIDENCE OF THEIR REALITY AND RELIABILITY (SEE SPECIFIC PROVISIONS BELOW FOR PERSONS WORKING EXCLUSIVELY FOR THE ACTION WITHOUT TIME RECORDS).</i></p> <p><u>If the persons are working exclusively for the action and without time records</u></p> <p>For the persons selected that worked exclusively for the action without time records, the Auditor verified evidence available demonstrating that they were in reality exclusively dedicated to the action and that the Beneficiary signed a declaration confirming that they have worked exclusively for the action.</p>	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>i. 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>ii. if the Beneficiary did not fall under the above-mentioned category the Auditor verified that the Beneficiary followed their usual procurement rules and respected the Terms and Conditions of the Agreement..</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.)
	<p>For the items included in the sample the Auditor also verified that:</p> <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	

<b>D</b>	<b>OTHER ACTUAL DIRECT COSTS</b>		
<b>D.1</b>	<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.	
<b>D.2</b>	<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>	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.	
		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.	
		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>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>o 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>o 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>o</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]

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<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>

<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>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>



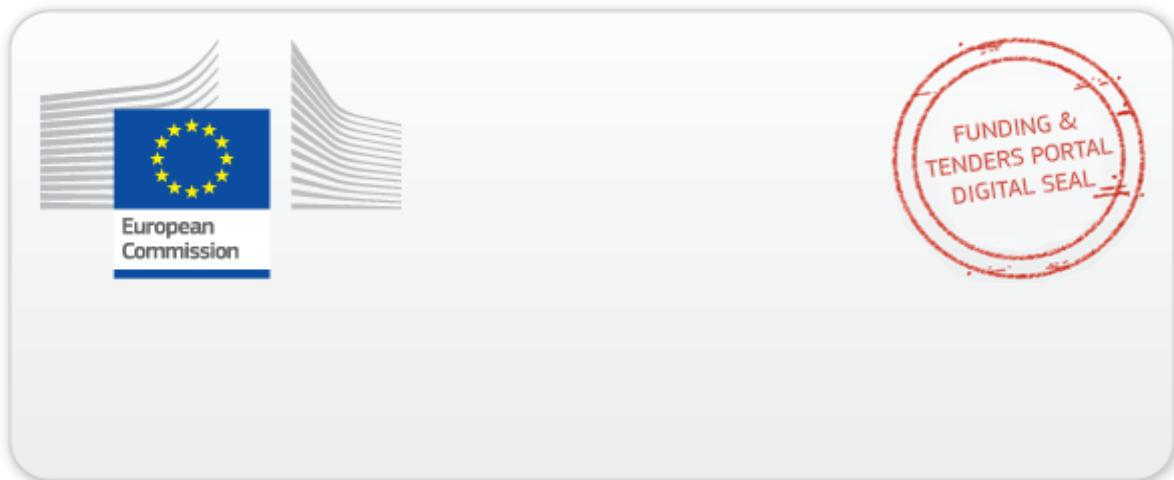
<i>Please explain any discrepancies in the body of the Report.</i>	
Statements to be made by Beneficiary	Procedures to be carried out and Findings to be confirmed by the Auditor
<p>arrangements in place to record their working time;</p> <p>XXVI. Records of time worked have been signed by the person concerned (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>	
<b>Statements to be made by Beneficiary</b>	<b>Procedures to be carried out and Findings to be confirmed by the Auditor</b>
	<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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