GRANT AGREEMENT

FOR MEMBERS [2] NUMBER — 730195 — PJ05 Remote Tower

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

on the one part,

The Single European Sky ATM (Air Trafic Management) Research Joint Undertaking ('the JU'), a joint undertaking within the meaning of Article 187 of the Treaty on the Functioning of the European Union[1], set-up by Council Regulation (EC) No 219/2007 of 27 February 2007 on the establishment of a Joint Undertaking to develop the new generation European air traffic management system[2], as amended by Council Regulation (EC) No 1361/2008 of 16 December 2008[3] and by Council Regulation (EU) No 721/2014 of 16 June 2014[4]

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

and

on the other part,

1. 'the coordinator ':

DEUTSCHES ZENTRUM FUER LUFT - UND RAUMFAHRT EV (DLR (AT-One)) EV, VR2780, established in Linder Hoehe, KOELN 51147, Germany, DE121965658 represented for the purposes of signing the Agreement by Contract Administrator, 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))** NL6, 41150373, established in Anthony Fokkerweg 2, AMSTERDAM 1059CM, Netherlands, NL002760551B01

3. **RIZENI LETOVEHO PROVOZU CESKE REPUBLIKY STATNI PODNIK (ANS CR (B4))** SP, 49710371, established in Navigacni 787, Jenec 25261, Czech Republic, CZ49710371

4. **LETOVE PREVADZKOVE SLUZBY SLOVENSKEJ REPUBLIKY, STATNY PODNIK (LPS SR (B4))** SK9, 35778458, established in IVANSKA CESTA 93, BRATISLAVA 823 07, Slovakia, SK2020244699

5. **VALSTYBES IMONE ORO NAVIGACIJA (ON (B4))** LT7, 210060460, established in RODUNIOS KEL 2, VILNIAUS 02188, Lithuania, LT100604610

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

1 OJ C 326, 26.10.2012, p. 47–390.

2 OJ L 64, 2.3.2007, p. 1–11.

3 OJ L 352, 31.12.2008, p. 12–17.

4 OJ L 192, 1.7.2014, p. 1–8.

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

7. **AUSTRO CONTROL OSTERREICHISCHE GESELLSCHAFT FUR ZIVILLUFTFAHRT MBH (ACG/COOPANS)** GMBH, FN71000M, established in WAGRAMER STRASSE 19, WIEN 1220, Austria, ATU37259408

8. **CROATIA CONTROL, CROATIAN AIR NAVIGATION SERVICES LTD (CCL/ COOPANS)** DOO, 080328617, established in RUDOLFA FIZIRA 2, VELIKA GORICA 10410, Croatia, HR33052761319

9. **UDARAS EITLIOCHTA NA HEIREANN THE IRISH AVIATION AUTHORITY (IAA/ COOPANS)** LTD, 211082, established in D'OLIER STREET 11-12 THE TIMES BUILDING, DUBLIN D02 T449, Ireland, IE8211082B

10. **LUFTFARTSVERKET (LFV/COOPANS)**, 2021000795, established in HOSPITALSGATAN 30, NORRKOPING 602 27, Sweden, SE202100079501

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

12. **DFS DEUTSCHE FLUGSICHERUNG GMBH (DFS)** GMBH, HRB34977, established in AM DFS CAMPUS 10, LANGEN 63225, Germany, DE114110232

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

14. **FREQUENTIS AG (FRQ (FSP))** AG, FN72115B, established in Innovationsstrasse 1, WIEN 1100, Austria, ATU14715600

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

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

17. **INDRA SISTEMAS SA (INDRA)** SA, M11339, established in AVENIDA DE BRUSELAS 35, ALCOBENDAS MADRID 28108, Spain, ESA28599033

18. **AIRTEL ATN LIMITED (AIRTEL (NATMIG))** LTD, 287698, established in 2 HARBOUR SQUARE CROFTON ROAD, DUN LOAGHAIRE DUBLIN A96D6R0, Ireland, IE8287698U

19. **SAAB AKTIEBOLAG (SAAB (NATMIG))** AB, 5560360793, established in ., LINKOPING 58188, Sweden, SE556036079301

20. **STIFTELSEN SINTEF (SINTEF (NATMIG))** NO1, 948007029, established in STRINDVEIEN 4, TRONDHEIM 7034, Norway, NO948007029MVA

21. ***EUROCONTROL - EUROPEAN ORGANISATION FOR THE SAFETY OF AIR NAVIGATION (EUROCONTROL)****, N/A, established in Rue de la Fusée 96, BRUXELLES 1130, Belgium, not applicable* as 'beneficiary not receiving JU funding' (see Article 9),

22. **AEROPORTS DE PARIS (ADP (SEAC2020))** FR39, 552016628, established in BOULEVARD RASPAIL 291, PARIS 75014, France, FR33552016628

23. **FLUGHAFEN MUNCHEN GMBH (MUC (SEAC2020))** GMBH, HRB5448, established in NORDALLEE 25, MUNCHEN 85326, Germany, DE129352365

24. **FLUGHAFEN ZURICH AG (ZRH (SEAC2020))** AG, CHE101921104, established in FLUGHAFEN KLOTEN, ZURICH 8058, Switzerland, CHE101921104MWST

25. **HEATHROW AIRPORT LIMITED (HAL (SEAC2020))** LTD, 1991017, established in NELSON ROAD THE COMPASS CENTRE HOUNSLOW, LONDON TW6 2GW, United Kingdom, GB927365404

26. **SCHIPHOL NEDERLAND B.V. (SNBV (SEAC2020))** BV, 34166584, established in EVERT VAN DE BEEKSTRAAT 202, LUCHTHAVEN SCHIPHOL 1118CP, Netherlands, NL810336406B01

27. **SWEDAVIA AB (Swed(SEAC2020))** AB, 5567970818, established in SWEDAVIA, STOCKHOLM ARLANDA 190 45, Sweden, SE556797081801

28. **AVINOR AS (AVINOR-SEAC2020)** AS, 985198292, established in DRONNING EUFEMIAS GATE 6, OSLO 2061, Norway

29. **LEONARDO - FINMECCANICA SPA (FINMECCANICA)** SPA, 7031/CF00401990585, established in PIAZZA MONTE GRAPPA 4, ROMA 00195, Italy, IT00881841001

30. **THALES AIR SYSTEMS SAS (THALES AIR SYS)** SAS, 319159877, established in AVENUE CHARLES LINDBERGH 3, RUNGIS 94150, France, 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

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 '**Remote Tower for Multiple Airports — PJ05 Remote Tower**' **('action')**, as described in Annex 1.

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

ARTICLE 3 — DURATION AND STARTING DATE OF THE ACTION

The duration of the action will be **37 months** as of the first day of the month following the date the Agreement enters into force (see Article 58) ('**starting date of the action**').

ARTICLE 4 — ESTIMATED BUDGET AND BUDGET TRANSFERS

4.1 Estimated budget

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

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

4.2 Budget transfers

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

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

CHAPTER 3 GRANT

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

5.1 Maximum grant amount

The '**maximum grant amount**' is **EUR 1,828,086.09** (one million eight hundred and twenty eight thousand eighty six EURO and nine 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 **12,875,887.33** (twelve million eight hundred and seventy five thousand eight hundred and eighty seven EURO and thirty three eurocents).

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

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

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

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

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

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

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

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

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

5.3 Final grant amount — Calculation

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

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

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

Step 2 – Limit to the maximum grant amount

Step 3 – Reduction due to the no-profit rule

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

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

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

5.3.2 Step 2 — Limit to the maximum grant amount

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

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

The grant must not produce a profit.

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

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

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

The following are considered **receipts**:

(a) income generated by the action; if the income is generated from selling equipment or other assets purchased under the Agreement, the receipt is up to the amount declared as eligible under the Agreement;

(b) financial contributions given by third parties to the beneficiary or to a linked third party specifically to be used for the action, and

(c) in-kind contributions provided by third parties free of charge and specifically to be used for the action, if they have been declared as eligible costs.

The following are however not considered receipts:

(a) income generated by exploiting the action's results (see Article 28);

(b) financial contributions by third parties, if they may be used to cover costs other than the eligible costs (see Article 6);

(c) financial contributions by third parties with no obligation to repay any amount unused at the end of the period set out in Article 3.

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

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

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

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

- the amount obtained following Steps 1 to 3 or

- the reduced grant amount following Step 4.

5.4 Revised final grant amount — Calculation

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

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

- in case of **rejection of costs**: by applying the reimbursement rate to the revised eligible costs approved by the JU for the beneficiary concerned;

- in case of **reduction of the grant**: by calculating the concerned beneficiary's share in the grant amount reduced in proportion to its improper implementation of the action or to the seriousness of its breach of obligations (see Article 43.2).

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

ARTICLE 6 — ELIGIBLE AND INELIGIBLE COSTS

6.1 General conditions for costs to be eligible

'**Eligible costs**' are costs that meet the following criteria:

(a) for **actual costs**:

(i) they must be actually incurred by the beneficiary;

(ii) they must be incurred in the period set out in Article 3, with the exception of costs relating to the submission of the periodic report for the last reporting period and the final report (see Article 20);

(iii) they must be indicated in the estimated budget set out in Annex 2;

(iv) they must be incurred in connection with the action as described in Annex 1 and necessary for its implementation;

(v) they must be identifiable and verifiable, in particular recorded in the beneficiary's accounts in accordance with the accounting standards applicable in the country where the beneficiary is established and with the beneficiary's usual cost accounting practices;

(vi) they must comply with the applicable national law on taxes, labour and social security, and

(vii) they must be reasonable, justified and must comply with the principle of sound financial management, in particular regarding economy and efficiency;

(b) for **unit costs**:

(i) they must be calculated as follows:

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

multiplied by

the number of actual units};

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

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

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

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

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

6.2 Specific conditions for costs to be eligible

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

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

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

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

A. Direct personnel costs

Types of eligible personnel costs

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

Beneficiaries that are non-profit legal entities[5] may also declare as personnel costs **additional remuneration** for personnel assigned to the action (including payments on the basis of supplementary contracts regardless of their nature), if:

(a) it is part of the beneficiary's usual remuneration practices and is paid in a consistent manner whenever the same kind of work or expertise is required;

(b) the criteria used to calculate the supplementary payments are objective and generally applied by the beneficiary, regardless of the source of funding used.

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

(a) if the person works full time and exclusively on the action during the full year: up to EUR 8 000;

(b) if the person works exclusively on the action but not full-time or not for the full year: up to the corresponding pro-rata amount of EUR 8 000, or

(c) if the person does not work exclusively on the action: up to a pro-rata amount calculated as follows:

{{EUR 8 000

divided by

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

multiplied by

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

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

(a) the person works under the beneficiary's instructions and, unless otherwise agreed with the beneficiary, on the beneficiary's premises;

(b) the result of the work carried out belongs to the beneficiary, and

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

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

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

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

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

Calculation

Personnel costs must be calculated by the beneficiaries as follows:

{{hourly rate

multiplied by

the number of actual hours worked on the action},

plus

for non-profit legal entities: additional remuneration to personnel assigned to the action under the conditions set out above (Point A.1)}.

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

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

{the number of annual productive hours for the year (see below)

minus

total number of hours declared by the beneficiary for that person in that year for other JU, EU or Euratom grants}.

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

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

{actual annual personnel costs (excluding additional remuneration) for the person

divided by

number of annual productive hours}.

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

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

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

(i) 'fixed number of hours': 1 720 hours for persons working full time (or corresponding pro-rata for persons not working full time);

(ii) 'individual annual productive hours': the total number of hours worked by the person in the year for the beneficiary, calculated as follows:

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

plus

overtime worked

minus

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

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

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

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

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

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

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

(i) for SME owners or beneficiaries that are natural persons: the hourly rate set out in Annex 2 (see Points A.4 and A.5 above), or

(ii) for personnel costs declared on the basis of the beneficiary's usual cost accounting practices: the hourly rate calculated by the beneficiary in accordance with its usual cost accounting practices, if:

- the cost accounting practices used are applied in a consistent manner, based on objective criteria, regardless of the source of funding;

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

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

and

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

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

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

D. Other direct costs

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

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

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

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

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

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

(a) purchased specifically for the action and in accordance with Article 10.1.1 or

(b) contributed in kind against payment and in accordance with Article 11.1.

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

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

(a) the value of the large research infrastructure represents at least 75% of the total fixed assets (at historical value in its last closed balance sheet before the date of the signature of the Agreement or as determined on the basis of the rental and leasing costs of the research infrastructure[7]);

(b) the beneficiary's methodology for declaring the costs for large research infrastructure has been positively assessed by the Commission ('**ex-ante assessment**');

(c) the beneficiary declares as direct eligible costs only the portion which corresponds to the duration of the action and the rate of actual use for the purposes of the action, and

(d) they comply with the conditions as further detailed in the annotations to the H2020 grant agreements.

E. Indirect costs

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

(a) costs of subcontracting and

(b) costs of in-kind contributions provided by third parties which are not used on the beneficiary's premises;

(c) not applicable;

(d) not applicable.

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

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

Beneficiaries receiving an operating grant[8] financed by the EU or Euratom budget cannot declare indirect costs for the period covered by the operating grant.

F. Specific cost category(ies)

Not applicable

6.3 Conditions for costs of linked third parties to be eligible

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

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

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

6.5 Ineligible costs

'**Ineligible costs**' are:

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

(i) costs related to return on capital;

(ii) debt and debt service charges;

(iii) provisions for future losses or debts;

(iv) interest owed;

(v) doubtful debts;

(vi) currency exchange losses;

(vii) bank costs charged by the beneficiary's bank for transfers from the JU;

(viii) excessive or reckless expenditure;

(ix) deductible VAT;

(x) costs incurred during suspension of the implementation of the action (see Article 49);

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

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

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

6.6 Consequences of declaration of ineligible costs

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

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

CHAPTER 4 RIGHTS AND OBLIGATIONS OF THE PARTIES

SECTION 1 RIGHTS AND OBLIGATIONS RELATED TO IMPLEMENTING THE ACTION

ARTICLE 7 — GENERAL OBLIGATION TO PROPERLY IMPLEMENT THE ACTION

7.1 General obligation to properly implement the action

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

7.2 Consequences of non-compliance

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

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

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

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

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

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

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

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

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

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

Their costs are estimated in Annex 2 but:

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

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

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

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

9.2 Consequences of non-compliance

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

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

ARTICLE 10 — PURCHASE OF GOODS, WORKS OR SERVICES

10.1 Rules for purchasing goods, works or services

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

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

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

10.1.2 Beneficiaries that are 'contracting authorities' within the meaning of Directive 2004/18/EC[9] or 'contracting entities' within the meaning of Directive 2004/17/EC[10] must comply with the applicable national law on public procurement.

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

10.2 Consequences of non-compliance

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

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

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

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

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

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

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

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

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

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

11.2 Consequences of non-compliance

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

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

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

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

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

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

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

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

- they are specifically justified in the periodic technical report and

- their use does not entail changes to the Agreement which would call into question the decision awarding the grant or breach the principle of equal treatment of applicants.

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

12.2 Consequences of non-compliance

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

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

ARTICLE 13 — IMPLEMENTATION OF ACTION TASKS BY SUBCONTRACTORS

13.1 Rules for subcontracting action tasks

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

Subcontracting may cover only a limited part of the action.

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

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

- they are specifically justified in the periodic technical report and

- they do not entail changes to the Agreement which would call into question the decision awarding the grant or breach the principle of equal treatment of applicants.

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

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

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

13.2 Consequences of non-compliance

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

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

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

ARTICLE 14 — IMPLEMENTATION OF ACTION TASKS BY LINKED THIRD PARTIES

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

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

- MICROSTEP-MIS SPOL SRO (MicroStep-MIS), affiliated or linked to LPS SR (B4), if it has accepted joint and several liability with the beneficiary (see Annex 3a)
- NAV CANADA (Nav Canada), affiliated or linked to ENAV
- CONSORZIO SICTA SISTEMI INNOVATIVIPER IL CONTROLLO DELTRAFFICO AEREO (SICTA), affiliated or linked to ENAV, if it has accepted joint and several liability with the beneficiary (see Annex 3a)
- NEXTANT APPLICATIONS & INNOVATIVE SOLUTION SRL (NAIS), affiliated or linked to ENAV, if it has accepted joint and several liability with the beneficiary (see Annex 3a)
- FREQUENTIS ROMANIA SRL (FRQ RO), affiliated or linked to FRQ (FSP)
- AVINOR FLYSIKRING AS (Avinor ANS), affiliated or linked to INDRA

[12] For the definition, see Article 2.1(2) of the Rules for Participation Regulation No 1290/2013: '**affiliated entity**' means any legal entity that is:
- under the direct or indirect control of a participant, or
- under the same direct or indirect control as the participant, or
- directly or indirectly controlling a participant.

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

However the following relationships between legal entities shall not in themselves be deemed to constitute controlling relationships:
(a) the same public investment corporation, institutional investor or venture-capital company has a direct or indirect holding of more than 50% of the nominal value of the issued share capital or a majority of voting rights of the shareholders or associates;
(b) the legal entities concerned are owned or supervised by the same public body.

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

- INDRA NAVIA AS (Indra Navia), affiliated or linked to INDRA, if it has accepted joint and several liability with the beneficiary (see Annex 3a)
- SELEX ES GMBH (Selex ES GmbH), affiliated or linked to FINMECCANICA , if it has accepted joint and several liability with the beneficiary (see Annex 3a)
- SEARIDGE TECHNOLOGIES INC. (Searidge), affiliated or linked to THALES AIR SYS, if it has accepted joint and several liability with the beneficiary (see Annex 3a)

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

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

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

14.2 Consequences of non-compliance

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

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

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

ARTICLE 15 — FINANCIAL SUPPORT TO THIRD PARTIES

15.1 Rules for providing financial support to third parties

Not applicable

15.2 Financial support in the form of prizes

Not applicable

15.3 Consequences of non-compliance

Not applicable

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

16.1 Rules for providing trans-national access to research infrastructure

Not applicable

16.2 Rules for providing virtual access to research infrastructure

Not applicable

16.3 Consequences of non-compliance

Not applicable

SECTION 2 RIGHTS AND OBLIGATIONS RELATED TO THE GRANT ADMINISTRATION

ARTICLE 17 — GENERAL OBLIGATION TO INFORM

17.1 General obligation to provide information upon request

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

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

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

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

(a) **events** which are likely to affect significantly or delay the implementation of the action or the EU's or JU's financial interests, in particular:

(i) changes in its legal, financial, technical, organisational or ownership situation or those of its linked third parties and

(ii) changes in the name, address, legal form, organisation type of its linked third parties;

(b) **circumstances** affecting:

(i) the decision to award the grant or

(ii) compliance with requirements under the Agreement.

17.3 Consequences of non-compliance

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

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

ARTICLE 18 — KEEPING RECORDS — SUPPORTING DOCUMENTATION

18.1 Obligation to keep records and other supporting documentation

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

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

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

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

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

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

18.1.2 Records and other documentation to support the costs declared

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

(a) for **actual costs**: adequate records and other supporting documentation to prove the costs declared, such as contracts, subcontracts, invoices and accounting records. In addition, the beneficiaries' usual cost accounting practices and internal control procedures must enable direct reconciliation between the amounts declared, the amounts recorded in their accounts and the amounts stated in the supporting documentation;

(b) for **unit costs**: adequate records and other supporting documentation to prove the number of units declared. Beneficiaries do not need to identify the actual eligible costs covered or to keep or provide supporting documentation (such as accounting statements) to prove the amount per unit.

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

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

subsequently, unless the beneficiaries have concealed information for the purpose of the approval.

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

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

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

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

18.2 Consequences of non-compliance

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

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

ARTICLE 19 — SUBMISSION OF DELIVERABLES

19.1 Obligation to submit deliverables

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

19.2 Consequences of non-compliance

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

ARTICLE 20 — REPORTING — PAYMENT REQUESTS

20.1 Obligation to submit reports

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

20.2 Reporting periods

The action is divided into the following '**reporting periods**':
- RP1: from month 1 to month 14
- RP2: from month 15 to month 26
- RP3: from month 27 to month 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 also detail the exploitation and dissemination of the results and — if required in Annex 1 — an updated '**plan for the exploitation and dissemination of the results**';

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

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

(b) a '**periodic financial report**' containing:

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

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

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

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

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

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

- the information provided is full, reliable and true;

- the costs declared are eligible (see Article 6);

- the costs can be substantiated by adequate records and supporting documentation (see Article 18) that will be produced upon request (see Article 17) or in the context of checks, reviews, audits and investigations (see Article 22), and

- for the last reporting period: that all the receipts have been declared (see Article 5.3.3);

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

(iii) not applicable;

(iv) a '**periodic summary financial statement**' (see Annex 4), created automatically by the electronic exchange system, consolidating the individual financial statements for the reporting period concerned and including — except for the last reporting period — the **request for interim payment**.

20.4 Final report — Request for payment of the balance

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

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

(a) a '**final technical report**' with a **summary** for publication containing:

(i) an overview of the results and their exploitation and dissemination;

(ii) the conclusions on the action, and

(iii) the socio-economic impact of the action;

(b) a '**final financial report**' containing:

(i) a '**final summary financial statement**' (see Annex 4), created automatically by the electronic exchange system, consolidating the individual financial statements for all reporting periods and including the **request for payment of the balance** and

(ii) a '**certificate on the financial statements**' (drawn up in accordance with Annex 5) for each beneficiary and for each linked third party, if it requests a total contribution of EUR 325 000 or more, as reimbursement of actual costs and unit costs calculated on the basis of its usual cost accounting practices (see Article 5.2 and Article 6.2, Point A).

20.5 Information on cumulative expenditure incurred

Not applicable

20.6 Currency for financial statements and conversion into euro

Financial statements must be drafted in euro.

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

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

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

20.7 Language of reports

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

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

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

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

ARTICLE 21 — PAYMENTS AND PAYMENT ARRANGEMENTS

21.1 Payments to be made

The following payments will be made to the coordinator:

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

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

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

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

The amount of the pre-financing payment will be EUR **1,462,468.88** (one million four hundred and sixty two thousand four hundred and sixty eight EURO and eighty eight 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 **91,404.30** (ninety one thousand four hundred and four EURO and thirty eurocents), corresponding to 5% of the maximum grant amount (see Article 5.1), is retained by the JU from the pre-financing payment and transferred into the '**Guarantee Fund**'.

21.3 Interim payments — Amount — Calculation

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

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

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

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

Step 1 – Application of the reimbursement rates

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

21.3.1 Step 1 — Application of the reimbursement rates

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

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

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

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

minus

{pre-financing and previous interim payments}}.

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

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

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

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

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

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

{final grant amount (see Article 5.3)

minus

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

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

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

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

21.5 Notification of amounts due

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

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

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

21.6 Currency for payments

The JU will make all payments in euro.

21.7 Payments to the coordinator — Distribution to the beneficiaries

Payments will be made to the coordinator.

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

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

Pre-financing may however be distributed only:

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

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

21.8 Bank account for payments

All payments will be made to the following bank account:

Name of bank: COMMERZBANK AG
Address of branch: KOELN, Germany
Full name of the account holder: DEUTSCHES ZENTRUM FUR LUFT UND RAUMFAHRT EV
Full account number (including bank codes):
IBAN code: DE17370400440503304818

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[18] and No 2185/96[19], Article 110 of the Financial Rules of the JU[20] (and in accordance with their provisions and procedures), 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 Financial Rules of the JU, the European Court of Auditors (ECA) may — at any moment during implementation of the action or afterwards — carry out audits.

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

22.4 Checks, reviews, audits and investigations for international organisations

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

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

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

22.5.1 Findings in this grant

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

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

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

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

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

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

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

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

22.5.2 Findings in other grants

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

(a) the beneficiary concerned is found, in other JU, EU or Euratom grants awarded under similar conditions, to have committed systemic or recurrent errors, irregularities, fraud or breach of obligations that have a material impact on this grant and

(b) those findings are formally notified to the beneficiary concerned — together with the list of grants affected by the findings — no later than two years after the payment of the balance of this grant.

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

22.5.3 Procedure

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

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

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

(b) the request to submit **revised financial statements** for all grants affected;

(c) the **correction rate for extrapolation** established by the JU or the Commission on the basis of the systemic or recurrent errors, to calculate the amounts to be rejected if the beneficiary concerned:

(i) considers that the submission of revised financial statements is not possible or practicable or

(ii) does not submit revised financial statements.

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

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

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

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

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

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

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

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

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

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

22.6 Consequences of non-compliance

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

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

ARTICLE 23 — EVALUATION OF THE IMPACT OF THE ACTION

23.1 Right to evaluate the impact of the action

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

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

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

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

23.2 Consequences of non-compliance

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

SECTION 3 RIGHTS AND OBLIGATIONS RELATED TO BACKGROUND AND RESULTS

SUBSECTION 1 GENERAL

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[21].

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.

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

24.2 Consequences of non-compliance

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

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

ARTICLE 25 — ACCESS RIGHTS TO BACKGROUND

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

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

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

Waivers of access rights are not valid unless in writing.

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

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

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

(a) informed the other beneficiaries that access to its background is subject to legal restrictions or limits, including those imposed by the rights of third parties (including personnel), or

(b) agreed with the other beneficiaries that access would not be on a royalty-free basis.

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

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

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

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

25.4 Access rights for affiliated entities

Unless otherwise agreed in the consortium agreement, access to background must also be given — under fair and reasonable conditions (see above; Article 25.3) and unless it is subject to legal

restrictions or limits, including those imposed by the rights of third parties (including personnel) — to affiliated entities[22] established in an EU Member State or '**associated country**'[23], if this is needed to exploit the results generated by the beneficiaries to which they are affiliated.

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

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

25.5 Access rights for third parties

The beneficiaries must give - under the conditions set out in Article 25.2 - access to their background to the complementary beneficiary[24] (see Article 2).

Not applicable

25.6 Consequences of non-compliance

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

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

SUBSECTION 3 RIGHTS AND OBLIGATIONS RELATED TO RESULTS

ARTICLE 26 — OWNERSHIP OF RESULTS

26.1 Ownership by the beneficiary that generates the results

Results are owned by the beneficiary that generates them.

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

26.2 Joint ownership by several beneficiaries

Two or more beneficiaries own results jointly if:

(a) they have jointly generated them and

(b) it is not possible to:

[22] For the definition, see 'affiliated entity' footnote (Article 14.1).

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

[24] '**Complementary beneficiary**' means a beneficiary of the complementary grant agreement.

(i) establish the respective contribution of each beneficiary, or

(ii) separate them for the purpose of applying for, obtaining or maintaining their protection (see Article 27).

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

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

(a) at least 45 days advance notice and

(b) fair and reasonable compensation.

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

26.3 Rights of third parties (including personnel)

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

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

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

26.4 JU ownership, to protect results

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

(a) the lack of protection is because protecting the results is not possible, reasonable or justified (given the circumstances);

(b) the lack of protection is because there is a lack of potential for commercial or industrial exploitation, or

(c) the beneficiary intends to transfer the results to another beneficiary or third party established in an EU Member State or associated country, which will protect them.

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

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

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

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

(a) the protection is stopped because of a lack of potential for commercial or industrial exploitation;

(b) an extension would not be justified given the circumstances.

A beneficiary that intends to stop protecting results or not seek an extension must — unless any of the cases above under Points (a) or (b) applies — formally notify the JU at least 60 days before the protection lapses or its extension is no longer possible and at the same time inform it of any reasons for refusing consent. The beneficiary may refuse consent only if it can show that its legitimate interests would suffer significant harm.

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

26.5 Consequences of non-compliance

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

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

ARTICLE 27 — PROTECTION OF RESULTS — VISIBILITY OF FUNDING

27.1 Obligation to protect the results

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

(a) the results can reasonably be expected to be commercially or industrially exploited and

(b) protecting them is possible, reasonable and justified (given the circumstances).

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

27.2 JU ownership, to protect the results

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

27.3 Information on funding

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

> *"The project leading to this application has received funding from the SESAR Joint Undertaking under grant agreement No 730195 under European Union's Horizon 2020 research and innovation programme"* .

27.4 Consequences of non-compliance

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

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

ARTICLE 28 — EXPLOITATION OF RESULTS

28.1 Obligation to exploit the results

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

(a) using them in further research activities (outside the action);

(b) developing, creating or marketing a product or process;

(c) creating and providing a service, or

(d) using them in standardisation activities.

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

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

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

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

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

> *"Results incorporated in this standard received funding from the SESAR Joint Undertaking under grant agreement No 730195 under European Union's Horizon 2020 research and innovation programme"* .

28.3 Consequences of non-compliance

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

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

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

29.1 Obligation to disseminate results

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

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

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

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

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

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

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

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

29.2 Open access to scientific publications

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

In particular, it must:

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

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

(b) ensure open access to the deposited publication — via the repository — at the latest:

(i) on publication, if an electronic version is available for free via the publisher, or

(ii) within six months of publication (twelve months for publications in the social sciences and humanities) in any other case.

(c) ensure open access — via the repository — to the bibliographic metadata that identify the deposited publication.

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

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

29.3 Open access to research data

Not applicable

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

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

(a) display the JU logo;

(b) display the EU emblem and

(c) include the following text:

"This project has received funding from the SESAR Joint Undertaking under grant agreement No 730195 under European Union's Horizon 2020 research and innovation programme" .

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

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

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

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

29.5 Disclaimer excluding JU responsibility

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

29.6 Consequences of non-compliance

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

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

ARTICLE 30 — TRANSFER AND LICENSING OF RESULTS

30.1 Transfer of ownership

Each beneficiary may transfer ownership of its results.

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

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

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

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

30.2 Granting licenses

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

(a) this does not impede the rights under Article 31 and

(b) the beneficiary complies with its additional exploitation obligations (see Article 28.1 and Annex 1).

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

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

30.3 JU right to object to transfers or exclusive licensing

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

(a) it is to a third party established in a non-EU country not associated with Horizon 2020 and

(b) the JU considers that the transfer or licence is not in line with EU interests regarding competitiveness or is inconsistent with ethical principles or security considerations.

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

- identify the specific results concerned;

- describe in detail the new owner or licensee and the planned or potential exploitation of the results, and

- include a reasoned assessment of the likely impact of the transfer or licence on EU competitiveness and its consistency with ethical principles and security considerations.

The JU may request additional information.

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

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

- pending the JU decision, within the period set out above;

- if the JU objects;

- until the conditions are complied with, if the JU objection comes with conditions.

30.4 Consequences of non-compliance

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

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

ARTICLE 31 — ACCESS RIGHTS TO RESULTS

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

The conditions set out in Article 25.1 apply.

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

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

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

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

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

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

31.4 Access rights of affiliated entities

Unless agreed otherwise in the consortium agreement, access to results must also be given — under fair and reasonable conditions (Article 25.3) — to affiliated entities established in an EU Member State or associated country, if this is needed for those entities to exploit the results generated by the beneficiaries to which they are affiliated.

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

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

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

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

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

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

31.6 Access rights for third parties

The beneficiaries must give — under the conditions set out in Article 31.2 and 31.3 — access to their results to complementary beneficiaries[24], for the purposes of the complementary grant agreement(s) (see Article 2).

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

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

[24] '**Complementary beneficiary**' means a beneficiary of a complementary grant agreement.

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

31.7 Consequences of non-compliance

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

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

SECTION 4 OTHER RIGHTS AND OBLIGATIONS

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[25], in particular regarding:

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

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

32.2 Consequences of non-compliance

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

ARTICLE 33 — GENDER EQUALITY

33.1 Obligation to aim for gender equality

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

33.2 Consequences of non-compliance

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

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

ARTICLE 34 — ETHICS

34.1 Obligation to comply with ethical principles

The beneficiaries must carry out the action in compliance with:

(a) ethical principles (including the highest standards of research integrity — as set out, for instance, in the European Code of Conduct for Research Integrity[26] — and including, in particular, avoiding fabrication, falsification, plagiarism or other research misconduct) 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.

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

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

(a) aim at human cloning for reproductive purposes;

(b) intend to modify the genetic heritage of human beings which could make such changes heritable (with the exception of research relating to cancer treatment of the gonads, which may be financed), or

(c) intend to create human embryos solely for the purpose of research or for the purpose of stem cell procurement, including by means of somatic cell nuclear transfer.

34.2 Activities raising ethical issues

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

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

(a) any ethics committee opinion required under national law and

(b) any notification or authorisation for activities raising ethical issues required under national law.

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

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

[26] The European Code of Conduct for Research Integrity of ALLEA (All European Academies) and ESF (European Science Foundation) of March 2011.
http://www.esf.org/fileadmin/Public_documents/Publications/Code_Conduct_ResearchIntegrity.pdf

34.3 Activities involving human embryos or human embryonic stem cells

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

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

34.4 Consequences of non-compliance

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

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

ARTICLE 35 — CONFLICT OF INTERESTS

35.1 Obligation to avoid a conflict of interests

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

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

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

35.2 Consequences of non-compliance

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

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

ARTICLE 36 — CONFIDENTIALITY

36.1 General obligation to maintain confidentiality

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

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

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

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

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

(a) need to know to implement the Agreement and

(b) are bound by an obligation of confidentiality.

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

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

(a) this is necessary to implement the Agreement or safeguard the EU's or JU's financial interests and

(b) the recipients of the information are bound by an obligation of confidentiality.

The confidentiality obligations no longer apply if:

(a) the disclosing party agrees to release the other party;

(b) the information was already known by the recipient or is given to him without obligation of confidentiality by a third party that was not bound by any obligation of confidentiality;

(c) the recipient proves that the information was developed without the use of confidential information;

(d) the information becomes generally and publicly available, without breaching any confidentiality obligation, or

(e) the disclosure of the information is required by EU or national law.

36.2 Consequences of non-compliance

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

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

ARTICLE 37 — SECURITY-RELATED OBLIGATIONS

37.1 Results with a security recommendation

Not applicable

37.2 Classified results

Not applicable

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

Not applicable

37.4 Consequences of non-compliance

Not applicable

ARTICLE 38 — PROMOTING THE ACTION — VISIBILITY OF FUNDING

38.1 Communication activities by beneficiaries

38.1.1 Obligation to promote the action and its results

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

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

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

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

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

(a) display the JU logo;

(b) display the EU emblem and

(c) include the following text:

> For communication activities: *"This project has received funding from the SESAR Joint Undertaking under grant agreement No 730195 under European Union's Horizon 2020 research and innovation programme"* .
>
> For infrastructure, equipment and major results: *"This [infrastructure][equipment][insert type of result] is part of a project that has received funding from the SESAR Joint Undertaking under grant agreement No 730195 under European Union's Horizon 2020 research and innovation programme"* .

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

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

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

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

38.1.3 Disclaimer excluding JU responsibility

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

38.2 Communication activities by the JU

38.2.1 Right to use beneficiaries' materials, documents or information

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

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

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

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

(a) **use for its own purposes** (in particular, making them available to persons working for the JU or any other EU institution, body, office or agency or body or institutions in EU Member States; and copying or reproducing them in whole or in part, in unlimited numbers);

(b) **distribution to the public** (in particular, publication as hard copies and in electronic or digital format, publication on the internet, as a downloadable or non-downloadable file, broadcasting by any channel, public display or presentation, communicating through press information services, or inclusion in widely accessible databases or indexes);

(c) **editing or redrafting** for communication and publicising activities (including shortening, summarising, inserting other elements (such as meta-data, legends, other graphic, visual, audio or text elements), extracting parts (e.g. audio or video files), dividing into parts, use in a compilation);

(d) **translation**;

(e) giving **access in response to individual requests** under Regulation No 1049/2001[27], 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.

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

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

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

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

38.3 Consequences of non-compliance

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

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

ARTICLE 39 — PROCESSING OF PERSONAL DATA

39.1 Processing of personal data by the JU and the Commission

Any personal data under the Agreement will be processed by the JU or the Commission under Regulation No 45/2001[28] and according to the 'notifications of the processing operations' to the Data Protection Officer (DPO) of the JU or the Commission (publicly accessible in the DPO register).

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

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

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

39.2 Processing of personal data by the beneficiaries

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

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

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

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

39.3 Consequences of non-compliance

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

ARTICLE 40 — ASSIGNMENTS OF CLAIMS FOR PAYMENT AGAINST THE JU

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

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

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

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

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

41.1 Roles and responsibilities towards the JU

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

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

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

41.2 Internal division of roles and responsibilities

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

(a) Each **beneficiary** must:

(i) keep information stored in the 'Beneficiary Register' (via the electronic exchange system) up to date (see Article 17);

(ii) inform the coordinator immediately of any events or circumstances likely to affect significantly or delay the implementation of the action (see Article 17);

(iii) submit to the coordinator in good time:

- individual financial statements for itself and its linked third parties and, if required, certificates on the financial statements (see Article 20);

- the data needed to draw up the technical reports (see Article 20);

- ethics committee opinions and notifications or authorisations for activities raising ethical issues (see Article 34);

- any other documents or information required by the JU under the Agreement, unless the Agreement requires the beneficiary to submit this information directly to the JU.

(b) The **coordinator** must:

(i) monitor that the action is implemented properly (see Article 7);

(ii) act as the intermediary for all communications between the beneficiaries and the JU (in particular, providing the JU with the information described in Article 17), unless the Agreement specifies otherwise;

(iii) request and review any documents or information required by the JU and verify their completeness and correctness before passing them on to the JU;

(iv) submit the deliverables and reports to the JU (see Articles 19 and 20);

(v) ensure that all payments are made to the other beneficiaries without unjustified delay (see Article 21);

(vi) inform the JU of the amounts paid to each beneficiary, when required under the Agreement (see Articles 44 and 50) or requested by the JU.

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

41.3 Internal arrangements between beneficiaries — Consortium agreement

Not applicable

41.4 Relationship with complementary beneficiaries — Collaboration agreement

Not applicable

41.5 Relationship with partners of a joint action — Coordination agreement

Not applicable

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

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

ARTICLE 42 — REJECTION OF INELIGIBLE COSTS

42.1 Conditions

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

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

42.2 Ineligible costs to be rejected — Calculation — Procedure

Ineligible costs will be rejected in full.

If the JU rejects costs **without reduction of the grant** (see Article 43) or **recovery of undue amounts** (see Article 44), it will formally notify the coordinator or beneficiary concerned the rejection of costs, the amounts and the reasons why (if applicable, together with the notification of amounts due; see Article 21.5). The coordinator or beneficiary concerned may — within 30 days of receiving notification — formally notify the JU of its disagreement and the reasons why.

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

42.3 Effects

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

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

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

ARTICLE 43 — REDUCTION OF THE GRANT

43.1 Conditions

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

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

43.2 Amount to be reduced — Calculation — Procedure

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

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

- informing it of its intention to reduce the grant, the amount it intends to reduce and the reasons why and

- inviting it to submit observations within 30 days of receiving notification

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

43.3 Effects

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

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

ARTICLE 44 — RECOVERY OF UNDUE AMOUNTS

44.1 Amount to be recovered — Calculation — Procedure

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

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

44.1.1 Recovery after termination of a beneficiary's participation

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

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

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

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

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

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

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

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

Bank charges incurred in the recovery process will be borne by the beneficiary, unless Directive 2007/64/EC[29] applies.

44.1.2 Recovery at payment of the balance

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

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

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

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

- pay the difference between the amount to be recovered and the amount retained for the Guarantee Fund, **if the difference is positive** or

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

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

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

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

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

plus

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

divided by

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

multiplied by

the final grant amount (see Article 5.3)},

minus

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

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

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

divided by

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

multiplied by

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

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

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

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

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

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

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

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

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

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

44.1.3 Recovery of amounts after payment of the balance

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

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

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

plus

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

divided by

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

multiplied by

the final grant amount (see Article 5.3)}.

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

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

- informing it of its intention to recover, the due amount and the reasons why and

- inviting it to submit observations within 30 days of receiving notification.

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

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

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

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

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

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

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

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

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

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

ARTICLE 45 — ADMINISTRATIVE AND FINANCIAL PENALTIES

45.1 Conditions

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

(a) has committed substantial errors, irregularities or fraud or is in serious breach of its obligations under the Agreement or

(b) has made false declarations about information required under the Agreement or for the submission of the proposal (or has not supplied such information).

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

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

45.2 Duration — Amount of penalty — Calculation

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

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

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

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

45.3 Procedure

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

- informing it of its intention to impose a penalty, its duration or amount and the reasons why and

- inviting it to submit observations within 30 days.

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

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

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

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

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

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

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

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

SECTION 2 LIABILITY FOR DAMAGES

ARTICLE 46 — LIABILITY FOR DAMAGES

46.1 Liability of the JU

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

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

46.2 Liability of the beneficiaries

46.2.1 Conditions

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

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

46.2.2 Amount of damages - Calculation

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

46.2.3 Procedure

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

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

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

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

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

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

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

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

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

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

SECTION 3 SUSPENSION AND TERMINATION

ARTICLE 47 — SUSPENSION OF PAYMENT DEADLINE

47.1 Conditions

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

(a) it does not comply with the provisions of the Agreement (see Article 20);

(b) the technical reports or financial reports have not been submitted or are not complete or additional information is needed, or

(c) there is doubt about the eligibility of the costs declared in the financial statements and additional checks, reviews, audits or investigations are necessary.

47.2 Procedure

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

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

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

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

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

ARTICLE 48 — SUSPENSION OF PAYMENTS

48.1 Conditions

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

(a) has committed or is suspected of having committed substantial errors, irregularities, fraud or serious breach of obligations in the award procedure or under this Agreement or

(b) has committed — in other JU, EU or Euratom grants awarded to it under similar conditions — systemic or recurrent errors, irregularities, fraud or serious breach of obligations that have

a material impact on this grant (**extension of findings from other grants to this grant**; see Article 22.5.2).

48.2 Procedure

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

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

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

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

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

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

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

ARTICLE 49 — SUSPENSION OF THE ACTION IMPLEMENTATION

49.1 Suspension of the action implementation, by the beneficiaries

49.1.1 Conditions

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

49.1.2 Procedure

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

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

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

Once circumstances allow for implementation to resume, the coordinator must immediately formally notify the JU and request an **amendment** of the Agreement to set the date on which the action will be resumed, extend the duration of the action and make other changes necessary to adapt the action

to the new situation (see Article 55) — unless the Agreement or the participation of a beneficiary has been terminated (see Article 50).

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

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

49.2 Suspension of the action implementation, by the JU

49.2.1 Conditions

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

(a) if a beneficiary has committed or is suspected of having committed substantial errors, irregularities, fraud or serious breach of obligations in the award procedure or under this Agreement;

(b) if a beneficiary has committed — in other JU, EU or Euratom grants awarded to it under similar conditions — systemic or recurrent errors, irregularities, fraud or serious breach of obligations that have a material impact on this grant (**extension of findings from other grants to this grant**; see Article 22.5.2), or

(c) if the action is suspected of having lost its scientific or technological relevance.

49.2.2 Procedure

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

- informing it of its intention to suspend the implementation and the reasons why and

- inviting it to submit observations within 30 days of receiving notification.

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

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

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

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

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

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

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

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

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

50.1 Termination of the Agreement by the beneficiaries

50.1.1 Conditions and procedure

The beneficiaries may terminate the Agreement.

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

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

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

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

50.1.2 Effects

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

(i) a periodic report (for the open reporting period until termination; see Article 20.3) and

(ii) the final report (see Article 20.4).

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

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

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

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

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

50.2.1 Conditions and procedure

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

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

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

The notification must include:

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

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

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

50.2.2 Effects

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

(i) a report on the distribution of payments to the beneficiary concerned and

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

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

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

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

The JU will **calculate** — on the basis of the periodic reports, the termination report and the report on the distribution of payments — if the (pre-financing and interim) payments received by the beneficiary concerned exceed the beneficiary's JU contribution (calculated by applying the reimbursement rate(s)

to the eligible costs declared by the beneficiary and its linked third parties and approved by the JU). Only costs incurred by the beneficiary concerned until termination takes effect are eligible (see Article 6). Costs relating to contracts due for execution only after termination are not eligible.

- If the payments received **exceed the amounts due**:

  - if termination takes effect during the period set out in Article 3 and the request for amendment is accepted, the beneficiary concerned must repay to the coordinator the amount unduly received. The JU will formally notify the amount unduly received and request the beneficiary concerned to repay it to the coordinator within 30 days of receiving notification. If it does not repay the coordinator, the JU will draw upon the Guarantee Fund to pay the coordinator and then notify a **debit note** on behalf of the Guarantee Fund to the beneficiary concerned (see Article 44);

  - in all other cases (in particular if termination takes effect after the period set out in Article 3), the JU will formally notify a **debit note** to the beneficiary concerned. If payment is not made by the date in the debit note, the Guarantee Fund will pay to the JU the amount due and the JU will notify a debit note on behalf of the Guarantee Fund to the beneficiary concerned (see Article 44);

  - if the beneficiary concerned is the former coordinator, it must repay the new coordinator according to the procedure above, unless:

    - termination is after an interim payment and

    - the former coordinator has not distributed amounts received as pre-financing or interim payments (see Article 21.7).

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

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

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

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

- the coordinator did not distribute any payment to the beneficiary concerned and that

- the beneficiary concerned must not repay any amount to the coordinator.

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

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

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

50.3.1 Conditions

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

(a) one or more beneficiaries do not accede to the Agreement (see Article 56);

(b) a change to their legal, financial, technical, organisational or ownership situation (or those of its linked third parties) is likely to substantially affect or delay the implementation of the action or calls into question the decision to award the grant;

(c) following termination of participation for one or more beneficiaries (see above), the necessary changes to the Agreement would call into question the decision awarding the grant or breach the principle of equal treatment of applicants (see Article 55);

(d) implementation of the action is prevented by force majeure (see Article 51) or suspended by the coordinator (see Article 49.1) and either:

(i) resumption is impossible, or

(ii) the necessary changes to the Agreement would call into question the decision awarding the grant or breach the principle of equal treatment of applicants;

(e) a beneficiary is declared bankrupt, being wound up, having its affairs administered by the courts, has entered into an arrangement with creditors, has suspended business activities, or is subject to any other similar proceedings or procedures under national law;

(f) a beneficiary (or a natural person who has the power to represent or take decisions on its behalf) has been found guilty of professional misconduct, proven by any means;

(g) a beneficiary does not comply with the applicable national law on taxes and social security;

(h) the action has lost scientific or technological relevance;

(i) not applicable;

(j) not applicable;

(k) a beneficiary (or a natural person who has the power to represent or take decisions on its behalf) has committed fraud, corruption, or is involved in a criminal organisation, money laundering or any other illegal activity affecting the EU's or JU's financial interests;

(l) a beneficiary (or a natural person who has the power to represent or take decisions on its behalf) has — in the award procedure or under the Agreement — committed:

(i) substantial errors, irregularities, fraud or

(ii) serious breach of obligations, including improper implementation of the action, submission of false information, failure to provide required information, breach of ethical principles;

(m) a beneficiary has committed — in other JU, EU or Euratom grants awarded to it under similar conditions — systemic or recurrent errors, irregularities, fraud or serious breach of obligations that have a material impact on this grant ('**extension of findings from other grants to this grant**').

50.3.2 Procedure

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

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

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

The termination will **take effect**:

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

50.3.3 Effects

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

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

(i) a periodic report (for the last open reporting period until termination; see Article 20.3) and

(ii) a final report (see Article 20.4).

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

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

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

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

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

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

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

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

(i) a report on the distribution of payments to the beneficiary concerned;

(ii) a request for amendment (see Article 55), with a proposal for reallocation of the tasks and estimated budget of the beneficiary concerned (see Annexes 1 and 2) and, if necessary, the addition of one or more new beneficiaries (see Article 56). If termination is notified after the period set out in Article 3, no request for amendment must be submitted unless the beneficiary concerned is the coordinator. In this case the request for amendment must propose a new coordinator, and

(iii) if termination takes effect during the period set out in Article 3, a **termination report** from the beneficiary concerned, for the open reporting period until termination, containing an overview of the progress of the work, an overview of the use of resources, the individual financial statement and, if applicable, the certificate on the financial statement (see Article 20).

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

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

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

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

- If the payments received **exceed the amounts due**:

  - if termination takes effect during the period set out in Article 3 and the request for amendment is accepted, the beneficiary concerned must repay to the coordinator the amount unduly received. The JU will formally notify the amount unduly received and request the beneficiary concerned to repay it to the coordinator within 30 days of receiving notification. If it does not repay the coordinator, the JU will draw upon the Guarantee Fund to pay the coordinator and then notify a debit note on behalf of the Guarantee Fund to the beneficiary concerned (see Article 44);

- in all other cases, in particular if termination takes effect after the period set out in Article 3, the JU will formally notify a **debit note** to the beneficiary concerned. If payment is not made by the date in the debit note, the Guarantee Fund will pay to the JU the amount due and the JU will notify a debit note on behalf of the Guarantee Fund to the beneficiary concerned (see Article 44);

- if the beneficiary concerned is the former coordinator, it must repay the new coordinator the amount unduly received, unless:

  - termination takes effect after an interim payment and

  - the former coordinator has not distributed amounts received as pre-financing or interim payments (see Article 21.7)

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

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

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

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

- the coordinator did not distribute any payment to the beneficiary concerned, and that

- the beneficiary concerned must not repay any amount to the coordinator.

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

SECTION 4 FORCE MAJEURE

ARTICLE 51 — FORCE MAJEURE

'Force majeure' means any situation or event that:

- prevents either party from fulfilling their obligations under the Agreement,

- was unforeseeable, exceptional situation and beyond the parties' control,

- was not due to error or negligence on their part (or on the part of third parties involved in the action), and

- proves to be inevitable in spite of exercising all due diligence.

The following cannot be invoked as force majeure:

- any default of a service, defect in equipment or material or delays in making them available, unless they stem directly from a relevant case of force majeure,
- labour disputes or strikes, or
- financial difficulties.

Any situation constituting force majeure must be formally notified to the other party without delay, stating the nature, likely duration and foreseeable effects.

The parties must immediately take all the necessary steps to limit any damage due to force majeure and do their best to resume implementation of the action as soon as possible.

The party prevented by force majeure from fulfilling its obligations under the Agreement cannot be considered in breach of them.

CHAPTER 7 FINAL PROVISIONS

ARTICLE 52 — COMMUNICATION BETWEEN THE PARTIES

52.1 Form and means of communication

Communication under the Agreement (information, requests, submissions, 'formal notifications', etc.) must:

- be made in writing and
- bear the number of the Agreement.

Until the payment of the balance: all communication must be made through the electronic exchange system and using the forms and templates provided there.

After the payment of the balance: formal notifications must be made by registered post with proof of delivery ('formal notification on paper').

Communications in the electronic exchange system must be made by persons authorised according to the 'Terms and Conditions of Use of the electronic exchange system'. For naming the authorised persons, each beneficiary must have designated — before the signature of this Agreement — a 'Legal Entity Appointed Representative (LEAR)'. The role and tasks of the LEAR are stipulated in his/her appointment letter (see Terms and Conditions of Use of the electronic exchange system).

If the electronic exchange system is temporarily unavailable, instructions will be given on the JU and Commission websites.

52.2 Date of communication

Communications are considered to have been made when they are sent by the sending party (i.e. on the date and time they are sent through the electronic exchange system).

Formal notifications through the **electronic** exchange system are considered to have been made when they are received by the receiving party (i.e. on the date and time of acceptance by the receiving party,

as indicated by the time stamp). A formal notification that has not been accepted within 10 days after sending is considered to have been accepted.

Formal notifications **on paper** sent by **registered post** with proof of delivery (only after the payment of the balance) are considered to have been made on either:

- the delivery date registered by the postal service or
- the deadline for collection at the post office.

If the electronic exchange system is temporarily unavailable, the sending party cannot be considered in breach of its obligation to send a communication within a specified deadline.

52.3 Addresses for communication

The **electronic** exchange system must be accessed via the following URL:

https://ec.europa.eu/research/participants/portal/desktop/en/projects/

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

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

SESAR Joint Undertaking
B-1049 Brussels Belgium

Formal notifications on paper (only after the payment of the balance) addressed **to the beneficiaries** must be sent to their legal address as specified in the 'Beneficiary Register'.

ARTICLE 53 — INTERPRETATION OF THE AGREEMENT

53.1 Precedence of the Terms and Conditions over the Annexes

The provisions in the Terms and Conditions of the Agreement take precedence over its Annexes.

Annex 2 takes precedence over Annex 1.

53.2 Privileges and immunities

Nothing in the Agreement may be interpreted as a waiver of any privileges or immunities accorded to the EUROCONTROL - EUROPEAN ORGANISATION FOR THE SAFETY OF AIR NAVIGATION by its constituent documents or international law.

ARTICLE 54 — CALCULATION OF PERIODS, DATES AND DEADLINES

In accordance with Regulation No 1182/71[30], periods expressed in days, months or years are calculated from the moment the triggering event occurs.

[30] Regulation (EEC, Euratom) No 1182/71 of the Council of 3 June 1971 determining the rules applicable to periods, dates and time-limits (OJ L 124, 8.6.1971, p. 1).

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;
- for a change of coordinator without its agreement: the opinion of the coordinator (or proof that this opinion has been requested in writing).

The JU may request additional information.

If the party receiving the request agrees, it must sign the amendment in the electronic exchange system within 45 days of receiving notification (or any additional information the JU has requested). If it does not agree, it must formally notify its disagreement within the same deadline. The deadline may be extended, if necessary for the assessment of the request. If no notification is received within the deadline, the request is considered to have been rejected

An amendment **enters into force** on the day of the signature of the receiving party.

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

ARTICLE 56 — ACCESSION TO THE AGREEMENT

56.1 Accession of the beneficiaries mentioned in the Preamble

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

by also submitting — at accession — a declaration on joint and several liability (see Annex 3a) signed by the third party.

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

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

56.2 Addition of new beneficiaries

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

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

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

ARTICLE 57 — APPLICABLE LAW AND SETTLEMENT OF DISPUTES

57.1 Applicable law

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

57.2 Dispute settlement

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

As an exception, if such a dispute is between the JU and STIFTELSEN SINTEF, FLUGHAFEN ZURICH AG, AVINOR AS, the competent Belgian courts have sole jurisdiction.

As an exception, for the following beneficiaries:

- EUROCONTROL - EUROPEAN ORGANISATION FOR THE SAFETY OF AIR NAVIGATION

such disputes must — if they cannot be settled amicably — be referred to arbitration.

The Permanent Court of Arbitration Optional Rules for Arbitration Involving International Organisations and States in force at the date of entry into force of the Agreement will apply.

The appointing authority will be the Secretary-General of the Permanent Court of Arbitration following a written request submitted by either party.

The arbitration proceedings must take place in Brussels and the language used in the arbitral proceedings will be English.

The arbitral award will be binding on all parties and will not be subject to appeal.

If a dispute concerns administrative or financial penalties or offsetting the beneficiaries must bring action before the General Court — or, on appeal, the Court of Justice of the European Union — under Article 263 TFEU.

ARTICLE 58 — ENTRY INTO FORCE OF THE AGREEMENT

The Agreement will enter into force on the day of signature by the JU or the coordinator, depending on which is later.

SIGNATURES

For the coordinator

Richter THOMAS with ECAS id nthomari signed in the Participant Portal on 31/10/2016 at 09:34:45 (transaction id SigId-2186-QiNqMxaKOmBR3rijeDDR7p0dm5zZMztmpicFNQn91AJZhi7kFWx27wNEJOpzQNJ06k1phPcRfmdUIzZlBpc0nrG-Jj71zxYb8yrI8GmV4asVNa-YRySTrzkUIseQg63Q3SMm3zb9y77ZLFQ7cpXF9yNYeGW).
Timestamp by third party at
Mon Oct 31 09:34:54 CET 2016

For the JU

Signed by Peter HOTHAM with ECAS id ihothape as an authorised representative on 31-10-2016 11:15:42 (transaction id SigId-3742-o1uNzveKzvIRsnxYbILRIsB7my7PEQsnbpT4FTFwc6OglprY12eryM6czL5wywk4iKg4w0JqtCfSfUm6dUQXu1W-Jj71zxYb8yrI8GmV4asVNa-lcIsxZXPYR8twiTN7E801J6dP2lwkwHzydo3vy2NCrB)
Mon Oct 31 11:15:47 CET 2016

ANNEX 1 (part A)

Research and Innovation action

NUMBER — 730195 — PJ05 Remote Tower

Table of Contents

1.1. The project summary

Project Number [1]	730195	Project Acronym [2]	PJ05 Remote Tower

One form per project

General information	
Project title [3]	Remote Tower for Multiple Airports
Starting date [4]	The first day of the month after the signature by the JU
Duration in months [5]	37
Call (part) identifier [6]	H2020-SESAR-2015-2
Topic	SESAR.IR-VLD.Wave1-08-2015 Remote Tower for Multiple Airports
Fixed EC Keywords	APT Airport Traffic Management
Free keywords	Remote Tower, Multiple, Center, remotely provided ATS service

Abstract [7]

Cost-effectiveness, clearly described in the topic SESAR.IR-VLD.Wave1-08-2015 as the main key performance area (KPA), is the principal KPA addressed by “PJ05 Remote Tower” project. 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. “Single” remote tower settings have already been deployed in former project, but most significant impacts in cost-effectiveness are to be expected with multiple and/or center settings that was only partly covered so far and needs immediate development effort to deploy it short term. PJ05 will bring the multiple/center concept to a higher matured level. In the end, the passengers will benefit from: More cost-effective aerodrome ATS would allow rural, less frequented airports to work cost-effective and to keep them in operations or even to increase the service levels for more day hours operations or even to upgrade non-controlled to controlled airports. All this would contribute to a better passenger comfort in terms of shorter travel times and better point to point connections.

The PJ05 aim 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

Project Number [1]	730195	Project Acronym [2]	PJ05 Remote Tower

List of Beneficiaries

No	Name	Short name	Country	Project entry month[8]	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)	Czech Republic	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	NAVIAIR	Naviair/COOPANS	Denmark	1	37
12	DFS DEUTSCHE FLUGSICHERUNG GMBH	DFS	Germany	1	37
13	ENAV SPA	ENAV	Italy	1	37
14	FREQUENTIS AG	FRQ (FSP)	Austria	1	37
15	ATOS BELGIUM	ATOS (FSP)	Belgium	1	37
16	HUNGAROCONTROL MAGYAR LEGIFORGALMI SZOLGALAT ZARTKORUEN MUKODO RESZVENYTARSASAG	HC (FSP)	Hungary	1	37
17	INDRA SISTEMAS SA	INDRA	Spain	1	37
18	AIRTEL ATN LIMITED	AIRTEL (NATMIG)	Ireland	1	37
19	SAAB AKTIEBOLAG	SAAB (NATMIG)	Sweden	1	37
20	STIFTELSEN SINTEF	SINTEF (NATMIG)	Norway	1	37
21	EUROCONTROL - EUROPEAN ORGANISATION FOR THE SAFETY OF AIR NAVIGATION	EUROCONTROL	Belgium	1	37
22	AEROPORTS DE PARIS	ADP (SEAC2020)	France	1	37

1.2. List of Beneficiaries

No	Name	Short name	Country	Project entry month[8]	Project exit month
23	FLUGHAFEN MUNCHEN GMBH	MUC (SEAC2020)	Germany	1	37
24	FLUGHAFEN ZURICH AG	ZRH (SEAC2020)	Switzerland	1	37
25	HEATHROW AIRPORT LIMITED	HAL (SEAC2020)	United Kingdom	1	37
26	SCHIPHOL NEDERLAND B.V.	SNBV (SEAC2020)	Netherlands	1	37
27	SWEDAVIA AB	Swed(SEAC2020)	Sweden	1	37
28	AVINOR AS	AVINOR-SEAC2020	Norway	1	37
29	LEONARDO - FINMECCANICA SPA	FINMECCANICA	Italy	1	37
30	THALES AIR SYSTEMS SAS	THALES AIR SYS	France	1	37

1.3. Workplan Tables - Detailed implementation

1.3.1. WT1 List of work packages

WP Number[9]	WP Title	Lead beneficiary[10]	Person-months[11]	Start month[12]	End month[13]
WP1	Project Management	1 - DLR (AT-One)	12.00	1	37
WP2	Solution PJ.05-02 - Remotely Provided Air Traffic Service for Multiple Aerodromes	10 - LFV/COOPANS	597.30	1	36
WP3	Solution PJ.05-03 - Remotely Provided Air Traffic Services from a Remote Tower Centre with a flexible allocation of aerodromes to Remote Tower Modules	12 - DFS	476.16	1	36
WP4	Ethics requirements	1 - DLR (AT-One)	N/A	1	37
		Total	1,085.46		

1.3.2. WT2 list of deliverables

Deliverable Number[14]	Deliverable Title	WP number[9]	Lead beneficiary	Type[15]	Dissemination level[16]	Due Date (in months)[17]
D1.1	Project Management Plan	WP1	1 - DLR (AT-One)	Report	Confidential, only for members of the consortium (including the Commission Services)	5
D1.2	Final Project Report	WP1	1 - DLR (AT-One)	Report	Confidential, only for members of the consortium (including the Commission Services)	34
D1.3	Biannual Report 1	WP1	1 - DLR (AT-One)	Report	Confidential, only for members of the consortium (including the Commission Services)	6
D1.4	Biannual Report 2	WP1	1 - DLR (AT-One)	Report	Confidential, only for members of the consortium (including the Commission Services)	12
D1.5	Biannual Report 3	WP1	1 - DLR (AT-One)	Report	Confidential, only for members of the consortium (including the Commission Services)	18
D1.6	Biannual Report 4	WP1	1 - DLR (AT-One)	Report	Confidential, only for members of the consortium (including the Commission Services)	24
D1.7	Biannual Report 5	WP1	1 - DLR (AT-One)	Report	Confidential, only for members of the consortium (including the Commission Services)	30
D2.1	Solution PJ.05-02: V2 Data Pack	WP2	10 - LFV/COOPANS	Report	Public	22
D2.2	Solution PJ.05-02: V3 Data Pack	WP2	10 - LFV/COOPANS	Report	Public	34

Deliverable Number[14]	Deliverable Title	WP number[9]	Lead beneficiary	Type[15]	Dissemination level[16]	Due Date (in months)[17]
D3.1	Solution PJ.05-03: V2 Data Pack	WP3	12 - DFS	Report	Public	34
D4.1	H - Requirement No. 1	WP4	1 - DLR (AT-One)	Ethics	Confidential, only for members of the consortium (including the Commission Services)	5
D4.2	POPD - Requirement No. 2	WP4	1 - DLR (AT-One)	Ethics	Confidential, only for members of the consortium (including the Commission Services)	5
D4.3	NEC - Requirement No. 3	WP4	1 - DLR (AT-One)	Ethics	Confidential, only for members of the consortium (including the Commission Services)	5
D4.4	M - Requirement No. 4	WP4	1 - DLR (AT-One)	Ethics	Confidential, only for members of the consortium (including the Commission Services)	5

1.3.3. WT3 Work package descriptions

Work package number [9]	WP1	**Lead beneficiary** [10]	1 - DLR (AT-One)
Work package title	Project Management		
Start month	1	**End month**	37

Objectives

Coordination and monitoring of project's progress to accomplish the main objectives regarding time and resources.

Description of work and role of partners

WP1 - Project Management [Months: 1-37]
DLR (AT-One)
Project Management and Coordination. 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 (monthly TelCo, on demand), EPMB (annual and on demand). The Project Manager (PM), together with the PMB and EPMB, will act as project steering committee. Change requests will be handled by the committee to allow flexibility. A management report will be produced every 6 months to document project progress.
Project Quality Management and Standardisation. The coordinator is ISO – 9001 standard certified and will ensure the quality of the project. A project management handbook will be produced to establish a project quality plan.
Reporting and Communication with the SJU. 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. 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).

Participation per Partner

Partner number and short name	WP1 effort
1 - DLR (AT-One)	12.00
Total	12.00

List of deliverables

Deliverable Number[14]	Deliverable Title	Lead beneficiary	Type[15]	Dissemination level[16]	Due Date (in months)[17]
D1.1	Project Management Plan	1 - DLR (AT-One)	Report	Confidential, only for members of the consortium (including the Commission Services)	5
D1.2	Final Project Report	1 - DLR (AT-One)	Report	Confidential, only for members of the consortium (including the Commission Services)	34

List of deliverables

Deliverable Number[14]	Deliverable Title	Lead beneficiary	Type[15]	Dissemination level[16]	Due Date (in months)[17]
D1.3	Biannual Report 1	1 - DLR (AT-One)	Report	Confidential, only for members of the consortium (including the Commission Services)	6
D1.4	Biannual Report 2	1 - DLR (AT-One)	Report	Confidential, only for members of the consortium (including the Commission Services)	12
D1.5	Biannual Report 3	1 - DLR (AT-One)	Report	Confidential, only for members of the consortium (including the Commission Services)	18
D1.6	Biannual Report 4	1 - DLR (AT-One)	Report	Confidential, only for members of the consortium (including the Commission Services)	24
D1.7	Biannual Report 5	1 - DLR (AT-One)	Report	Confidential, only for members of the consortium (including the Commission Services)	30

Description of deliverables

D.05.0.01 Project Management Plan PMP CO T0 + 3
D.05.0.02 Final Project Report PMP CO T0 + 34
D.05.0.03 Q1 2017 Biannual Report CO T0 + 6
D.05.0.04 Q3 2017 Biannual Report CO T0 + 12
D.05.0.05 Q1 2018 Biannual Report CO T0 + 18
D.05.0.06 Q3 2018 Biannual Report CO T0 + 24
D.05.0.07 Q1 2019 Biannual Report CO T0 + 30

D1.1 : Project Management Plan [5]

Project Management Plan

D1.2 : Final Project Report [34]

Final Project Report

D1.3 : Biannual Report 1 [6]

Biannual Progress Report

D1.4 : Biannual Report 2 [12]

Biannual Progress Report

D1.5 : Biannual Report 3 [18]

Biannual Progress Report

D1.6 : Biannual Report 4 [24]

Biannual Progress Report

D1.7 : Biannual Report 5 [30]

Biannual Progress Report

Schedule of relevant Milestones

Milestone number[18]	Milestone title	Lead beneficiary	Due Date (in months)	Means of verification

Work package number [9]	WP2	Lead beneficiary [10]	10 - LFV/COOPANS
Work package title	Solution PJ.05-02 - Remotely Provided Air Traffic Service for Multiple Aerodromes		
Start month	1	End month	36

Objectives

Develop and validate concepts and systems covering the scope and objectives of SESAR Solution PJ.05-02 "Remotely Provided Air Traffic Service for Multiple Aerodromes", addressing the following OI steps:
- SDM-0207: Remotely Provided Air Traffic Service for Multiple Aerodromes
- SDM-0208: Remote Tower Centre supported by short term planning

Produce the associated deliverables to this SESAR solution and prototypes.
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 V2 and V3 datapack.

Further objective is to ensure compliance with the 'ethics requirements' set out in work package 4.

Description of work and role of partners

WP2 - Solution PJ.05-02 - Remotely Provided Air Traffic Service for Multiple Aerodromes [Months: 1-36]
LFV/COOPANS, DLR (AT-One), NLR (AT-One), LPS SR (B4), ON (B4), ACG/COOPANS, CCL/COOPANS, ENAV, FRQ (FSP), HC (FSP), INDRA, SAAB (NATMIG), SINTEF (NATMIG), EUROCONTROL, Swed(SEAC2020), FINMECCANICA , THALES AIR SYS
Perform all necessary activities to achieve V3 maturity of solution PJ.05.02 at the end of wave 1.
This includes the following tasks:

T.05-02.00 V2 Solution Management
Task Description: Operational and technical coordination of the SESAR PJ.05-02 solution, management of related validation activities, timely delivery of V2 and V3 data pack.
Deliverable (SGA Contractual): D2.1 - Solution PJ.05-02 Datapack (V2) and D2.2 - Solution PJ.05-02 Datapack (V3)
Lead: LFV/COOPANS
Contributors: NLR (AT-One), ON (B4), ACG/COOPANS, CCL/COOPANS, ENAV, FRQ (FSP), INDRA, Saab (NATMIG), SINTEF (NATMIG), EUROCONTROL, Swed(SEAC2020), FINMECCANICA, Selex ES GmbH, THALES AIR SYS
Contribution Description:
LFV/COOPANS will act as leader for solution 02
All partners will provide the required input

Solution 02 V2 Validation (SDM-0208)

T.05-02.01 V2 Concept Development
Task Description: Development and update of V2 OSED/SPR/INTEROP for solution 02 at V2 maturity for SDM-0208. This activity will consist on the development of operational, safety, performance and interoperability requirements. Initial versions of OSED/SPR/INTEROP will be prepared as input to the validation plan (VALP) and an initial set of technical requirements (TS).
The initial set of operational, safety, performance and interoperability requirements will then be updated based on the results of the V2 validation exercises.
Deliverable (PMP): D2.1 V2.1 OSED-SPR-INTEROP (V2)
Lead:
LFV/COOPANS will lead the OSED.
EUROCONTROL will lead the SPR.
FRQ (FSP) will lead the INTEROP.
Contributors: ON (B4), ACG/COOPANS, CCL/COOPANS, ENAV, ECTL, Selex ES GmbH, HC (FSP), INDRA, Saab (NATMIG), THALES AIR SYS
Contribution Description:
ON (B4) will provide input to the OSED with 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.

LFV/COOPANS will lead work on OSED coordinating all inputs from partners with baseline of inputs from own validation activities and experience from trials. LFV/COOPANS will invite to trials and provide input to Safety and Human Performance Requirements for the SPR based on results from validations and operative experts participating.
ENAV and its LTP SICTA will provide contribution to OSED and SPR document in particular in terms of concept and operational requirements development.
EUROCONTROL will contribute to OSED ensuring consistency with SPR. EUROCONTROL will lead the work on SPR and will contribute to the content, from initial development to final update based on validation results performed by partners.
Selex ES GmbH will define interoperability requirements in terms of provision of MET data.
HC (FSP) will provide input to the OSED with the Requirements, as derived from the validation results an operational experience. HC (FSP) will provide input on Safety and Performance Requirements based on the validation results an operational experience.
FRQ (FSP) will coordinate INTEROP work split and contribute to technical specification.
INDRA will contribute to the OSED, and Safety and Performance Requirements (SPR) based on the validation results an operational experience. INDRA will contribute to the INTEROP
Saab (NATMIG) will contribute to the INTEROP
THALES AIR SYS will contribute to the INTEROP

T.05-02.02 V2 Technical Specification
Task Description: The TS-IRS at V2 maturity will be developed for solution 02.
This activity will consist in the development of technical requirements split into two tasks. The first one will define a set of initial requirements, based on the V2 initial OSED. The second task will update the initial set of technical requirements based on the results of the V2 validation exercises and on the V2 OSED/SPR/INTEROP.
Deliverable (PMP): D2.1 V2.2 TS-IRS (V2)
Lead: Saab (NATMIG)
Contributors: Selex ES GmbH, FRQ (FSP), INDRA, Saab (NATMIG), THALES AIR SYS
Contribution Description:
Selex ES GmbH will describe the MET system necessary to support RTO for multiple airports at one CWP.
FRQ (FSP) will contribute to the TS.
INDRA will contribute to the Technical Specification.
Saab (NATMIG) will coordinate work split and contribute to technical specification.
SINTEF (NATMIG) will contribute to technical specification.
THALES AIR SYS will contribute to the TS.

T.05-02.03 V2 Cost Benefit Analysis
Task Description: The initial CBA at V2 maturity will be developed for solution 02.
Deliverable (PMP): D2.1V2.3 CBA (V2)
Lead: ON (B4)
Contributors: ON (B4), LFV/COOPANS, EUROCONTROL, HC (FSP), INDRA
Contribution Description:
ON (B4) To ensure CBA addressing in PMP, coordination of timely provision of cost and benefit related data to be collected (planned to be gathered in VALP and presented in VALR) and further used for CBA ensuring the level and integrity as per CBA methodology approach
LFV/COOPANS will provide inputs to the CBA. SDM-0207 on traffic levels and possibility to increase capacity in a multiple CWP. SDM-0208 on more effective planning on airport activities with service provided in a multiple environment.
EUROCONTROL Will support CBA providing system level input and supporting the methodology approach
HC (FSP) will provide inputs to the CBA. SDM-0207 on traffic levels and possibility to increase capacity in a multiple CWP. SDM-0208 on more effective planning on airport activities with service provided in a multiple environment.
INDRA will provide inputs to the CBA according to the results obtained from the validations

T.05-02.04 V2 Validation Plan
Task Description: Development of a consolidated V2 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): D2.1V2.4 Consolidated VALP S02 V2

Lead: LFV/COOPANS will lead overall task as well as detailed Validation Plan for COOPANS. ON (B4) will lead detailed Validation Plan for ON (B4) Validation. INDRA will lead detailed Validation Plan for INDRA Validation
Contributors: NLR (AT-One), ON (B4), ACG/COOPANS. CCL/COOPANS, INDRA, Saab (NATMIG), SINTEF (NATMIG), THALES AIR SYS, EUROCONTROL
Contribution Description:
NLR (AT-One) will provide system development expertise and ATC Operational and Validation expertise for COOPANS validation. NLR (AT-One) experts in the area of Human Performance and Airport Operations will participate in such investigations and will contribute to concept design for COOPANS validation. NLR (AT-One) will contribute with a real-time simulation platform and capacity to find out which combinations of airports are appropriate to be controlled within one RTM for COOPANS validation.
ON (B4) V2 Validation will be performed focusing on one remote tower center (RTC) operating on common regional COM infrastructure (including SWIM solutions implemented). V2 validation will cover human factor, remote ATS provision for GA/Rotorcraft, Training and licencing aspects, infrastructures' assessment (inter alia for Cyber Defence solutions introduced) as well as MET provision including local weather, CWP enhancement issues to support RTC/RTM concept. The validation plan will be provided with the validation objectives being co-ordinated between all validations scheduled for solution 02. The validation plan will be provided with the validation objectives being co-ordinated between all validations scheduled for solution 02.
ON (B4) will coordinate work on the validation plan and will provide operational and technical inputs.
LFV/COOPANS, ACG/COOPANS, CCL/COOPANS The validation plan will be provided with the validation objectives being co-ordinated between all validations scheduled for solution 02. LFV/COOPANS will lead the validation plan. COOPANS partners will provide operative and technical skills when developing systems needed in an RTM, based on experience from SESAR 1 and SDM-0205 as well as implementation of Remote Towers. COOPANS partners have the ability to use live data video from 3 different remotely controlled aerodromes.
INDRA will provide the Validation Plan describing required integration tasks and the configuration of the platform used for the validation exercise. INDRA will also define of validation scenarios and validation objectives for V2 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 V2 validations scheduled for solution 02.
Saab (NATMIG) will provide technical input to the validation plan and contribute in workshops to provide input for COOPANS validation plan.
SINTEF (NATMIG) will provide technical input to the validation plan.
THALES AIR SYS will provide operational and technical expertise and validation know-how to the validation plan for ON (B4) validation.
EUROCONTROL will participate to assure coherency with SPR.

T.05-02.05 V2 Prototyping and Platform Development
Task Description: Development of necessary prototypes and platforms to support the different V2 validation exercises. It will include prototype development, verification activities, prototype integration into the platform, platform tests and acceptance.
Deliverable (PMP): D2.1V2.5 S02 V2 Prototyping and Platform Development
Lead: INDRA will lead prototyping and platform development for INDRA Validation / Saab (NATMIG) will lead prototyping and platform development for COOPANS Validation / THALES AIR SYS will lead prototyping and platform development for ON (B4) Validation
Contributors: NLR (AT-One), LFV/COOPANS, ACG/COOPANS, INDRA, Saab (NATMIG), SINTEF (NATMIG), THALES AIR SYS
Contribution Description:
NLR (AT-One) will provide platform development expertise as well as ATC operational and Validation expertise for COOPANS validation. NLR (AT-One) will contribute with a real-time simulation platform and capacity to find out which combinations of airports are appropriate to be controlled within one RTM for COOPANS validation. NLR (AT-One) experts in the area of Human Performance and Airport Operations will participate in such investigations and will contribute to concept design of tools and features for the CWP and the RTC for FSP validation.
LFV/COOPANS ACG/COOPANS CCL/COOPANS COOPANS partners will contribute with extensive knowledge from research within SESAR as well as internally on operational aspects of both multiple and RTC. 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.

INDRA will enhance the remote Controller Working Position to allow the control from one ATCO/AFISO. With the objective of supporting controller task, technical supervision of the two airports and short term planning tools will be initially integrated providing effective handling of short term issues.
The required prototypes successfully verified will be delivered as well as the validation platform.
Saab (NATMIG) will provide an enhanced multiple RTM 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. Simulator with pseudo-pilot positions. Saab (NATMIG) will develop short term planning tools for RTC.
SINTEF (NATMIG) will develop and integrate technology for coupling 3D models with video for visual support for an operator in a RTM.
THALES AIR SYS will provide validation platform (shadow mode or real-time simulation) in Vilnius (or in Siauliai), Gdansk for ON (B4) validation

T.05-02.06 V2 Validations
Task Description: Development of a consolidated V2 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): D2.1V2.6 Consolidated VALR S02 V2
Lead: ON (B4) will lead detailed Validation Report for ON (B4) Validation. LFV COOPANS will lead the detailed Validation Report for COOPANS Validation and the Consolidated Validation Report. INDRA will lead detailed Validation Report for INDRA Validation
Contributors: NLR (AT-One), ON (B4), LFV/COOPANS, ACG/COOPANS, CCL/COOPANS, INDRA, EUROCONTROL, Saab (NATMIG), SINTEF (NATMIG)
Contribution Description:
NLR (AT-One) will bring in its Human Performance and Validation expertise, participating COOPANS validation exercises with an active role and contributing to prepare COOPANS VALR.
ON (B4) V2 Validation real-time simulation (shadow mode) will be prepared, executed and analysed. The required for prototypes as well as the validation platform will be deployed in Vilnius (or in Siauliai), Gdansk. ON (B4) will develop data inputs needed (electronic flight strips, surveillance data, etc.) to the validation platform. ON (B4) will contribute to the video simulation preparation. ON (B4) perform validation activity by providing controllers and pseudo-pilots
LFV/COOPANS; ACG/COOPANS and CCL/COOPANS will provide operators during validations to ensure high quality data from activities to meet operative improvements and safety levels. They will use engineers skilled from Remote Tower implementation to provide relevant data from research activities to final deliverables
INDRA 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.
Saab (NATMIG) provide technical validation support to COOPANS.
SINTEF (NATMIG) will produce the Validation Report of the resilience of Multiple RTM and issues of network availability, quality of service, and security. Validation process will be adapted from Safety Reference Material, Guidance I.
EUROCONTROL will participate to assure coherency with SPR.

Solution 02 V3 Validation (SDM-0207 & SDM-0208)

T.05-02.11 V3 Concept Development
Task Description:
Development and update of V3 OSED/SPR/INTEROP for solution 02 at V3 maturity for SDM-0207 and SDM-0208. This activity will consist on the development of operational, safety, performance and interoperability requirements. Initial versions of OSED/SPR/INTEROP will be prepared as input to the validation plan (VALP) and an initial set of technical requirements (TS).
The final set of operational, safety, performance and interoperability requirements will then be updated based on the results of the V3 validation exercises.
Deliverable (PMP): D2.2V3.1 OSED-SPR-INTEROP (V3)
Lead: LFV COOPANS will lead the OSED. EUROCONTROL will lead the SPR. FRQ (FSP) will lead the INTEROP.
Contributors:
ON (B4), LPS SR (B4), LFV/COOPANS, ACG/COOPANS, CCL/COOPANS, ENAV, EUROCONTROL, FINMECCANICA, Selex ES GmbH, HC (FSP), INDRA, Saab (NATMIG), THALES AIR SYS
Contribution Description:
LPS SR (B4) together with linked third party MicroStep-MIS will provide input to the OSED with Requirements, as derived from the validation results and operational experience. LPS SR (B4) together with linked third party MicroStep-

MIS will provide input on Safety and Performance Requirements as derived from the validation results and operational experience.
ON (B4) will provide input to the OSED with 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.
LFV/COOPANS, ACG/COOPANS, CCL/COOPANS:
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 and operative experts participating.
ENAV and its LTP SICTA will provide input to the Requirements, as derived from the validation results an operational experience. SICTA will provide input on Safety and Performance Requirements based on the validation results and operational experience.
EUROCONTROL will contribute to OSED ensuring consistency with SPR. EUROCONTROL will lead the work on SPR and will contribute to the content, from initial development to final update based on validation results performed by partners.
Selex ES GmbH will define interoperability requirements in terms of provision of MET data.
FINMECCANICA will support Selex ES GmbH in the definition of interoperability requirements.
HC (FSP) will provide input to the OSED with the Requirements, as derived from the validation results an operational experience. HC (FSP) will provide input on Safety and Performance Requirements based on the validation results an operational experience.
FRQ (FSP) will coordinate INTEROP work split and contribute to technical specification.
INDRA will contribute to the OSED, and Safety and Performance Requirements (SPR) based on the validation results an operational experience.
INDRA will contribute to the INTEROP
Saab (NATMIG) Saab (NATMIG) will contribute to the INTEROP
THALES AIR SYS will contribute to the INTEROP

T.05-02.12 V3 Technical Specification
Task Description: The TS-IRS at V3 maturity will be developed for solution 03.
Deliverable (PMP): D2.2V3.2 TS-IRS (V3)
Lead: Saab (NATMIG)
Contributors: Selex ES GmbH, LPS SR (B4), FRQ (FSP), INDRA, Saab (NATMIG), THALES AIR SYS
Contribution Description:
Selex ES GmbH will describe the MET system necessary to support RTO for multiple airports at one CWP.
LPS SR (B4) together with linked third party MicroStep-MIS will contribute to the TS concerning full MET information and its integration.
FRQ (FSP) will contribute to the TS.
INDRA will contribute to the Technical Specification.
Saab (NATMIG) will coordinate work split and contribute to the technical specification.
SINTEF (NATMIG) will contribute to the technical specification.
THALES AIR SYS will contribute to the TS.

T.05-02.13 V3 Cost Benefit Analysis
Task Description: The CBA at V3 maturity will be developed for solution 02.
Deliverable (PMP): D2.2V3.3 CBA (V3)
Lead: ON (B4)
Contributors: LPS SR (B4), LFV/COOPANS, EUROCONTROL, HC (FSP), INDRA
Contribution Description:
ON (B4) To ensure CBA addressing in PMP, coordination of timely provision of cost and benefit related data to be collected (planned to be gathered in VALP and presented in VALR) and further used for CBA ensuring the level and integrity as per CBA methodology approach.
The LPS SR (B4) together with linked third party MicroStep-MIS will provide support to ON (B4) for processing of CBA.
LFV/COOPANS will provide inputs to the CBA. SDM-0207 on traffic levels and possibility to increase capacity in a multiple CWP. SDM-0208 on more effective planning on airport activities with service provided in a multiple environment.
EUROCONTROL will support CBA providing system level input and supporting the methodology approach
HC (FSP) will provide inputs to the CBA. SDM-0207 on traffic levels and possibility to increase capacity in a multiple CWP. SDM-0208 on more effective planning on airport activities with service provided in a multiple environment.

INDRA will provide inputs to the CBA according to the results obtained from the validations

T.05-02.14 V3 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): D2.2V3.4 Consolidated VALP S02 V3
Lead: LFV/COOPANS will lead overall task as well as detailed Validation Plan for COOPANS. ON (B4) and LPS SR (B4) will lead detailed Validation Plans for ON (B4) and LPS SR (B4) Validations
ENAV will lead detailed Validation Plan for ENAV Validation. SICTA will contribute in the definition of validation objectives and validation scenarios.
HC (FSP) will lead detailed Validation Plan for FSP Validation
INDRA will lead detailed Validation Plan for INDRA Validation
Contributors: DLR (AT-One), NLR (AT-One), ON (B4) and LPS SR (B4), LFV/COOPANS, ACG/COOPANS, CCL/COOPANS, ENAV, FINMECCANICA, Selex ES GmbH, HC (FSP), INDRA, Saab (NATMIG), THALES AIR SYS, EUROCONTROL
Contribution Description:
DLR (AT-One) will provide ATC Operational and Validation expertise to FSP.
NLR (AT-One) will provide system development expertise and ATC Operational and Validation expertise for COOPANS validation. AT-One experts in the area of Human Performance and Airport Operations will participate in such investigations and will contribute to concept design for COOPANS validation. NLR (AT-One) will contribute with a real-time simulation platform and capacity to find out which combinations of airports are appropriate to be controlled within one RTM for COOPANS validation.
LPS SR (B4) The validation plan will be provided with the validation objectives being co-ordinated between all validations scheduled for solution 02.
LPS SR (B4) will coordinate work on the validation plan and will provide operational and technical inputs.
MicroStep-MIS linked third party to LPS SR (B4) will perform work during V3 Validation including validation of Remote MET Observer System in two modes: fully automated (automatic data processing from various sensors installed at remote aerodrome and their presentation to the Remote Tower) and human (presentation of the meteorological data from sensors and cameras from remote airport to the human MET Observer, who is responsible for their processing before these are presented at the Remote Tower Controller's HMI).
ON (B4) The validation plans will be provided with the validation objectives being co-ordinated between all validations scheduled for solution 02. ON (B4) will coordinate work on the validation plan and will provide operational and technical inputs.
V3 Validation will be performed focussing on one remote tower centre (RTC) operating on common regional COM infrastructure (including SWIM solutions implemented). V3 validation will cover human factor, remote ATS provision for GA/Rotorcraft, Training and licencing aspects, infrastructures' assessment (inter alia for Cyber Defence solutions introduced) as well as MET provision including local weather, CWP enhancement issues to support RTC/RTM concept.
LFV/COOPANS, ACG/COOPANS, CCL/COOPANS The validation plan will be provided with the validation objectives being co-ordinated between all validations scheduled for solution 02. LFV/COOPANS will lead the validation plan. COOPANS partners will provide operative and technical skills when developing systems needed in an RTM, based on both experience from SESAR 1 and SDM-0205 as well as implementation of Remote Towers. COOPANS partners have the ability to use live data video from 3 different remotely controlled aerodromes.
ENAV To provide in shared format all the information required to perform validation activities addressed by ENAV. ENAV will lead the task as well as the planned RTS. It will provide all the operational and technical input.
Selex ES GmbH will provide technical input in terms of weather information for HMIs and the corresponding representation for the HC (FSP) Validation Plan.
FINMECCANICA will support Selex ES GmbH with respect to technical input provision for HMIs.
HC (FSP) V3 validation will be prepared and described
Validation activity will focus on a mix of small airport (VFR traffic) and medium to large airport (mainly IFR) aiming a prototype of an integrated multi remote tower HMI concept (voice, video, flight and support info). Budapest in a one runway configuration and a small regional airport will be used.
The validation plan will be provided with the validation objectives being co-ordinated between all validations scheduled for solution 02.
HC (FSP) will coordinate work on the validation plan and will provide operational and technical skills based on implementation of Remote Towers

FRQ (FSP) will provide technical input to the validation plan especially for multi tower working position and related functionality.
INDRA will provide the Validation Plan describing required integration tasks and the configuration of the platform used for the validation exercise. INDRA will also define of 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 02.
Saab (NATMIG) Saab (NATMIG) will provide technical input to the validation plan and contribute in workshops to provide input for COOPANS validation plan.
THALES AIR SYS will provide operational and technical expertise and validation know-how to the validation plan for ON (B4) validation.
EUROCONTROL will participate to assure coherency with SPR.

T.05-02.15 V3 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): D2.2V3.5 S02 V3 Prototyping and Platform Development
Lead: ENAV will lead prototyping and platform development for ENAV Validation
FRQ (FSP) will lead prototyping and platform development for FSP Validation and FRQ RO will support with development.
INDRA will lead prototyping and platform development for INDRA Validation
Saab (NATMIG) will lead prototyping and platform development for COOPANS Validation.
THALES AIR SYS and LPS SR (B4) will lead prototyping and platform development for ON (B4) and LPS SR (B4) Validations
Contributors: DLR (AT-One), NLR (AT-One), LFV/COOPANS, ACG/COOPANS, CCL/COOPANS, ENAV, FINMECCANICA, Selex ES GmbH, FRQ (FSP), INDRA, Saab (NATMIG), SINTEF (NATMIG), THALES AIR SYS, LPS SR (B4)
Contribution Description
NLR (AT-One) will provide platform development expertise and ATC Operational and Validation expertise for COOPANS validation. AT-One experts in the area of Human Performance and Airport Operations will participate in such investigations and will contribute to concept design of tools and features for the CWP and the RTC for FSP validation. AT-One will contribute with a real-time simulation platform and capacity to find out which combinations of airports are appropriate to be controlled within one RTM for COOPANS validation.
DLR (AT-One) will support the prototyping of the FSP validation platform designing the multi tower working position and related functionality by providing its operational and technical expertise, the Remote Tower Lab and its Remote Tower field test platform (incl. MLAT/WAM/ADS-B surveillance) in Braunschweig to prepare FSP validation in Budapest.
LFV/COOPANS / ACG/COOPANS / CCL/COOPANS COOPANS partners will contribute with extensive knowledge from research within SESAR 1 as well as internally on operational aspects of both multiple and RTC. COOPANS partners will continue to provide requirements to SAAB (NATMIG) platform development. 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.
ENAV will provide all the expertise required to perform the proposed validation activities such as platform development operational and validation preparation. SICTA will contribute through KPAs expert during preparation/execution and post execution activities.
NAIS will support ENAV in the analysis, design and development of the visual reproduction of the multiple remote aerodrome views (e.g. static/dynamic visual features/cues also encompassing the visual representation of MET information, PTZ functionalities, 3D virtual scenarios reconstruction) for the validation activities.
Selex ES GmbH will develop MET data simulations for different weather scenarios and integrate them in the FSP validation platform.
FINMECCANICA will support the development of the Selex ES GmbH MET data simulations based their experience on platform development for prototyping.
FRQ (FSP) will provide parts of the validation platform especially a multi remote tower working position for a minimum of 2 airports. with focus on the following integration functions :
• Integration of several airport information in one integrated CWP concept.
• Integration of Voice Services for multiple airports in the Visualisation Environment

• Basic Alerting function based on video sensors and other low cost surveillance
FRQ (FSP) will provide technical support during validation.
INDRA will develop and deliver a Remote CWP prototype enhanced to allow the control of multiple airports (more than two) from one ATCO/AFISO.
With the objective of supporting controller task, technical supervision of several airports and short term planning tools will be fully integrated providing effective handling of short term issues.
Integrated information from multiple airports and Human performance in a multi aerodrome environment will be considered. Also the unified CWP aspects of the RTM operating multiple airports simultaneously focusing on Human Performance, Situational Awareness, Conflict Detection will be included. Special attention will be on MET information and presentation based on local and AIM information, both real time and forecasted.
The required prototypes successfully verified will be delivered as well as the validation platform. The required prototypes successfully verified will be delivered as well as the validation platform.
Saab (NATMIG) will further develop the enhanced multiple RTM based on the solution 02 and requirements from COOPANS partners. Saab (NATMIG) will contribute with a real-time simulator platform with the same interface to a RTM as a normal remote airport and pseudo-pilot positions. Saab (NATMIG) will further develop the short term planning tools for RTC.
SINTEF (NATMIG) will further develop and integrate technology for coupling 3D models with video for visual support for an operator in a RTM.
THALES AIR SYS will provide validation platform (shadow mode or real-time simulation) in Vilnius (or in Siauliai), Gdansk for ON (B4) validation.
LPS SR (B4) together with linked third party MicroStep-MIS will develop required prototypes as well as the validation platform for LPS SR (B4) validation.
Thales LTP Searidge will deploy its intelligent video system: IntelliDAR Video Platform to monitor all airfield targets (aircraft, vehicles, humans, etc.). Searidge will contribute to integrate IntelliDAR platform to THALES AIR SYS validation platform.

T.05-02.16 V3 Validations
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): D2.2V3.6 Consolidated VALR S02 V3
Lead: LPS SR (B4) will lead detailed Validation Reports for LPS SR (B4) Validations / ON (B4) will lead detailed Validation Reports for ON (B4) Validations / LFV/COOPANS will lead the detailed Validation Report for COOPANS Validation and the Consolidated Validation Report / ENAV will lead detailed Validation Report for ENAV Validation / HC (FSP) will lead overall task as well as detailed Validation Report for FSP Validation / INDRA will lead detailed Validation Report for INDRA Validation
Contributors: DLR (AT-One), NLR (AT-One), ON (B4), LPS SR (B4), LFV/COOPANS, ACG/COOPANS, CCL/COOPANS, ENAV, EUROCONTROL, Selex ES GmbH, HC (FSP), Saab (NATMIG), INDRA
Contribution Description
AT-One partners will bring in its Human Performance and Validation expertise, participating in FSP (DLR (AT-One)) and COOPANS (NLR (AT-One)) validation exercises with an active role and contributing to prepare the FSP (DLR (AT-One) and COOPANS VALR (NLR (AT-One)).
ON (B4) V3 Validation real-time simulation (shadow mode) will be prepared, executed and analysed. The required for prototypes as well as the validation platform will be deployed in Vilnius (or in Siauliai), Gdansk.
ON (B4) will develop data inputs needed (electronic flight strips, surveillance data, etc.) to the validation platform.
ON (B4) will contribute to the video simulation preparation.
ON (B4) perform validation activity by providing controllers and pseudo-pilots
LPS SR (B4) together with linked third party MicroStep-MIS during V3 will prepare, execute and analyse Validation (for Remote MET Observer). The required prototypes as well as the validation platform will be developed in Bratislava.
LPS SR (B4) together with linked third party MicroStep-MIS will develop, deploy and validate Remote MET Observer System.
LFV/COOPANS / ACG/COOPANS / CCL/COOPANS COOPANS partners will provide operators during 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 deliverable.
ENAV will lead the task, will manage the RTS execution and will collect and analyse available results. SICTA will contribute through KPAs experts during preparation/execution and post execution phases. NAV CANADA will contribute in the task by supporting ENAV on RTS validation.

Selex ES GmbH will provide MET data simulations for different weather scenarios and test and evaluate the provision and representation of MET data for different airports for the FSP VALR.
HC (FSP) will lead the validation report. 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. HC (FSP) will use engineers skilled from Remote Tower implementation to provide proper technical information and infrastructure (cameras, network infrastructures, operation room and consoles) to final deliverables. Operational considerations specific to cooperative RPAS will be identified and consider as well.
Saab (NATMIG) provide technical validation support to COOPANS.
INDRA 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 V3 Datapack
EUROCONTROL will participate to assure coherency with SPR.

With effort spent by all WP2 partners this work package also sets out the 'ethics requirements' that work package 2 must comply with.

Participation per Partner

Partner number and short name	WP2 effort
1 - DLR (AT-One)	13.00
2 - NLR (AT-One)	9.60
4 - LPS SR (B4)	3.66
MicroStep-MIS	58.93
5 - ON (B4)	16.12
7 - ACG/COOPANS	12.75
8 - CCL/COOPANS	7.93
10 - LFV/COOPANS	81.34
13 - ENAV	3.09
Nav Canada	2.71
SICTA	5.65
NAIS	8.85
14 - FRQ (FSP)	78.00
FRQ RO	81.00
16 - HC (FSP)	12.00
17 - INDRA	29.83
Avinor ANS	4.50
Indra Navia	46.74
19 - SAAB (NATMIG)	28.00
20 - SINTEF (NATMIG)	22.00
21 - EUROCONTROL	20.00
27 - Swed(SEAC2020)	2.00
29 - FINMECCANICA	6.00
Selex ES GmbH	20.60

Partner number and short name	WP2 effort
30 - THALES AIR SYS	9.00
Searidge	14.00
Total	597.30

List of deliverables

Deliverable Number[14]	Deliverable Title	Lead beneficiary	Type[15]	Dissemination level[16]	Due Date (in months)[17]
D2.1	Solution PJ.05-02: V2 Data Pack	10 - LFV/COOPANS	Report	Public	22
D2.2	Solution PJ.05-02: V3 Data Pack	10 - LFV/COOPANS	Report	Public	34

Description of deliverables

Solution PJ.05-02: V2 Data Pack T0+22
Solution PJ.05-02: V3 Data Pack T0+34

D2.1 : Solution PJ.05-02: V2 Data Pack [22]

Development and update of V2 OSED/SPR/INTEROP for solution 02 at V2 maturity for SDM-0208. This activity will consist on the development of operational, safety, performance and interoperability requirements. Initial versions of OSED/SPR/INTEROP will be prepared as input to the validation plan (VALP) and an initial set of technical requirements (TS).

D2.2 : Solution PJ.05-02: V3 Data Pack [34]

Development and update of V3 OSED/SPR/INTEROP for solution 02 at V3 maturity for SDM-0207 and SDM-0208. This activity will consist on the development of operational, safety, performance and interoperability requirements. Initial versions of OSED/SPR/INTEROP will be prepared as input to the validation plan (VALP) and an initial set of technical requirements (TS).

Schedule of relevant Milestones

Milestone number[18]	Milestone title	Lead beneficiary	Due Date (in months)	Means of verification
MS1	V2 Gate for solution PJ.05-02	10 - LFV/COOPANS	24	Gate Review Availability
MS2	V3 Gate for solution PJ.05-02	10 - LFV/COOPANS	34	Gate Review Availability

Work package number [9]	WP3	**Lead beneficiary** [10]	12 - DFS
Work package title	Solution PJ.05-03 - Remotely Provided Air Traffic Services from a Remote Tower Centre with a flexible allocation of aerodromes to Remote Tower Modules		
Start month	1	**End month**	36

Objectives

Develop and validate concepts and systems covering the scope and objectives of SESAR Solution PJ.05-03 "Remotely Provided Air Traffic Services from a Remote Tower Centre with a flexible allocation of aerodromes to Remote Tower Modules ", addressing the following OI steps:
- SDM-0209: Remote Tower Center supported by Long-term Planning
- SDM-0210: Highly Flexible Allocation of Aerodromes to controller working positions
Produce the associated deliverables to this SESAR solution and prototypes.

The objective is to achieve a full V2 maturity level at the end of wave 1.
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 V2 datapack.

Further objective is to ensure compliance with the 'ethics requirements' set out in work package 4.

Description of work and role of partners

WP3 - Solution PJ.05-03 - Remotely Provided Air Traffic Services from a Remote Tower Centre with a flexible allocation of aerodromes to Remote Tower Modules [Months: 1-36]
DFS, DLR (AT-One), NLR (AT-One), ON (B4), ACG/COOPANS, CCL/COOPANS, LFV/COOPANS, ENAV, FRQ (FSP), HC (FSP), INDRA, SAAB (NATMIG), SINTEF (NATMIG), EUROCONTROL, Swed(SEAC2020), FINMECCANICA , THALES AIR SYS
Perform all necessary activities to achieve V2 maturity of solution PJ.05.03 at the end of wave 1. This includes:

T.05-03.00 V2 Solution Management
Task Description: Operational and technical coordination of the SESAR PJ.05-03 solution, management of related validation activities, timely delivery of V2 data pack.
Deliverable (SGA Contractual) : D3.1.V2. Datapack (V2)
Lead: DFS
Contributors: DLR (AT-One), NLR (AT-One), ON (B4), LFV/COOPANS, ACG/COOPANS, CCL/COOPANS, DFS, ENAV, FRQ (FSP) and HC (FSP), INDRA, Saab (NATMIG), SINTEF (NATMIG), EUROCONTROL, Swed(SEAC2020), Selex ES GmbH, THALES AIR SYS
Contribution Description: DFS will act as leader for solution 03. All partners will provide the required input.With effort spent by all WP3 partners this work package also sets out the 'ethics requirements' that work package 3 must comply with.

T.05-03.01 V2 Concept Development
Task Description: Development and update of V2 OSED/SPR/INTEROP for solution 03 at V2 maturity for SDM-0209 and SDM-0210. This activity will consist of the development of operational, safety, performance and interoperability requirements. Initial versions of OSED/SPR/INTEROP will be prepared as input to the validation plan (VALP) and an initial set of technical requirements (TS). The initial set of operational, safety, performance and interoperability requirements will then be updated based on the results of the V2 validation exercises.
Deliverable (PMP): D3.1.V2.1 OSED-SPR-INTEROP (V2)
Lead: LFV/COOPANS will lead the overall task as well as OSED development. EUROCONTOL will lead SPR development. FRQ (FSP) will lead INTEROP development.
Contributors: ON (B4), DFS, ACG/COOPANS, CCL/COOPANS, ENAV, EUROCONTROL, Selex ES GmbH, HC (FSP) and FRQ (FSP), INDRA, Saab (NATMIG), THALES AIR SYS
Contribution Description:
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.
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.
ENAV, SICTA and NAIS 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 and SICTA will also participate in the consolidation and review process of OSED, when updated with V2 results. ENAV and SICTA 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 and SICTA will also participate in the consolidation and review process of SPR, when updated with V2 results. NAIS will contribute on Safety / Performance requirements focusing on Cyber-security, Network quality of Service.
EUROCONTROL will lead the work on SPR and will contribute to the content, from initial development to final update based on validation results performed by EUROCONTROL will participate to OSED in order to assure coherency with SPR.
Selex ES GmbH will define interoperability requirements in terms of provision of MET data.
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.
FRQ (FSP) will lead the work on INTEROP.
INDRA will contribute to OSED and SPR based on validation results and operational experience. INDRA will provide inputs to the INTEROP.
Saab (NATMIG) Saab (NATMIG) will contribute to INTEROP.
THALES AIR SYS will contribute to INTEROP.

T.05-03.02 V2 Technical Specification
Task Description: The TS-IRS at V2 maturity will be developed for solution 03. This activity will consist in the development of technical requirements. It will be split into two tasks. The first one will define a set of initial requirements, based on the V2 initial OSED. The second task will update the initial set of technical requirements based on the results of the V2 validation exercises and on the V2 OSED/SPR/INTEROP.
Deliverable (PMP): D3.1.V2.2 TS-IRS (V2)
Lead: Saab (NATMIG)
Contributors: INDRA, FRQ (FSP), Saab (NATMIG), SINTEF (NATMIG), Selex ES GmbH, THALES AIR SYS
Contribution Description:
Selex ES GmbH will describe the MET system necessary to support RTO with a flexible allocation of airports to RTMs.
FRQ (FSP) will contribute with technical requirements.
INDRA will contribute to the Technical Specification.
Saab (NATMIG) will coordinate work split and contribute to the technical specification.
SINTEF (NATMIG) will contribute to the technical specification.
THALES AIR SYS will contribute to the Technical Specification.

T.05-03.03 V2 Cost Benefit Analysis
Task Description: The CBA at V2 maturity will be developed for solution 03. 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): D3.1.V2.3 CBA (V2)
Lead: HC (FSP)
Contributors: LFV/COOPANS, DFS, INDRA, EUROCONTROL, ON (B4)
Contribution Description:
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 will contribute with benefit mechanisms to the CBA.
EUROCONTROL will support CBA providing system level input and supporting the methodology approach.
HC (FSP) will coordinate work of provision of cost and benefit related data to be collected (planned to be gathered in VALP and presented in VALR) and further used for CBA ensuring the level and integrity as per CBA methodology approach.
INDRA will provide inputs to the CBA according to the results obtained from the validations.

T.05-03.04 V2 Validation Plan

Task Description: Development of a consolidated V2 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): D3.1.V2.4 V2 Consolidated Validation Plan
Lead: DFS will lead overall task as well as detailed Validation Plan for DFS Validation. COOPANS will lead detailed Validation Plan for COOPANS Validation. INDRA will lead detailed Validation Plan for INDRA Validation. ON (B4) will lead detailed Validation Plan for ON (B4) Validation. HC (FSP) will lead detailed Validation Plan for Frequentis SESAR Partners Validation.
Contributors: DLR (AT-One), NLR (AT-One), ON (B4), LFV/COOPANS, ACG/COOPANS, CCL/COOPANS, DFS, FRQ (FSP), INDRA, Saab (NATMIG), SINTEF (NATMIG), Selex ES GmbH, THALES AIR SYS, EUROCONTROL
Contribution Description:
NLR (AT-ONE) will provide system development, validation and HMI expertise and validation know-how to the COOPANS Validation Plan.
DLR (AT-One) will provide HMI expertise and validation know-how to the DFS and Validation Plan.
ON (B4) validation plan will address SDM-0210 and SDM-0209 focussing on interconnection of at least 2 remote tower centres (RTC) via common regional COM infrastructure (including SWIM solutions implemented). ON (B4) validation will cover 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. ON (B4) will coordinate work on the ON (B4) validation plan and will provide operational and technical inputs. ON (B4) will contribute to the consolidated Validation Plan providing input to validation objectives, criteria and scenarios.
COOPANS validation plan will address SDM-0210 and SDM-0209 focusing on using live data video from 3 different remotely controlled aerodromes.
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 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.
Selex ES GmbH will provide technical input to DFS Validation Plan in terms of weather information for HMIs and the corresponding representation.
HC (FSP) validation plan will address SDM-0210 and SDM-0209 focussing on Remote Tower for medium size airports. The validation will consider heterogeneous environments including differentiation in traffic, service level, surveillance and layout. HC (FSP) will coordinate work on the Frequentis SESAR Partners Validation Plan and will provide operational and technical input. HC (FSP) will contribute to the consolidated Validation Plan providing input to validation objectives, criteria and scenarios.
FRQ (FSP) will provide technical input to DFS Validation Plan.
INDRA will provide the Validation Plan describing required integration tasks and the configuration of the platform used for the validation exercise. INDRA will also define of validation scenarios and validation objectives for V2 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 V2 validations scheduled for solution 03.
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.
THALES AIR SYS will provide operational and technical expertise and validation know-how to the Frequentis SESAR Partners validation plan including simulation expertise. THALES AIR SYS will provide operational and technical expertise and validation know-how to the ON (B4) validation plan including simulation expertise.
EUROCONTROL will participate to assure coherency with SPR.

T.05-03.05 V2 Prototyping and Platform Development
Task Description: Development of necessary prototypes and platforms to support the different V2 validation exercises. It will include prototype development, verification activities, prototype integration into the platform, platform tests and acceptance.
Deliverable (PMP): D3.1.V2.5 V2 Availability Notes

Lead: FRQ (FSP) will lead overall task and will lead prototyping and platform development for Frequentis SESAR Partners Validation. Saab (NATMIG) will lead prototyping and platform development for COOPANS Validation. INDRA will lead prototyping and platform development for INDRA Validation. THALES AIR SYS will lead prototyping and platform development for ON (B4) Validation. DFS will lead prototyping and platform development for DFS Validation.
Contributors: NLR (AT-ONE), LFV/COOPANS, ACG/COOPANS, CCL/COOPANS, ON (B4), DFS, Selex ES GmbH, FRQ (FSP), INDRA, Saab (NATMIG), SINTEF (NATMIG), THALES AIR SYS,
Contribution Description:
NLR (AT-One) will contribute to COOPANS validation with a real-time simulation platform and capacity to find out which combinations of airports are appropriate to be controlled within one RTM. NLR (AT-One) will support development of tools for COOPANS validation to balance workload within an RTM and re-distributes or splits aerodromes to other RTMs in case of remaining planning bottlenecks. NLR Mini-Tower environment set-up as multiple RTM is suitable for validation of such. NLR (AT-One) will co-operate in this effort with NATMIG and COOPANS and simulate a multiple RTM, either standalone or as addition to a larger RTM. Validation of such a development is expected to be carried out mainly with fast-time or gaming exercises as the number of required RTM platforms for shadow-mode or real-time simulation.
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) will develop data inputs needed for ON (B4) validation (electronic flight strips, surveillance data, etc.) to the validation platform.
DFS will provide the DFS validation platform (real-time simulator) in Langen. DFS will develop the flight plan and surveillance related systems for the validation exercise and will co-ordinate integration of prototypes.
Selex ES GmbH will develop MET data simulations for different weather scenarios and provide input to the DFS validation.
FRQ (FSP) will contribute to the DFS validation platform in the area of video based visualization, VCS, video tracking.
FRQ (FSP) will provide basic integration support for voice services in Frequentis SESAR Partners validation.
INDRA will enhance the remote Controller Working Position with the aim for providing flexible allocation of aerodromes to RTM. The prototype will be focused on the Supervisor Role, technical and operational supervision functionality and long term planning tools. Connection of RTCs with flow systems and tools for flexible allocation of all aerodromes included in the RTC in the RTM could be investigated. The required prototypes successfully verified will be delivered as well as the validation platform.
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 many RTM. Saab (NATMIG) will develop long term planning tools for a supervisor position and also for technical supervision for RTC.
SINTEF (NATMIG) will contribute to SWIM infrastructure development.
THALES AIR SYS will provide platform and prototypes for Frequentis SESAR Partners validation. THALES AIR SYS will use an enhanced industrial multiple RTM with RTC functionality with a capability to conduct simulations for real time results. THALES AIR SYS will provide inputs on long term planning tools for a supervisor position and also for technical supervision. THALES AIR SYS will provide the ON (B4) validation platform (shadow mode or real-time simulation) in Vilnius (or in Siauliai), Gdansk. Thales LTP Searidge will deploy or update its intelligent video system: IntelliDAR Video Platform to monitor all airfield targets (aircraft, vehicles, humans, etc.). Searidge will contribute to integrate IntelliDAR platform to THALES AIR SYS validation platform.

T.05-03.06 V2 Validations
Task Description: Development of a consolidated V2 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): D3.1.V2.6 V2 Consolidated Validation Report
Lead: HC (FSP) will lead overall task as well as detailed Validation Report for Frequentis SESAR Partners Validation. LFV/COOPANS will lead detailed Validation Report for COOPANS Validation. INDRA will lead detailed Validation Report for INDRA Validation. ON (B4) will lead detailed Validation Report for ON (B4) Validation. DFS will lead detailed Validation Report for DFS Validation.
Contributors: DLR (AT-One), NLR (AT-One), ON (B4), LFV/COOPANS, ACG/COOPANS, CCL/COOPANS,
DFS, FRQ (FSP), INDRA, Saab (NATMIG), SINTEF (NATMIG), Selex ES GmbH, THALES AIR SYS, EUROCONTROL
Contribution Description:

NLR (AT-ONE) will contribute to COOPANS and DLR (AT-One) will contribute to DFS validation with validation support, analyse the validation results and develop validation report with partner contributions.
ON (B4) will execute the V2 validation providing controllers. ON (B4) will lead development of ON (B4) validation report and also contribute to the consolidated validation report. ON (B4) will prepare, execute and analyse V2 validation being a real-time simulation. ON (B4) perform validation activity by providing controllers and pseudo-pilots.
COOPANS partners will execute the COOPANS V2 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 V2 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 will execute the DFS V2 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 V2 validation being a real-time simulation.
HC (FSP) will execute the Frequentis SESAR Partners V2 validation providing controllers. HC (FSP) will lead development of Frequentis SESAR Partners validation report and also contribute to the consolidated validation report. HC (FSP) will prepare, execute and analyse Frequentis SESAR Partners V2 validation being a real time simulation. 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. HC (FSP) will have the ability to use live data and video from a medium size aerodromes.
FRQ (FSP) will provide technical support during DFS validation.
Selex ES GmbH will provide MET data simulations for different weather scenarios and test and evaluate the provision and displaying of MET data for different airports including the switching from one RTM to another.
INDRA 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.
EUROCONTROL will participate to assure coherency with SPR
Saab (NATMIG) will participate and support validations exercises.
SINTEF (NATMIG) will produce the Validation Report describing the resilience and flexibility of Multiple RTM reconfiguration in case of network incidents. Validation process will be adapted from Safety Reference Material, Guidance I.
THALES AIR SYS will participate and support validations exercises.

With effort spent by all WP3 partners this work package also sets out the 'ethics requirements' that work package 3 must comply with.

Participation per Partner

Partner number and short name	WP3 effort
1 - DLR (AT-One)	10.00
2 - NLR (AT-One)	16.10
5 - ON (B4)	17.46
7 - ACG/COOPANS	4.39
8 - CCL/COOPANS	4.96
10 - LFV/COOPANS	47.97
12 - DFS	77.00
13 - ENAV	2.04
Nav Canada	0.56
SICTA	3.32
NAIS	2.21

Partner number and short name	WP3 effort
14 - FRQ (FSP)	57.00
FRQ RO	54.00
16 - HC (FSP)	4.00
17 - INDRA	19.88
Avinor ANS	3.00
Indra Navia	31.17
19 - SAAB (NATMIG)	61.40
20 - SINTEF (NATMIG)	7.00
21 - EUROCONTROL	21.90
27 - Swed(SEAC2020)	2.00
29 - FINMECCANICA	0.00
Selex ES GmbH	8.80
30 - THALES AIR SYS	13.00
Searidge	7.00
Total	476.16

List of deliverables

Deliverable Number[14]	Deliverable Title	Lead beneficiary	Type[15]	Dissemination level[16]	Due Date (in months)[17]
D3.1	Solution PJ.05-03: V2 Data Pack	12 - DFS	Report	Public	34

Description of deliverables

Solution PJ.05-03: V2 Data Pack T0+34

D3.1 : Solution PJ.05-03: V2 Data Pack [34]

Development and update of V2 OSED/SPR/INTEROP for solution 03 at V2 maturity for SDM-0209 and SDM-0210. This activity will consist of the development of operational, safety, performance and interoperability requirements. Initial versions of OSED/SPR/INTEROP will be prepared as input to the validation plan (VALP) and an initial set of technical requirements (TS).

Schedule of relevant Milestones

Milestone number[18]	Milestone title	Lead beneficiary	Due Date (in months)	Means of verification
MS3	V2 Gate for solution PJ.05-03	12 - DFS	34	Gate Review Availability

Work package number [9]	WP4	Lead beneficiary [10]	1 - DLR (AT-One)
Work package title	Ethics requirements		
Start month	1	End month	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

Deliverable Number[14]	Deliverable Title	Lead beneficiary	Type[15]	Dissemination level[16]	Due Date (in months)[17]
D4.1	H - Requirement No. 1	1 - DLR (AT-One)	Ethics	Confidential, only for members of the consortium (including the Commission Services)	5
D4.2	POPD - Requirement No. 2	1 - DLR (AT-One)	Ethics	Confidential, only for members of the consortium (including the Commission Services)	5
D4.3	NEC - Requirement No. 3	1 - DLR (AT-One)	Ethics	Confidential, only for members of the consortium (including the Commission Services)	5
D4.4	M - Requirement No. 4	1 - DLR (AT-One)	Ethics	Confidential, only for members of the consortium (including the Commission Services)	5

Description of deliverables

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

D4.1 : H - Requirement No. 1 [5]

2.1. Details on the procedures and criteria that will be used to identify/recruit research participants must be provided. 2.2. Detailed information must be provided on the informed consent procedures that will be implemented for the participation of humans. 2.3. Templates of the informed consent forms and information sheet must be submitted on request. 2.9. Copies of ethics approvals for the research with humans must be submitted.

D4.2 : POPD - Requirement No. 2 [5]

4.1. Copies of opinion or confirmation by the competent Institutional Data Protection Officer and/or authorization or notification by the National Data Protection Authority must be submitted (which ever applies according to the Data

Protection Directive (EC Directive 95/46, currently under revision, and the national law). 4.4. Detailed information must be provided on the procedures that will be implemented for data collection, storage, protection, retention and destruction and confirmation that they comply with national and EU legislation.

D4.3 : NEC - Requirement No. 3 [5]

6.1. The applicant must confirm that the ethical standards and guidelines of Horizon2020 will be rigorously applied, regardless of the country in which the research is carried out. 6.3. The applicant must provide details on the material which will be imported to/exported from EU and provide the adequate authorisations.

D4.4 : M - Requirement No. 4 [5]

9.1. Details on measures to prevent malevolent/criminal/terrorist abuse of research findings must be provided.

Schedule of relevant Milestones

Milestone number[18]	**Milestone title**	**Lead beneficiary**	**Due Date (in months)**	**Means of verification**

1.3.4. WT4 List of milestones

Milestone number[18]	Milestone title	WP number[9]	Lead beneficiary	Due Date (in months)[17]	Means of verification
MS1	V2 Gate for solution PJ.05-02	WP2	10 - LFV/COOPANS	24	Gate Review Availability
MS2	V3 Gate for solution PJ.05-02	WP2	10 - LFV/COOPANS	34	Gate Review Availability
MS3	V2 Gate for solution PJ.05-03	WP3	12 - DFS	34	Gate Review Availability

1.3.5. WT5 Critical Implementation risks and mitigation actions

Risk number	Description of risk	WP Number	Proposed risk-mitigation measures
1	Availability of operators	WP2	Avoid vacation time – schedule validations well in advance
2	Availability of operators	WP3	Avoid vacation time – schedule validations well in advance
3	Maturity of platform not reached in time	WP2	Consider buffer times
4	Maturity of platform not reached in time	WP3	Consider buffer times
5	Dependencies on inputs from other projects	WP2	Early coordination between other projects' content integration teams on a regular basis
6	Dependencies on inputs from other projects	WP3	Early coordination between other projects' content integration teams on a regular basis

1.3.6. WT6 Summary of project effort in person-months

	WP1	WP2	WP3	WP4	Total Person/Months per Participant
1 - DLR (AT-One)	12	13	10		35
2 - NLR (AT-One)	0	9.60	16.10		25.70
3 - ANS CR (B4)	0	0	0		0
4 - LPS SR (B4)	0	3.66	0		3.66
· MicroStep-MIS	0	58.93	0	0	58.93
5 - ON (B4)	0	16.12	17.46		33.58
6 - PANSA (B4)	0	0	0		0
7 - ACG/COOPANS	0	12.75	4.39		17.14
8 - CCL/COOPANS	0	7.93	4.96		12.89
9 - IAA/COOPANS	0	0	0		0
10 - LFV/COOPANS	0	81.34	47.97		129.31
11 - Naviair/COOPANS	0	0	0		0
12 - DFS	0	0	77		77
13 - ENAV	0	3.09	2.04		5.13
· Nav Canada	0	2.71	0.56	0	3.27
· SICTA	0	5.65	3.32	0	8.97
· NAIS	0	8.85	2.21	0	11.06
14 - FRQ (FSP)	0	78	57		135
· FRQ RO	0	81	54	0	135
15 - ATOS (FSP)	0	0	0		0
16 - HC (FSP)	0	12	4		16
17 - INDRA	0	29.83	19.88		49.71
· Avinor ANS	0	4.50	3	0	7.50
· Indra Navia	0	46.74	31.17	0	77.91

	WP1	WP2	WP3	WP4	Total Person/Months per Participant
18 - AIRTEL (NATMIG)	0	0	0		0
19 - SAAB (NATMIG)	0	28	61.40		89.40
20 - SINTEF (NATMIG)	0	22	7		29
21 - EUROCONTROL	0	20	21.90		41.90
22 - ADP (SEAC2020)	0	0	0		0
23 - MUC (SEAC2020)	0	0	0		0
24 - ZRH (SEAC2020)	0	0	0		0
25 - HAL (SEAC2020)	0	0	0		0
26 - SNBV (SEAC2020)	0	0	0		0
27 - Swed(SEAC2020)	0	2	2		4
28 - AVINOR-SEAC2020	0	0	0		0
29 - FINMECCANICA	0	6	0		6
· Selex ES GmbH	0	20.60	8.80	0	29.40
30 - THALES AIR SYS	0	9	13		22
· Searidge	0	14	7	0	21
Total Person/Months	12	597.30	476.16		1085.46

1.3.7. WT7 Tentative schedule of project reviews

Review number [19]	Tentative timing	Planned venue of review	Comments, if any
RV1	14	TBD	First project control gate
RV2	26	TBD	Second project control gate
RV3	36	SJU, Brussels	Project close out gate

1. Project number

The project number has been assigned by the Commission as the unique identifier for your project. It cannot be changed. The project number **should appear on each page of the grant agreement preparation documents (part A and part B)** to prevent errors during its handling.

2. Project acronym

Use the project acronym as given in the submitted proposal. It can generally not be changed. The same acronym **should appear on each page of the grant agreement preparation documents (part A and part B)** to prevent errors during its handling.

3. Project title

Use the title (preferably no longer than 200 characters) as indicated in the submitted proposal. Minor corrections are possible if agreed during the preparation of the grant agreement.

4. Starting date

Unless a specific (fixed) starting date is duly justified and agreed upon during the preparation of the Grant Agreement, the project will start on the first day of the month following the entry into force of the Grant Agreement (NB : entry into force = signature by the Commission). Please note that if a fixed starting date is used, you will be required to provide a written justification.

5. Duration

Insert the duration of the project in full months.

6. Call (part) identifier

The Call (part) identifier is the reference number given in the call or part of the call you were addressing, as indicated in the publication of the call in the Official Journal of the European Union. You have to use the identifier given by the Commission in the letter inviting to prepare the grant agreement.

7. Abstract

8. Project Entry Month

The month at which the participant joined the consortium, month 1 marking the start date of the project, and all other start dates being relative to this start date.

9. Work Package number

Work package number: WP1, WP2, WP3, ..., WPn

10. Lead beneficiary

This must be one of the beneficiaries in the grant (not a third party) - Number of the beneficiary leading the work in this work package

11. Person-months per work package

The total number of person-months allocated to each work package.

12. Start month

Relative start date for the work in the specific work packages, month 1 marking the start date of the project, and all other start dates being relative to this start date.

13. End month

Relative end date, month 1 marking the start date of the project, and all end dates being relative to this start date.

14. Deliverable number

Deliverable numbers: D1 - Dn

15. Type

Please indicate the type of the deliverable using one of the following codes:

R	Document, report
DEM	Demonstrator, pilot, prototype
DEC	Websites, patent fillings, videos, etc.
OTHER	
ETHICS	Ethics requirement

16. Dissemination level

Please indicate the dissemination level using one of the following codes:

PU	Public
CO	Confidential, only for members of the consortium (including the Commission Services)
EU-RES	Classified Information: RESTREINT UE (Commission Decision 2005/444/EC)
EU-CON	Classified Information: CONFIDENTIEL UE (Commission Decision 2005/444/EC)
EU-SEC	Classified Information: SECRET UE (Commission Decision 2005/444/EC)

17. Delivery date for Deliverable

Month in which the deliverables will be available, month 1 marking the start date of the project, and all delivery dates being relative to this start date.

18. Milestone number

Milestone number:MS1, MS2, ..., MSn

19. Review number

Review number: RV1, RV2, ..., RVn

20. Installation Number

Number progressively the installations of a same infrastructure. An installation is a part of an infrastructure that could be used independently from the rest.

21. Installation country

Code of the country where the installation is located or IO if the access provider (the beneficiary or linked third party) is an international organization, an ERIC or a similar legal entity.

22. Type of access

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

23. Access costs

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

History of Changes

Version	Date	Who	What
0-01	2016-07-26	PJ05 Coordinator	• 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. • Deletion of work package descriptions, effort, milestone and risk tables • A further Ethics Deliverables Work package has been introduced to address the handling of ethics requirements = WP4 Ethics requirements
0-02	2016-09-02	PJ05 Coordinator	• History of version 0-01 supplemented • Figure 1 corrected • Figure 2 corrected • WP0 / WP1 / WP2 due to ECAS platform constraints renamed to WP1 /WP2 / WP3 • references to the EC where it should be SJU - page 20 where it should be SESAR JU corrected • consistency check with partners' names and update when necessary • deletion of table 1 since the list of beneficiaries is already provided by Part A • Justification why contribution of LTP is greater than its related beneficiary added in §4.2 for FINMECCANICA, LPS SR (B4)
0-03	2016-10-14	PJ05 Coordinator	• Figure 2 corrected • consistency check with partners' names and update when necessary • Justification why contribution of LTP is greater than its related beneficiary added in §4.2 for ENAV and Indra • Justification added in $4.2 for legal entities Nav Canada (LTP of ENAV) and searidge LTP of THALES AIR SYS) which are established in non-Member Countries and are requesting financial EU contributions.

			• WP2 effort changed marginally due to: o In the original proposal the sum of 572 person months was wrong (calculation error), should read 594.3 with the original partners figures o It is now 597.3 person months because LTP were not to be mentioned in the original proposal as it is required now. Since man months rates are usually different from the mother beneficiary, slight changes in the effort patterns occur consequently • WP3 effort changed marginally from 487 to 476,15 person months due to: o LTP were not to be mentioned in the original proposal as it is required now. Since man months rates are usually different from the mother beneficiary, slight changes in the effort patterns occur consequently • As a result of solve the dilemma of planned contributions by HuncaroControl both as a beneficiary under FSP consortium and parallel as an LTP of Thales Air Sys there was a re-adjustment of costs: HungaroControl withdraws as LTP of Thales and shifts the forseen LTP costs to FSP in order to contribute the planned tsak as LTP of Thales Air Sys now as an active member of FSP consortium (total costs, planned effort and tasks remain untouched by this shift) – this was agreed by the EU on 2016-10-13 • §3.4 supplemented with a disclaimer regarding the pre-financing
0-04	2016-10-20	PJ05 Coordinator	• EU/SJU changed the project title from “PJ05 - Remote Tower for Multiple Airports” to “Remote Tower for Multiple Airports” • option 14 – Joint several liability – has been activated by EU/SJU when the LTP contribution is higher or similar than the main beneficiary or together with the others amount more than 50% • Project management plan postponed from T0+3 to T0+5
0-05	2016-10-28	HC (FSP), Thales Air Systems	• Update of §3.4 regarding justification of other direct costs by beneficiary HC (FSP) and THALES AIR SYSTEMS
0-06	2016-10-28	Thales Air	• Update of §3.4 regarding justification of other direct costs by beneficiary THALES AIR SYSTEMS

		Systems	

Table of Contents

1 Excellence

This project is part of the SESAR 2020 Multi Annual Program for the period 2016-2019. It is part of the Industrial Research & Validation phase, developed under the SJU Private Public Partnership and addresses topic 8 C.5 “High Performing Airport Operations – Remote Tower for Multiple Airports (PJ05)” in particular.

1.1 Objectives

The costs for performing Air Traffic Service (ATS) particularly at low to medium traffic density airports are high and need to be reduced / limited,. It is very important to maintain this service at small airports to keep rural and remote regions vivid and interesting for people to inhabit and for local industry to grow. Remote Tower Services (RTS) provide an opportunity for continued operations and integration of those airports into the global network.

SESAR 1 performed trials to test the feasibility to perform ATS from a remote location. It was assumed that multiple remote tower operations from a single Controller Working Position (CWP) could increase effectiveness as one operator (ATCO/AFISO) can provide service to more than one aerodrome. Validation in SESAR 1 was conducted within the frame of the three different Operational Improvements,

- Single Remote Tower for low density aerodromes – SDM-0201,
- Contingency solutions for aerodromes with one main RWY – SDM-0204 and
- Multiple solution for two low density aerodromes simultaneously – SDM-0205.

The idea of a Remote Tower Centre (RTC) was only partly covered in discussions, leaving many ideas untouched. This results in a gap between the results achieved in SESAR 1 and the market demand for highly efficient RTC as well as for a potential multiple remote tower solution. This gap will be filled by PJ05 solutions to bring the multiple remote tower and remote tower center to a higher maturity level and provide a baseline for implementations. In Wave 1 the multiple solution will be further developed to maturity level V3, the “Remote Tower Center” solution will be reached V2 maturity.

PJ05 is composed of two solutions:

i. WP2 - Solution PJ.05-02 - Remotely Provided Air Traffic Service for Multiple Aerodromes
ii. WP3 - Solution PJ.05-03 - Remotely Provided Air Traffic Services from a Remote Tower Centre with a flexible allocation of aerodromes to Remote Tower Modules

The main objective of **PJ.05-02: “Remotely Provided Air Traffic Service for Multiple Aerodromes”** is to validate that the provision of ATS for two or more aerodromes simultaneously is possible, and concurrently reveals a sufficient level of safety. 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:

- different level of airport complexity,
- varying controller workload and
- variable traffic mix (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 local actual and forecasted weather (MET) and the local actual and forecasted status of the infrastructure (AIM) will need to be addressed from various operational perspectives as well as short term planning tools. Attention will be given to the definition of information needs, liaising with PJ18 to develop potential System Wide Information Management (SWIM) enabled MET and AIM capabilities to support these needs, and to integrating this information into the remote Controller Working Position (CWP). Human Performance (HP) aspects in the working environment will be addressed on a case-by-case basis, as well as the impact of different technical solutions on operations. Training and licensing aspects will be considered to be prepared for the deployment phase.

The second SESAR Solution **PJ.05-03 "Remotely Provided Air Traffic Services from a Remote Tower Centre with a flexible allocation of aerodromes to Remote Tower Modules"** addresses the flexible use of the human resource ATCO/AFISO through a flexible and dynamic allocation of airports connected to different RTMs. In some environments an integration of airport approach positions connected to the RTC need to be investigated, and connections of RTCs with systems for flow management have to be considered. Development of long term planning tools and features for a flexible planning of all aerodromes connected to remote tower services will be addressed. The solution further addresses additional automation functionalities like voice recognition, alerting and warnings for conflict, and resolution advisories. 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), handling of contingency situations, and situational awareness as indicator for safety and cross border interoperability issues will be further considered by this solution. A V2 maturity is the aim for planning automation, and V3 maturity (Wave 2) is the aim for providing solutions for a "highly flexible allocation of aerodromes to RTMs".

1.2 Relation to the SESAR 2020 Work programme

This document constitutes the SESAR2020 Consortium Members' response to the Industrial Research topic PJ05 'Remote Tower for Multiple Airports' within the area of High Performing Airport Operations as defined in the SESAR 2020 Work Programme.

The proposal builds on the work already performed in SESAR 1 where the focus was lying on validating the technical and operational feasibility of the Remote Tower. The new overall objective of PJ05 is the development and validation of a multiple / center solution that furthermore can increase the cost effectiveness of remote tower while maintaining safety/security and capacity at an acceptable level. Any potential issues regarding degradation of human performance will be mitigated by adjusting procedures or introducting new system functionalities.

The following are the key elements requiring further development within the project in order to realise the multiple / center concept for solution PJ.05-02: "Remotely Provided Air Traffic Service for Multiple Aerodromes"

- Several different environments (which type and how many airports with how much traffic can be controlled)
- Short-term planning tools for RTC development with a limited number of aerodromes connected
- RTM development of a workable visual reproduction of several remote aerodrome views enhanced with other sensor data, additional information for low visibility or night conditions at any of the aerodromes that can be presented as overlays
- Provision of enhanced Voice Communication System (VCS) to support multiple RTMs
- SWIM infrastructure
- MET / AIM integration (local actual and forecasted weather and status of the infrastructure)
- Consider Human Performance aspects (appropriate Workload / Situational Awareness)

For PJ.05-03 "Remotely Provided Air Traffic Services from a Remote Tower Centre with a flexible allocation of aerodromes to Remote Tower Modules" the key elements are:

- Integration of approach control
- Long term planning tools for RTC development with a large number of aerodromes connected
- Handover of airports between Remote Tower Modules (RTM)
- RTC to RTC coupling
- Additional automation functionalities (voice recognition, alerting and warnings for non-conformances)

- SWIM infrastructure
- Proof of the need for the implementation of functionality for the role of a RTC supervisor
- Technical aspects (e.g. network)
- Development of the RTC (with several RTMs)
- Seamless integration of air/ground multi sensor tracking
- Situational Awareness as indicator for safety
- Cross border interoperability

The paradigm shift that occurs due to an aerodrome ATCO / AFISO being responsible for more than one airport at the same time is the challenge that PJ05 addresses. PJ05 will provide technical and operational evidence that this new ATS concept will be feasible in terms of controllers' acceptance and proper technical solutions achieving a better cost efficiency and maintaining required safety margins. SESAR 1 achieved this for the single airport solution but for the multiple / center solution this project is absolutely needed by the ATM community world-wide.

In the last decade the remote tower concept received world-wide attention. Starting with interests of the Swedish and German ANSPs the concepts spill over to Norway, Ireland, Spain etc. but also to Australia, the US and Canada. One single remote Tower is already operationally running in Sweden, but the greatest gains in terms of cost-efficiency are expected in multiple / center solutions which are anticipated to get deployed very short term. PJ05 will enable this deployment plan that aerodrome control can continue operating safe and by affordable costs.

1.3 Concept and methodology

1.3.1 CONCEPT

In SESAR 1 the concept for Single Remote Tower (SDM-0201), Contingency Remote Tower (SDM-0204) and Multiple Remote Tower for two small aerodromes (SDM-0205) was developed. Based on this work the concept for Multiple Remote Tower will be expanded in SESAR 2020 to cover more airports at a time and more traffic that is controlled from one RTM.
This concept will be validated in several validation activities and validation platforms, in simulated environments and in passive shadow mode environments by ATCOs/AFISOs acting as test subjects under experimental conditions. The validated concept of both solutions will be used for providing input to standardisation of systems (EUROCAE WG100). Furthermore the concept aims at providing input for EASA for having common regulations for approval of CWPs (that approved CWPs from one NSA are approved for all ANSPs with minor local implementation).

1.3.1.1 CONCEPT – WP2 "Remotely Provided Air Traffic Service for Multiple Aerodromes":

Main Ideas

Solution 02 aims to develop the RTM, further based on SESAR 1 and SDM-0205. The primary goal is to develop a more advanced RTM enhanced with features for automation and support for operators in an environment with several connected aerodromes. Solution 02 also aims to ensure that short-term planning tools are developed for an RTC where just a few RTMs are connected as and control a limited amount of aerodromes.

The concept for WP2 will address the following OI steps:

- SDM-0207 — Remotely Provided Air Traffic Service for Multiple Aerodromes
  this OI will look into the impact of different runway combinations and how different amount of traffic affect the operators possibility to stay in control.

- SDM-0208 — Remote Tower Centre supported by Short-term Planning
  this OI will develop short term planning tools for an environment with a couple of RTMs for more effective handling of short term issues such as the daily operative work

These two OI steps will lead to a more cost effective RTM for any ANSP to implement without the need of building a large RTC with a numerous amount of RTMs and connected aerodromes.

With regards to SDM-0208, this OI has been allocated to Solution 03 in DoW, however it was agreed by all partners to move the OI to Solution 02 to enable the integration of short term planning tools in RTM.

Maturity[1]

Solution 02 builds on experience from SESAR 1 and SDM-0205 which already reached V3 status.

The aim of this solution is to start at V2 level with the short-term planning tools (SDM-0208). SDM-0207 will start at V2 and is expected to reach V3 at the end of Wave 1.

SDM-0207 has a final deliverable on V3 at Q2 of 2019, R9

SDM-0208 has a V2 during R7 and a final deliverable on V3 level at end of wave 1

Assumptions

As every aerodrome has its own layout and different amounts of traffic, there is a need to develop an RTM that could increase automation at an early stage as well as measurements on feasible traffic amounts.

Operational R&D Needs

Development of a multiple RTM and research on short term planning tools for a more effective planning of more than one RTM:

- The HMI of the RTM will be fine-tuned based on the features already available from previous work in SESAR 1.
- Aerodromes with more than one runway, still having one main runway (crossing VMC RWY or grass strip) will be addressed
- A possibility to merge and split the mapping of aerodromes, while also adding split and merge procedures for the limited number of aerodromes connected.
- Investigate whether local endorsements on an RTM comply with all other connected aerodromes and how the operators can be kept fit for work in any situation within the RTM
- Short term planning tools for daily operative work for the aerodromes connected to the RTC will be developed.
- Local endorsement and a generic license of use for the RTC system rather than on a fixed aerodrome basis (compared to pilots who are licensed on a plane), will be investigated in cooperation with EASA
- Integration of co-operative RPAS will be considered
- MET information needs to be integrated in the RTM in a way that supports situational awareness for more than one runway and multiple airports.

Technical R&D Needs

- All visual reproduction features needed for any of the aerodromes and all data from each one of the aerodromes will be provided
- Visual features such as overlays to enable coping t with several aerodromes at the same time will be provided

[1] The dates to the different maturity levels are adapted to the deferred project start caused by external reasons.

- The RTM will need enhanced VCS (integrated in the CWP) to enable the operator to stay focused on the visual presentation of all aerodromes
- Short term planning tools for daily operative work for the RTMs connected to the RTC.
- Tools and features that enable the RTMs to handle operational obstacles such as snow sweeping, maintenance, lawn moving in an effective way will be developed
- Investigation on how to include and represent MET information for multiple airports and airports with more than one runway.
- Enhanced PTZ functionality for a CWP suitable for several aerodromes will be developed
- Cyber Security will be addressed
- SWIM related service models to be consumed by and/or distributed from the RTC will be addressed.

1.3.1.2 CONCEPT – WP3"Remotely Provided Air Traffic Services from a Remote Tower Centre with a flexible allocation of aerodromes to Remote Tower Modules":

Main Ideas

The main idea of solution 03 is to extend the multiple remote tower concept to a higher number of airports with higher traffic volumes. In order to optimize the balance between traffic demand and the number of ATCOs/AFISOs required, a flexible allocation of airports to the different RTMs within the RTC will be investigated. In addition to this, new automation functionalities supporting the ATCO/AFISO as well as the implementation of new functionality for the role of a RTC supervisor will be investigated. This should lead to a further improvement in cost-efficiency.

The concept for WP3 will address the following OI steps:

- SDM-0210 — Highly Flexible Allocation of Aerodromes to Remote Tower Modules
  - flexible allocation of aerodromes to RTMs will optimise the balance between traffic demand and operator workload. Supporting automation functionalities will increase the traffic volumes that can be controlled from one RTM.
- SDM-0209 — Remote Tower Center supported by Long-term Planning
  - in order to support the flexible allocation of aerodromes to RTMs, long-term planning will be established in addition to the short-term planning.

Maturity

Solution 03 starts with maturity level V1 and will reach V2 by the end of wave 1. In wave 2 the solution will reach maturity level V3.

Assumptions

The human actor involved in the solution is the operator (ATCO/AFISO/RTC supervisor) that works on one RTM. There is no workshare foreseen between different RTMs.

The systems available within the RTC are harmonized in solution 03 in order to be able to transfer airports between RTMs in a flexible manner.

It is expected that a supervisor role will change with the flexible allocation of airports to RTMs. This requires that the supervisor is provided with long term planning systems and is present in the RTC on a regular basis.

It is assumed that all relevant MET information is already available in the RTC. The work will therefore focus on the question on how to best integrate MET information into the HMI.

Operational R&D Needs

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

- The RTM must be designed in a way that allows integration of 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.
- Long term planning needs to be established considering aspects like planning of allocation of operators, airports and RTMs which are closely interlinked
- MET information needs to be integrated in the RTM in a way that supports situational awareness for multiple airports.
- Handover procedures for transferring an airport from one RTM to another will be defined and validated.
- Automation support for monitoring tasks needs to be developed in order to reduce ATCO/AFISO's workload. This adds requirements on non-cooperative surveillance and voice services that need to be investigated.
- The role for the supervisor needs to be defined and validated
- Integration of co-operative RPAS will be considered

Technical R&D Needs

- The technical solution must be developed to flexibly switch all required systems between the RTMs
- Long term planning tools for planning and allocation of airports to the RTMs.
- SWIM infrastructure needs to be defined
- Network quality of service will be verified
- Resilience and Redundancy Issues will be verified
- Technical supervision in the Remote Tower Center will be investigated
- Cyber Security will be addressed

*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. It is further assumed that RPAS are always co-operative.
- 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 METHODOLOGY – WP2 "Remotely Provided Air Traffic Service for Multiple Aerodromes"

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

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

The list shows that there are many different factors to be considered, therefore a number of different validation sites will be investigated addressing different combinations of those factors in order to allow providing guidelines on how to implement the solution after V3 has been reached.

Validation Approach

The following five validations will be executed in order to reach V3 maturity for Solution 02:

- LPS SR (B4) and ON (B4) Validations for small Slovak, Lithuanian and Polish airports based on THALES AIR SYS prototype and BTS/LPS SR (B4), ON (B4) platforms (Real Time Simulation)
- COOPANS partners validation for small and medium-sized airports, based on platforms further developed from SESAR 1 by Saab (NATMIG) and by NLR (AT-One) (Real Time Simulation + Passive Shadow Mode).
- INDRA validation for small to medium sized Norwegian airports based on INDRA prototype and INDRA (Avinor ANS Linked Third Party) validation platform (Real Time Simulation + Passive Shadow Mode)
- FREQUENTIS SESAR Partners (FSP) validation for one runway of Budapest and a small Hungarian airports based on integrated Frequentis prototype and HC (FSP) validation platform (Passive Shadow Mode)
- ENAV validation for small to medium sized Italian airports based on TBA3D platform updated with changes required by the solution.

The validations will be complementary in terms of:

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

SDM-0207 with the respective enablers will be addressed in the validations as shown in the table below (based on DS15):

	ON (B4)	LPS SR (B4)	ACG/COOPANS, CCL/COOPANS, LFV/COOPANS)	ENAV	HC (FSP)	FRQ (FSP)	INDRA
AERODROME-ATC-79	X		X	X		X	X
AERODROME-ATC-80	X		X	X		X	X
CTE-C14	-		X	X		X	-
METEO-03c	X	X	X	X	X		X
METEO-04c	X	X	X	X	X		X

With the enablers being defined as:

- AERODROME-ATC-79 Provide a Remote CWP that enables one ATCO to control multiple remote towers simultaneously
- AERODROME-ATC-80 Provide the Multiple Remote Tower CWP with additional information that can be presented as overlays
- CTE-C14 Advanced VCS (Voice Com System) for multiple remote towers
- METEO-03c Provision and monitoring of real-time airport weather information, Step 2
- METEO-04c Generate and provide MET information relevant for Airport and approach related operations, Step 2

SDM-0208 with the respective enablers will be addressed in the validations as shown in the table below (based on DS15):

	ON (B4)	ACG/COOPANS, CCL/COOPANS, LFV/COOPANS)	HC (FSP)	INDRA
AERODROME-ATC-81	X	X	X	X
AERODROME-ATC-82	X	X	X	X
METEO-03c	-	X	X	X
METEO-04c	-	X	X	X

With the enablers being defined as:

- AERODROME-ATC-81 Short term planning tools for a remote tower center with several controller working positions
- AERODROME-ATC-82 Technical supervision of several remotely-connected airports and controller working positions.
- METEO-03c Provision and monitoring of real-time airport weather information, Step 2
- METEO-04c Generate and provide MET information relevant for Airport and approach related operations, Step 2

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

	ON (B4)	LPS SR (B4)	ACG/COOPANS, CCL/COOPANS, LFV/COOPANS)	ENAV	HC (FSP)	FRQ (FSP)	INDRA
Two simultaneous airports	X	X	X	X	X		X
More than two airports	X		X				X
Integration of Approach	X		X				
RPAS			X		X		
Cyber Security	X		X				
Supervisor functionality / role	X		X				X
Handover between RTMs			X	X			X
Training and licenses			X	X	X		
Network quality of Service	X		X				
Resilience / Redundancy Issues	X		X			X	
Enhanced VCS			X	X		X	

The solution will be validated at a number of different sites in order to be able to get feedback on the different parameters influencing the number of airports and the level of traffic that can be handled from one RTM.

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 a repetitive way. In addition to this, expert groups will help to analyse the validation results and propose new designs (HMI, architecture). PSM, Passive Shadow Mode, have been a fruitful method to reach V3 during SESAR 1 and will also be used.

Validation Platforms

Six prototypes will be provided by FRQ (FSP), Saab (NATMIG), INDRA, ENAV, THALES AIR SYS and LPS SR (B4), which allow validating the multiple remote tower concepts at six 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

The main dependency will be within PJ05 between solution 02 and solution 03. While solution 02 looks at fixed allocation between airports to RTMs, solution 03 will investigate a flexible allocation. Solution 03 will

take into account the results from solution 02 while on the other hand solution 03 can start developments independently from solution 02.

18.04 will provide MET data/products via SWIM enabled services. If new products will be developed in PJ05 (e.g. RVR in IR) and can therefore be provided as new SWIM service, or new requirements will be defined with respect to already existing MET products (required because e.g. more suitable for displaying as overlays) this will be exchanged with 18.4. It has to be determined which MET information will be directly available to/at airports and which information will be requested via SWIM.

SWIM related service models to be consumed by, and/or distributed from an RTC will be addressed and provided to PJ19 to be compiled in architecture framework (EATMA).

Project 02.08 will provide short term planning tools which will help in optimising runway operations and make best use of different airports and ATC services. The predictability and planning provided by these tools and its integration in the remote tower will support solution2 (WP1) in the decision of airport allocation or multiple aerodrome control.

1.3.2.2 METHODOLOGY – WP3 "Remotely Provided Air Traffic Services from a Remote Tower Centre with a flexible allocation of aerodromes to Remote Tower Modules":

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

- Different traffic volumes (IFR and VFR will be considered as well as Rotorcraft and RPAS)
- Different traffic complexity
- 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 contribute to, 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

The following five validations will be executed in order to reach V2 maturity for Solution 03:

- ON (B4) Validation for small Lithuanian and Polish airports based on THALES AIR SYS prototype ON platform (Real Time Simulation)
- DFS validation for medium size German airports based on integrated Frequentis/DFS prototype and DFS platform (Real Time Simulation)
- COOPANS validation for small and medium-sized airports, based on platforms further developed from SESAR 1 by Saab (NATMIG) and by NLR (AT-One), based on Solution 02 (Real Time Simulation + Passive Shadow Mode).
- INDRA validation for small and medium sized Norwegian airports based on INDRA prototype and INDRA (Avinor ANS as Linked Third Party) validation platform (Real Time Simulation + Passive Shadow Mode)
- HC (FSP) validation for medium and small Hungarian airports based on integrated THALES AIR SYS prototype and HC (FSP) validation platform (Real Time Simulation)

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-0209 (Remote Tower Center supported by Long-term Planning) with the respective enablers will be addressed in the validations as shown in the table below (based on DS15):

	ON (B4)	ACG/COOPANS, CCL/COOPANS, LFV/COOPANS)	HC (FSP)	INDRA
AERODROME-ATC-83	X	X	X	X
METEO-03c		X	X	X
METEO-04c	-	-	X	X

With the enablers being defined as:

- AERODROME-ATC-83 Long term planning tools to enable a more flexible usage of CWP and staffing for traffic as well as shift planning.
- METEO-03c Provision and monitoring of real-time airport weather information, Step 2
- METEO-04c Generate and provide MET information relevant for Airport and approach related operations, Step 2

SDM-0210 with the respective enablers will be addressed in the validations as shown in the table below (based on DS15):

	ON (B4)	ACG/COOPANS, CCL/COOPANS, LFV/COOPANS)	DFS	HC (FSP)	FRQ (FSP)	THALES AIR SYS	INDRA
AERODROME-ATC-84	X	X	X	X	X		X
AERODROME-ATC-85	X	X	X		X	X	X

With the enablers being defined as:

- AERODROME-ATC-84 Provide the Remote Tower Controller Working Position with planning and sequencing tools as well as other enablers that are necessary for simultaneously ATS to multiple remote aerodromes
- AERODROME-ATC-85 Provide the Multiple Remote Tower CWP with automation functionalities to reduce workload for the controller

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

	ON (B4)	ACG/COOPANS, CCL/COOPANS, LFV/COOPANS)	DFS	HC (FSP)	FRQ (FSP)	INDRA
Civil RPAS		X	X	X		
Cyber Security	X	X			X	
Supervisor functionality / role	X	X	X	X		X
Handover between RTMs		X	X			X
Contingency in an RTC	X			X		X
Network quality of Service	X	X				
Resilience / Redundancy Issues	X	X	X	X		
SWIM enabled Services		X			X	
Advanced Voice Communication integrated in CWP		X	X		X	
Non-cooperative Surveillance	X	X	X			
Integration of Approach	X	X		X		
RTC to RTC Coupling	X	X				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).

Validation Platforms

Four prototypes will be provided by FRQ (FSP), Saab (NATMIG), INDRA and THALES AIR SYS (THALES AIR SYS used at two validation sites), which 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

The main dependency will be within PJ05 between solution 02 and solution 03. While solution 02 looks at fixed allocation between airports to RTMs, solution 03 will investigate a flexible allocation. Solution 03 will take into account the results from solution 02 while on the other hand solution 03 can start developments independently from solution 02.

Project 14.4.3 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.

Project 16.4.2 will provide enhanced voice services that can be used to support the monitoring task of the controller, which is essential in multiple remote tower. Under those conditions, where the ATCO/AFISO provides ATS for more than one airport simultaneously, the task load increases. The higher task load will increase the ATCO/AFISO's workload which makes the air traffic control process more failure-prone. A mitigation means might be increased automation support to decrease the task load. One very promising concept will be advanced speech recognition: if the automation is aware of the ATCO/AFISO's voice communication with the pilot, the automation can highlight aircraft in the visual presentation, can fill in electronic flight strip information and is aware of planned sequences, routes and thus can establish a much better safety net in terms of conflict prediction and resolution.

SWIM related service models to be consumed by, and/or distributed from, the RTC will be addressed and provided to PJ19 to be compiled in architecture framework (EATMA).

Project 18.4 will provide MET data/products via SWIM enabled services. It has to be determined which MET information will be directly available to/at airports and which information will be requested via SWIM.

Linked (non-SESAR) Research Activities

There is currently no non-SESAR Research Activities known.

1.4 Ambition

Within SESAR 1 the solution for single remote tower and multiple remote tower for two low density aerodromes were developed and are considered 'state-of-the-art'.

Both solutions will contribute to development of this "state-of-the-art" technology enabling even more products or extended services for even more aerodromes.

PJ05 Solution 02

PJ05-Solution02 will advance the concept for multiple remote towers to more than two airports to be controlled by one ATCO/AFISO from one RTM. At the same time the concept will be extended to higher traffic volumes to be controlled from one RTM. 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 02 is expected to reach V3 maturity by the end of wave 1.

PJ05 Solution 03

PJ05-Solution03 will add further flexibility in the allocation of airports to RTMs in an RTC which in turn allows to even better match traffic demand with required ATCO/AFISOs. 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 03 is expected to reach V2 maturity by the end of wave 1. It is planned to continue work up to V3 maturity in wave 2.

2 Impact

2.1 Expected impacts

SESAR 1 showed that single remote tower concepts is reducing costs, as the installation cost less than an ordinary tower and new technique and maintenance can be more efficient with several airports connected to a remote center.

Solution 02

The main driver for solution 02 is increased cost effectiveness. It is obvious that ATCO/AFISO productivity can significantly be increased at small to medium airports if one ATCO/AFISO provides ATS to two and more aerodromes at a time compared to providing it to one aerodrome. 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.

Solution 03

The main driver for solution 03 is increased cost effectiveness. While solution 02 will in general still show significant times with low traffic due to the fact of a fixed allocation of aerodromes to an RTM, solution 03 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.

Both solutions 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. The technical impact could be any of the enablers figured out during the research. Remote TWR concept, once deployed for multiple airports will serve as:

- an engine for further enhancement of ATS provision for single flight and SES traffic as a whole in terms of contributing to the ATS,
- a demanding factor to speed up the evolution of CNS infrastructure in terms of its reliability and to integrate any new either ATM or non-ATM technology which could improve CNS performance to support RTWR for multiple airports in FAB/Regional geographical context.

b) Economic Impact

Impact for local airport owners could lead to savings as the concept grows; this will allow to maintain regional and small airports operating in rural regions fostering local economy. Airliners 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. It is clearly recognized, that despite the huge variations of traffic density in various airports and comparatively wide range of ratios related to the airport services demand/utilization in time, provision of ATS in all airports should be efficient. This approach logically results in the matter of fact, that the costs for performing of ATS and apron control in particular at medium to low density airports are higher due to the lower ATM investment efficiency (due to expensive equipment/systems/infrastructure) and lower ATCO productivity (due to the personnel cost allocated to the single flight/flight segment) than in high utilization airports.

Remote tower solutions for multiple airports will allow to improve cost effectiveness (ATCO productivity) and, on the other hand, via utilization of the standardized common infrastructure and service interfaces for communication between the remote airports (via Remote Tower Centre) and other ATM stakeholders, will ensure in cost effective manner required reliability of the airport ATS (ATM investment efficiency) and continuity of the business processes of all stakeholders involved.

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).

2.2 Measures to maximise impact

a) 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 - Remote Tower for Multiple Airports 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 the Remote Tower for Multiple Airports project, 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 remote tower concept in the beginning that today is 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 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.

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.

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 Pj05 project lifecycle.

- In the first 3 first month after projects starts,
  - The dissemination and exploitation plan 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**

Project Updates	Essential to have every partner connected and up to date, but also to explain better expected results to stakeholders	• S2020 Project Website	
Archives & Reference documents	Keep past records for future needs and documents that might support the activities of any area	• S2020 Project Website	
Notices	News that can affect or help and develop the project	• S2020 Project Website	
Schedule updates	Updated calendar of events	• S2020 Project Website	
Results	The need to verify projects outcome and effectiveness	• S2020 Project Website	• SJU public Website • Information sessions • Demonstrations • Exhibitions • Conferences • Publications

- At project closure,
  - Evaluating achievements and impact;
  - Disseminating key project results data pack;
  - Participating to a S2020 closure event;
  - Developing areas for future cooperation.

b) Communication activities

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 SESAR JU or at specific meetings organized by European bodies in Air Transport.

As internal communication channel the OneSky extranet is already established. Furthermore, it is planned to build up a database on the OneSky extranet containing all relevant documents produced in PJ.05. At least all program documentation will be stored in order to provide full electronic access to documentation.

The second step, after internally using OneSky extranet, will be the creation of a project's website for PJ.05 external communication. The external accessible website will inform about all public objectives and goals of the project, the consortium members with contact data, it will provide short descriptions of work packages and co-operation activities between partners. In the course of project, a newsletter with current project status and planned meetings will be the means of a regular flow of information about the project's general progress.

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

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

3 Implementation

3.1 Work plan — Work packages and deliverables

3.1.1 Project Structure

The project is divided into two different Solutions; each split into a certain number of activities and to a certain extent, coordinated independently by its solution leads (SL). The project structure is displayed in Figure 1.

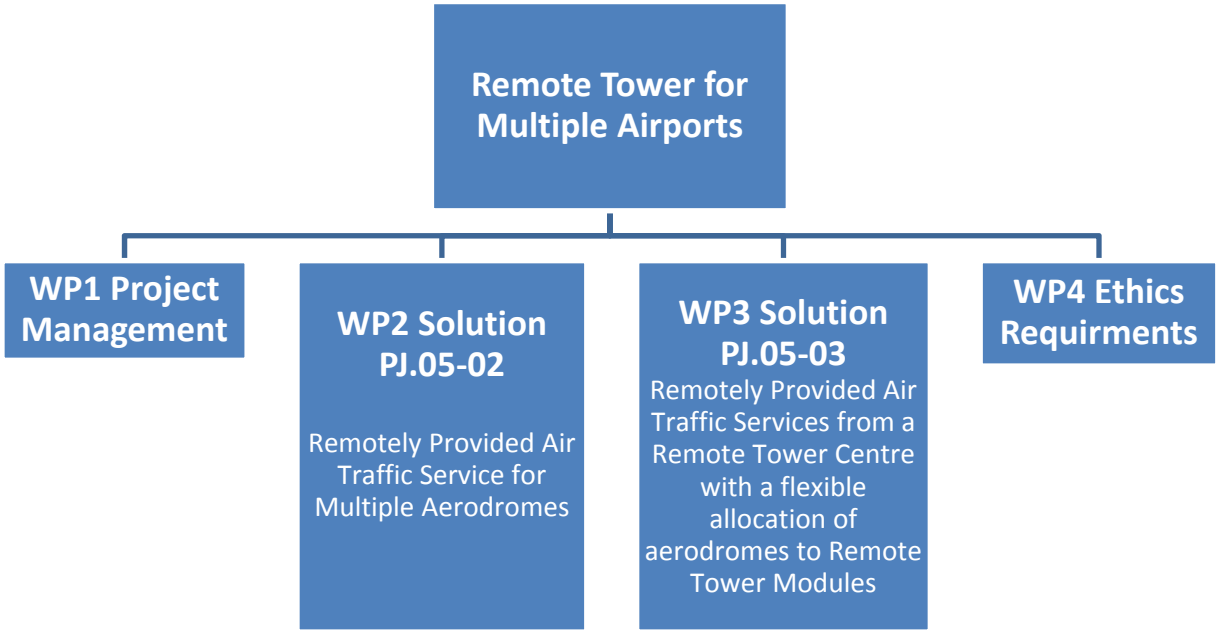

Figure 1: [PJ05 Remote Tower] Work Break Down Structure

Vorgangsname	Start	Finish
WP1 - Project Management	**Tue 01.11.16**	**Fri 29.11.19**
T.05.0-03 Project Management Plan	Tue 01.11.16	Fri 31.03.17
D1.1 Project Management Plan	Mon 03.04.17	Mon 03.04.17
T.05.0.02 Project Management	Tue 01.11.16	Tue 29.10.19
D1.2 Final Project Report	Mon 02.09.19	Mon 02.09.19
D1.3 Biannual Report 1	Wed 17.05.17	Wed 17.05.17
D1.3 Biannual Report 2	Wed 15.11.17	Wed 15.11.17
D1.3 Biannual Report 3	Wed 16.05.18	Wed 16.05.18
D1.3 Biannual Report 4	Wed 14.11.18	Wed 14.11.18
D1.3 Biannual Report 5	Wed 15.05.19	Wed 15.05.19
WP2 -Solution2	**Tue 01.11.16**	**Thu 31.10.19**
Solution Management	**Tue 01.11.16**	**Thu 31.10.19**
T.05-02.00 Solution Management	Tue 01.11.16	Thu 31.10.19
D2.1 Solution PJ.05-02: V2 Data Pack	Tue 31.07.18	Tue 31.07.18
D2.2 Solution PJ.05-02: V3 Data Pack	Mon 02.09.19	Mon 02.09.19
MS1 V2 Gate for solution PJ.05-02	Wed 31.10.18	Wed 31.10.18
MS2 V3 Gate for solution PJ.05-02	Mon 02.09.19	Mon 02.09.19
S02-Maturity V2 (Short Term Planning only)	**Fri 02.12.16**	**Thu 02.08.18**
T.05-02.01 V2 Concept Development	**Fri 02.12.16**	**Thu 02.08.18**
D2.3 Solution PJ.05-02: OSED-SPR-INTEROP (V2)	Thu 02.08.18	Thu 02.08.18
T.05-02.02 V2 Technical Specification	**Fri 02.12.16**	**Thu 02.08.18**
D2.4 Solution PJ.05-02: TS-IRS (V2)	Thu 02.08.18	Thu 02.08.18
T.05-02.03 V2 Cost Benefit Analysis	**Fri 02.12.16**	**Thu 02.08.18**
D2.5 Solution PJ.05-02: CBA (V2)	Thu 02.08.18	Thu 02.08.18
T.05-02.04 V2 Validation Plan	**Wed 01.02.17**	**Mon 01.05.17**
T.05-02.05 V2 Prototyping and Platform Development	**Tue 02.05.17**	**Wed 06.12.17**
T.05-02.06 V2 Validations	**Thu 07.12.17**	**Wed 04.04.18**
S02-Maturity V3	**Fri 02.12.16**	**Thu 01.08.19**
T.05-02.11 V3 Concept Development	Fri 02.12.16	Thu 01.08.19
D2.6 Solution PJ.05-02: OSED-SPR-INTEROP (V3)	Thu 01.08.19	Thu 01.08.19
T.05-02.12 V3 Technical Specification	Fri 02.12.16	Thu 01.08.19
D2.7 Solution PJ.05-02: TS-IRS (V3)	Thu 01.08.19	Thu 01.08.19
T.05-02.13 V3 Cost Benefit Analysis	Fri 02.12.16	Thu 01.08.19
D2.8 Solution PJ.05-02: CBA (V3)	Thu 01.08.19	Thu 01.08.19
T.05-02.14 V3 Validation Plan	**Wed 01.02.17**	**Mon 01.05.17**
T.05-02.15 V3 Prototyping and Platform Development	**Tue 02.05.17**	**Thu 29.11.18**
T.05-02.16 V3 Validations	**Wed 06.12.17**	**Tue 02.04.19**
WP3 - Solution3	**Tue 01.11.16**	**Thu 31.10.19**
Solution Management	**Tue 01.11.16**	**Thu 31.10.19**
T.05-03.00 Solution Management	Tue 01.11.16	Thu 31.10.19
D3.1 Solution PJ.05-03: V2 Data Pack	Mon 02.09.19	Mon 02.09.19
MS3 V2 Gate for solution PJ.05-03	Mon 02.09.19	Mon 02.09.19
S03-V2 Maturity	**Fri 02.12.16**	**Thu 01.08.19**
T.05-03.01 V2 Concept Development	Fri 02.12.16	Thu 01.08.19
D3.2 Solution PJ.05-03: OSED-SPR-INTEROP (V2)	Thu 01.08.19	Thu 01.08.19
T.05-03.02 V2 Technical Specification	Fri 02.12.16	Thu 01.08.19
D3.3 Solution PJ.05-03: TS-IRS (V2)	Thu 01.08.19	Thu 01.08.19
T.05-03.03 V2 Cost Benefit Analysis	Fri 02.12.16	Thu 01.08.19
D3.4 Solution PJ.05-03: CBA (V2)	Thu 01.08.19	Thu 01.08.19
T.05-03.04 V2 Validation Plan	Wed 01.02.17	Mon 01.05.17
T.05-03.05 V2 Prototyping and Platform Development	Tue 02.05.17	Thu 29.11.18
T.05-03.06 V2 Validations	Wed 06.12.17	Wed 03.04.19
WP4 Ethics Requirements	**Tue 01.11.16**	**Fri 31.03.17**
T.05-04.01 Ethics Requirements	Tue 01.11.16	Thu 30.03.17
D4.1 H - Requirement No. 1	Fri 31.03.17	Fri 31.03.17
D4.2 POPD - Requirement No. 2	Fri 31.03.17	Fri 31.03.17
D4.3 NEC - Requirement No. 3	Fri 31.03.17	Fri 31.03.17
D4.4 M - Requirement No. 4	Fri 31.03.17	Fri 31.03.17

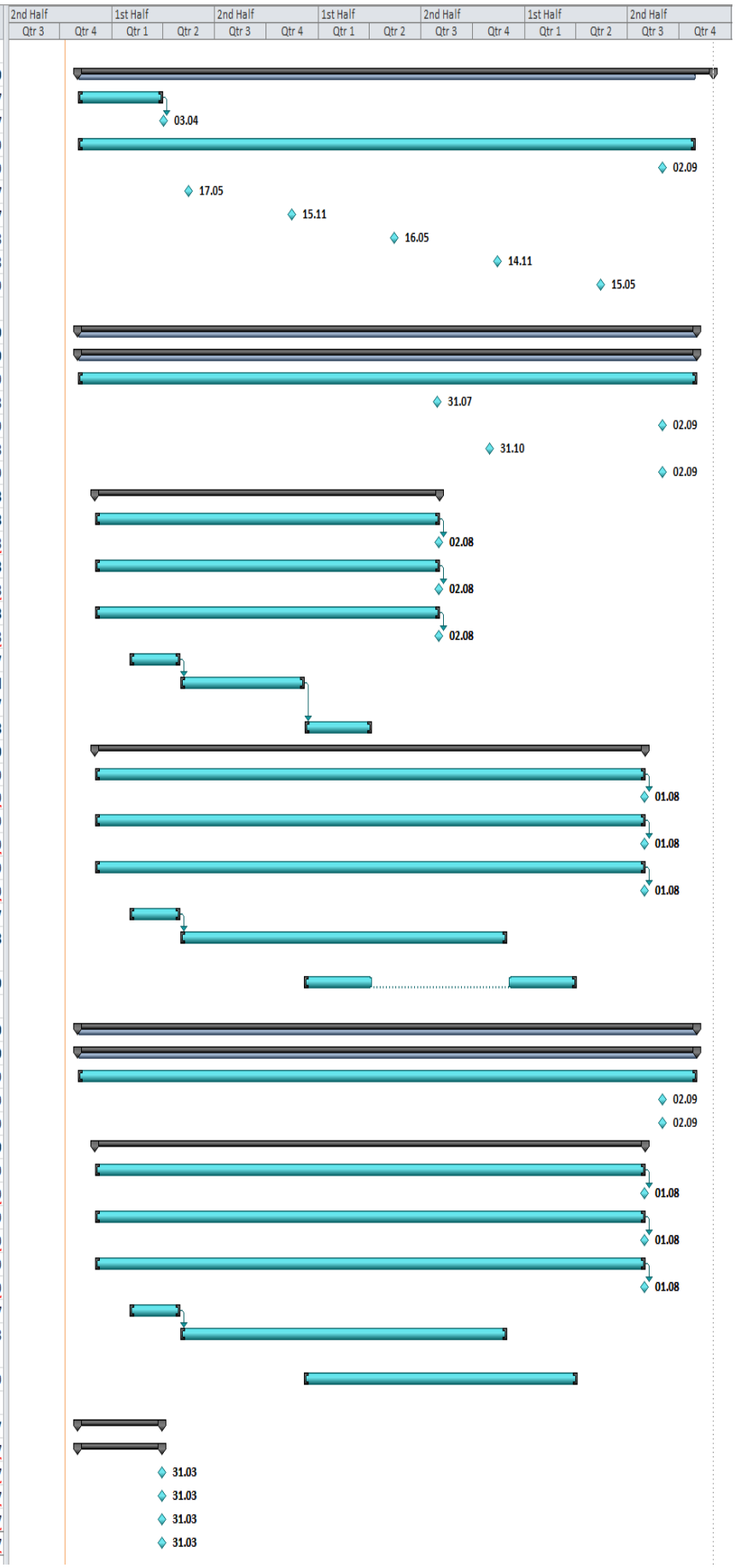

Figure 2: Project 'PJ05 Remote Tower' Gantt chart

3.2 Management structure, milestones and procedures

A lean and efficient management structure will be applied that allows for fast decision making to ensure that the pursued objectives are met. The Project Management Plan will further refine management processes in line with the governance rules defined in the Grant Agreement and in the SJU Membership Agreement. The administrative and organisational management activities are hosted in WP1. 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 3.

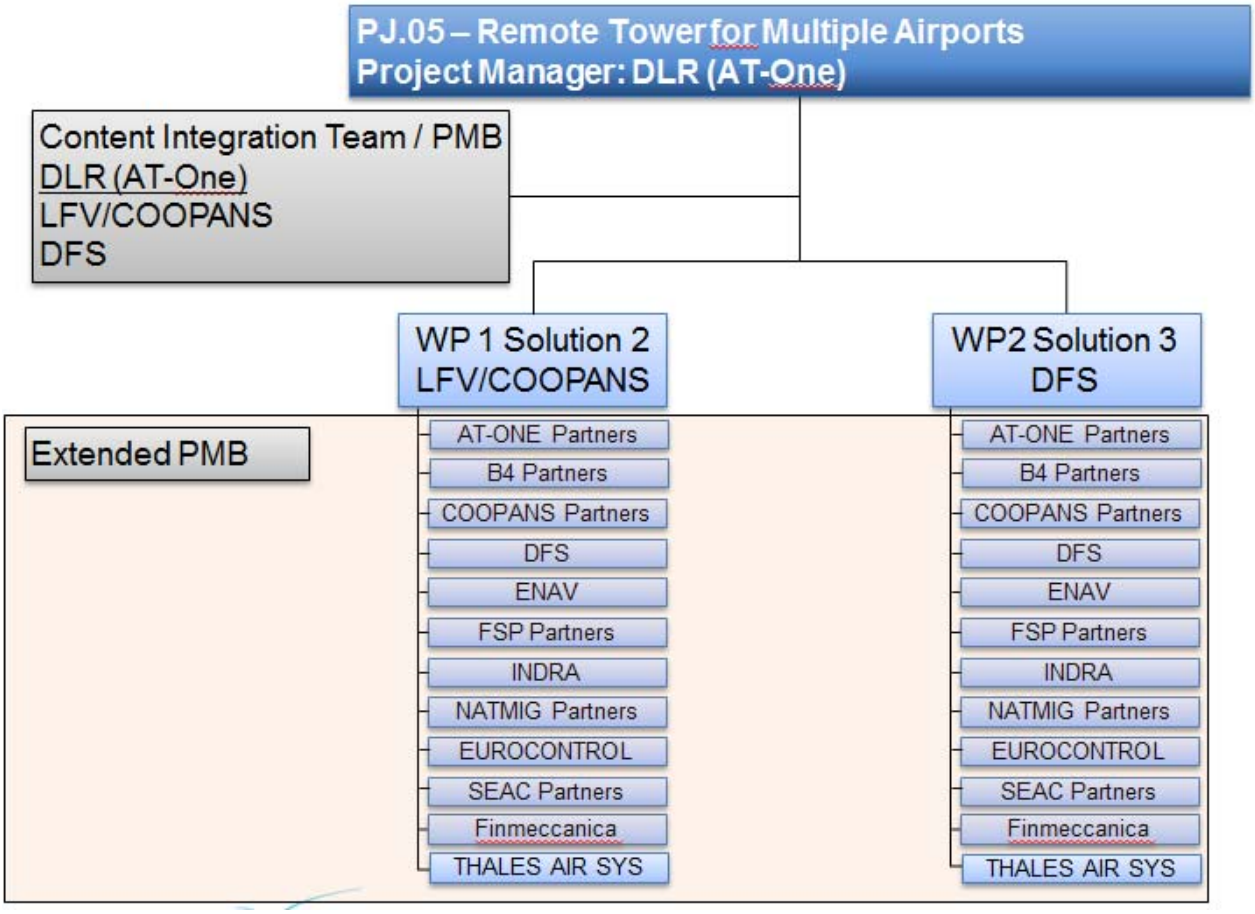

Figure 3: Management Project Structure

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 Team 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 program 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;
- 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.

The PCIT function is performed by the PMB and/or the PCIL function is performed by the PM

3.2.2 Project Management Board (PMB)

The Project Management Board will ensure that all key management decisions of the project are taken with the full support of contributors of the projects. Decision will be made by consensus of all partners involved in a given solution or work package, or in the project if the decision applies to the whole project. In case of disagreement, the escalation process foreseen in Appendix F of the SESAR Private Public Partnership Agreement will apply.

The Project Management Board should meet periodically (WebEx or Face to Face as required) to:

- review progress of the project;
- decide corrective actions;
- review project risks and associated mitigation actions;
- review any potential Change Request to the SGA when necessary.

The Project Management Board will be composed of:

- Project Manager (chairman);
- Project Content Integration Lead;
- Solution Leads

The PCIT function is performed by the PMB and/or the PCIL function is performed by the PM

3.2.3 Extended Project Management Board (EPMB)

An Extended Project Management Board meeting (including all contributors of the project) will need to be convened annually at a minimum.

In addition in case of significant changes to the project, the Extended Project Management Board shall be asked for approval by correspondence, e.g. for:

- critical deliverables of the project :
  - Initial PMP and updates
  - CBAs (approved by contributors to the solution)
  - V Data Pack
- Change Request to the SGA.

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

3.2.4 Solution Lead (SL)

The Solution Lead is the person responsible for the operational and technical leading of the solution. The solution lead is responsible for the SESAR Solution refinement, the overall management of related validation activities and timely delivery of the Solution deliverables. In particular, the Solution Lead will:

- Organise and coordinate the activities of the Solution Team;
- Report to the Project Manager on progresses and issues;
- Make proposal for update and amendments of the validation roadmap, to be agreed at project level
- Ensure consistency within the solution and in particular of the different deliverables in support of the different maturity evolution/levels (V1, V2 and V3)
- Prepare and represent the solution at the maturity gate, notably responsible for producing the Maturity Report.
- Participate to the PMB;

3.2.5 Solution Team

The main role of the Solution Team is to:

- Define, validate the SESAR Solution and produce the associated deliverables and prototypes. A Project validation roadmap will be agreed at project level. The Solution Team will conduct validations according to the agreed roadmap.
- Identify and initiate required changes to the SESAR Solution, including the validation roadmap.
- Contribute, under the coordination of the Project Content Integration Lead, to update the relevant sections of Transversal Projects deliverables.
- The Solution Team is composed of all contributors to the work of a given Solution.

3.2.6 Project Content Integration Lead (PCIL)

The Project Content Integration Lead:

- 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 WP1.

3.2.7 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

The PJ05 consortium members work and cooperate together to the best of their abilities with a view of implementing SESAR2020 PJ05 Remote Tower in a correct, efficient, open and timely manner and of

attaining the objectives and the deliverables as envisaged by the prevailing project proposal. The Consortium involves key stakeholders of the Ground ATM System, Air Traffic Service Provision, Airports and EUROCONTROL hence providing a wide range of expertise covering all aspects of EUROPEAN ATM.

This project consortium comprises 12 SESAR2020 SJU Members, summing up to 30 related participants as a whole, that come from 19 different European states. The consortium was carefully selected according to the skills and experiences required to accomplish the proposed work. The operational expertise, which is crucial for the conceptualisation and implementation phase of the project, is found in the strong representation of highly-experienced end-user organisations in the consortium. All European main drivers of the remote tower concept will participate in this project. Among them all organisations that in SESAR1 already developed and deployed the single remote tower concept, who now intend to deploy the next step, the multiple / center concept. The consortium is complemented by ANSPs and manufactures who did not participate in SESAR1 but who will bring into additional operational needs and technological expertise and support the development of a harmonised and widely accepted concept solution. It is therefore of utmost importance that this project is composed of this variety of partners to reflect the variety of operational needs and technical solutions which in the end of the project will enable a consolidated SESAR2020 solution. The work is structured in a very collaborative way throughout all work packages and will ensure the transfer of knowledge and know-how between all participants.

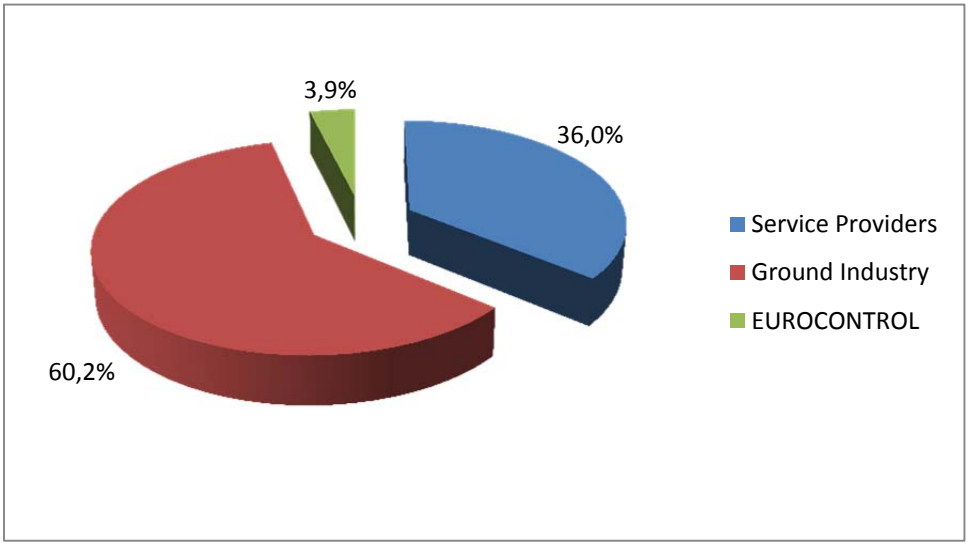

Figure 4: Effort per Stakeholder Group [%]

3.4 Resources to be committed

Table 1: 'Other direct cost' items (travel, equipment, other goods and services, large research infrastructure)[2]

NLR (AT-One)	Cost (€)	Justification
Travel	11.000,00	Coordinating and carrying out validation work on related or connected validation platforms at other locations.
Equipment	45.394,00	Use of NARSIM Tower as HMI development and real-time simulation component in validation exercises involving multiple airports in Remote Tower Operations.
Other goods and services	0	N/A
Total	56.394,00	

LFV/COOPANS	Cost (€)	Justification
Travel	251.146,50	Several consortium members participating with long distance travels - platform in Malmoe. A high personnel effort is required to secure successful validation results.
Equipment	142.634,50	Remote tower platform - upgrade and adaptation
Other goods and services	9.280,01	Audit cost
Total	403.061,00	

Saab (NATMIG)	Cost (€)	Justification
Travel	94.488,00	Estimated based on experience from SESAR 1
Equipment	262.000,00	Due to large scale 3D simulations in solution 03 with many airports simultaneously in several RTMs.
Other goods and services	0	
Total	356.488,00	

[2] *the tables below are fulfilled only for those participants whose sum of the costs for' travel', 'equipment', and 'goods and services' exceeds 15% of their personnel costs (according to the budget table in section 3 of the Part A administrative forms).*

HC (FSP)	Cost (€)	Justification
Travel	29900	Travel costs for WP2 -Preparation for Verification and Validation Exercises -Execution of Verification and Validation Exercises -Project Meetings -Workshops Travel costs for WP3 -Preparation for Verification and Validation Exercises -Execution of Verification and Validation Exercises -Project Meetings -Workshops
Equipment	255448	ATM system deployment, surveillance system, CWP licenses – Platform for joint Validation with FRQ (FSP) and Validation for Thales Air Systems
Other goods and services	0	
Total	285348	

LPS SR (B4)	Cost (€)	Justification
Travel	3 000 €	Travel on project meetings, validation set up
Equipment	0	
Other goods and services	22 680 €	Audit Costs, services related to validation, advisory, purchase of additional equipment.
Total	25 680 €	

THALES AIR SYS – 30 - (incl. Searidge LTP)	Cost (€)	Justification
Travel	60000	expert meeting, simulations event, project progress meeting Validation platform installation and configuration As Searidge is a company located in Ottawa, Canada, travels costs are higher than for a European organization, however for this project the number of travels has been carefully reviewed in order to avoid unnecessary expenses.
Equipment	0	
Other goods and services	29000	Audit costs
Total	89000	

Table 2: Input dependencies

Description of contribution	Work package(s) involved	Project responsible of this contribution
A low cost surveillance solution that can be used as baseline for the automated monitoring support is required for solution 03. 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. PJ14.4-03 will provide the verification results to PJ05	WP3	Project 14.4.3
Project 16.4.2 will provide enhanced voice services that can be used to support the monitoring task of the controller, which is essential in multiple remote tower. By PJ16.4.2 AT-One & FRQ (FSP) will integrate voice services into Frequentis platform to be validated at T.05-03.V2.2 VALR RTS-DFS.	WP3	Project 16.4.2
SWIM enabled MET services have to be provided by 18.4 to include MET information in RTM.	WP2/3	Project 18.4
Project 02.08 will provide short term planning tools which will help in optimising runway operations and make best use of different airports and ATC services. The predictability and planning provided by these tools and its integration in the remote tower will support RTC Supervisor in the decision of airport allocation or multiple aerodrome control.	WP2	Project 02.8
• SESAR 1 P06.08.04-D94- 6.8.4 OSED Single Remote TWR Ph2 - Final Update • SESAR 1 P06.08.04-D103- 6.8.4 Multiple Remote Advanced - OSED Update (6.9.3 D04) • SESAR 1 P06.09.03-D35- Final OSED • SESAR 1 P12.04.07 D09 Remote tower specifications - final Consolidated DEL • SESAR 1 P12.04.06 / 12.04.08 final deliveries	WP2/3	SESAR 1

Table 3: Output dependencies

Description of contribution	Work package(s) involved	Project taking benefits from this contribution
WP3 will provide requirements on the surveillance to be developed for multiple remote tower automation support tools.	WP3	Project 14.4.3
WP3 will provide voice service (speech recognition) requirements to be developed for multiple remote tower automation support tools.	WP3	Project 16.4
• New SWIM services for newly developed products within PJ05 can be provided for further use by stakeholders (e.g. RVR in IR) • SWIM services of data measured at remote airports for further use by stakeholders (e.g. National Weather Service will use data in models). • Adapted requirements for existing MET products (because changes needed for better dynamic overlay and displaying purposes)	WP2/3	Project 18.4
WP2 will provide requirements on the short planning tools for multiple remote tower airports	WP2	Project 02.8

As per Section 3.5 of the amended Annual Work Programme, due to annual budget constraints of the SJU, the SJU contribution to the Action shall be broken down into several instalments. The first instalment ("First SJU Contribution" of the Action), corresponding to the initial "maximum grant amount" as per Article 5.1 of the Grant Agreement, will be calculated in proportion of:

- the maximum grant amount after evaluation for the Action,
- the number of grants awarded under the IR call, and
- the 50M€ SJU budget available.

On the basis of the First SJU Contribution for this Action established at a maximum grant amount of **1.828.086,09** 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:

- D1 Project Management Plan (T3)
- D2 Biannual Report 1 (T6)
- D11 H – Requirement No. 1 (T5)
- D12 POPD – Requirement No. 2 ((T5)
- D13 NEC – Requirement No. 3 ((T5)
- D14 M – Requirement No. 4 ((T5)

Any further SJU contribution resulting from further budget availability, will be implemented through a Grant Amendment as per Section 3.5 of SJU amended AWP and will result in an update of the Maximum Grant Amount in Article 5.1 of the Grant Agreement. The Grant Amendment shall also modify article 21 of the Grant Agreement with an update of the pre-financing payment for the Action.

The level of SJU contributions and pre-financing of the grant amendments will be established in accordance with the SJU Single Programming Document (SPD) as approved by the Administrative Board..

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

4. Members of the consortium

4.1 Participants (applicants)

4.1.1 Companies profile

4.1.1.1 DLR (AT-One) (coordinator)

Organisation	1 DLR (AT-One)	Research
Description	Deutsches Zentrum für Luft-und Raumfahrt e. V. (German Aerospace Center) is coordinating the AT-One Consortium, DLR (AT-One). The AT-One consortium is formed by the German Aerospace Center (DLR (AT-One)) and the Netherlands Aerospace Centre (NLR (AT-One)). AT-One combines the strength of DLR and NLR (AT-One) by joining their capabilities with respect to innovative and independent Air Traffic Management research and implementation support. 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 and security is integrated into national and international cooperative ventures. In addition to its own research, as Germany's space agency, DLR has been given responsibility by the federal government for the planning and implementation of the German space programme. DLR is also the umbrella organisation for the nation's largest project management agency. DLR has approximately 8000 employees at 16 locations. Several DLR (AT-One) research institutes are participating in SESAR which are shortly introduced in the following: DLR (AT-One) Institute of Flight Guidance develops innovative air traffic concepts – from the idea towards the implementation. The goal is to ensure an air transport system that is safe, efficient, environmentally friendly and reliable. In the field of air traffic management (ATM) and airports, the institute acts as a supplier of know-how and ideas while balancing the conflicting interests between fundamental research and applied science. As the largest German research facility for flight guidance, it strives to validate and deliver solutions to one of the greatest challenges in aviation – how to increase the efficiency and capacity of air transport in a safe and green way. Key tasks of the institute are to explore how the interplay of flight guidance on board and on the ground is optimized and how the complex interdependencies between the increasingly optimized aviation systems can be handled in a robust and resilient manner. DLR (AT-One) Institute of Communications and Navigation develops and investigates new systems and methods for radio transmission and positioning. Its work in aviation focusses on enabling technologies for air-traffic management. The Institute has a profound expertise in communications, navigation, and surveillance (CNS) technologies. It actively performs research and development in air-ground, air-air, and satellite communications as well as on the networking concept for the future communications infrastructure. In navigation, the Institute has largely contributed to the development of GBAS as well as future ARAIM. It has developed means to protect navigation systems from harmful interference, spoofing and space weather effects and conceptualized integrity monitoring standards for all phases of flight. The DLR (AT-One) Institute of Atmospheric Physics focusses on the research of the physical and chemical processes of the atmosphere and meteorological applications. On both regional and global scales, the relevant processes and changes of the state of the atmosphere are quantified and systematically investigated using remote sensing,

	research aircraft and computational models. The knowledge of dynamical, cloud physical, and chemical processes constitute the basis for many aeronautical applications. DLR (AT-One) Institute of Flight Systems is active in the topics of flight mechanics and measurement and system technology of all flying systems. The Institute has extensive knowledge in wake turbulence and aviation flight safety, originating from numerous wake-vortex related research projects. DLR (AT-One) Air Transport Systems is conducting research in the field of understanding the system complexity in air transportation. The portfolio comprises of concepts, preliminary designs and the optimization of sub systems, as well as the simulation and assessment of entire air transportation systems with respect to economic and ecological sustainability. DLR (AT-One) Air Transportation Systems has several years of experience with the design and the assessment of new concepts and technologies for future air transportation.
Previous experience	Publications: [1] Moehlenbrink, Christoph und Papenfuss, Anne (2014) Eye-data metrics to characterize tower controllers' visual attention in a Multipe Remote Tower Exercise. Paper presented at the ICRAT 2014, May 26-30, 2014, Istanbul, Turkey. [2] 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. [3] 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. [4] Fürstenau, N., Schmidt, M., Rudolph, M., Möhlenbrink, C., & Halle, W. (2008). Augmented vision videopanorama system for remote airport tower operation. Paper presented at the 26. Int. Congress of the Aeronautical Sciences (ICAS), Anchorage. List of relevant projects & activities [1] SESAR LOT 1 06.08.04, EXE-06.08.04-VP-638, EXE-06.08.04-VP-641 [2] RAiCe - Remote Airport Traffic Control Center, (2008 – 2012); funded by DLR [3] “Virtual Control Tower Research Studies” VICTOR, 2009 – 2012) planning and conduction of validation trials; national funding via LuFo-IV research program iPort [4] RapTOr: Remote Airport Tower Operation with Augmented Vision Videopanorama Human System Interface (2005 – 2007); funded by DLR
Entity Profile matching the task	DLR (AT-One) intends to bring superb concept and validation know-how to PJ.05. 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. DLR (AT-One) intensively contribute to standardisation activities in function of the chairman of the EUROCAE WG100 “Remote and Virtual Tower”.
Contribution	In WP2 DLR (AT-One) will participate with its Remote Tower Platform in order to develop and pretest HMI design solutions and to integrate WAM/MLAT surveillance, together with the manufacturing- and service industry. These

developements will be validated afterwards on a FRQ and HC (FSP) platform. AT-One/DLR will contribute to concept design (OSED/SPR), e.g. integration of speech recognition, to the validation documentation (VALP/VALR) and to Human Performance & Safety Assessments.

In PJ.05-03 DLR (AT-One) will provide validation support to a V2 validation exercise at Langen (in partnership with the host DFS & manufactoring industry FRQ (FSP) in terms of working out the VALP methodology/schedules, conducting the exercise and preparing the VALR.

4.1.1.2 NLR (AT-One)

Organisation	2 NLR (AT-One)	Research
Description	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. 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. 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 & Evaluation. NLR (AT-One) thereby bridges the gap between research and practical applications, while working for both government and industry. Founded in 1919, and employing some 650 people. NLR (AT-One) is participating with two divisions in SESAR which are shortly introduced in the following: The division Aerospace Operations of NLR (AT-One) supports its customers – worldwide- with the realization of an excellent operation. With our extensive expertise and unique simulation facilities we contribute to the sustainable performance of air traffic: futureproof, safer, more efficient and more environmentally friendly. Through consultancy and R&D our flexible and state-of-the-art activities find their way to customers such as airlines, air traffic control, airports, ATM industry and governments. We find our customers both in The Netherlands and beyond its borders and also contribute to European programmes such as SESAR and CleanSky. From the integration of drones in civil airspace to new airport concepts, with our passion for aerospace and our excellence and extensive knowledge of air traffic we always strive for the best result for the customer. 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.
Previous experience	Publications: [1] Sundberg, M., van Schaik, F.J. (2010). Advanced Remote Towers: Final Activity Report, Sixth European Commission Framework Programme, Research Area 4, Brussels. [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. List of relevant projects & activities [1] Advanced Remote Tower (2007-2010), Sixth European Commission Framework Programme, Research Area 4 [2] Field Tests with a Camera Surveillance Evaluation System for RWY 18R/36L at Schiphol Airport (2011) [3] Establishing System Requirements for a Camera Surveillance System for RWY 18R/36L at Schiphol Airport (2013) [4] SESAR Large Scale Demonstration 02.05: Remote Tower Operations (2014-ongoing), SESAR-JU
Entity Profile matching the task	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 Rsearch 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 its flexibility and 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 to contribute to Remote Tower Module simulations based on the experience gathered during the SESAR Large Scale Demonstrations (LSD). NLR (AT-One) is the major partner of Dutch ANSP LVNL, who are performing a SESAR LSD this year with remote control of Groningen Airport Eelde and a simulataneous 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, but will also provide an excellent environment for developing innovative solutions for controller support in multiple remote tower operations.
Contribution	NLR (AT-One) will use their rapid prototyping platforms to develop a supervisor short-term planning tool for the RTC, which balances workload in a multiple RTM and in case of remaining planning bottlenecks splits one or more aerodromes to available single RTMs. Validation of such a tool will occur in real-time and/or shadow-mode simulations (a multiple RTM with one or two additional single RTMs). NLR (AT-One) will co-operate in this effort with NATMIG and COOPANS and intend to simulate one or two airports in addition to a passive or active shadow-mode set-up for a smaller airport. NLR (AT-One) further will use their rapid prototyping platforms to support development of a supervisor tool for inter-centre planning between different RTCs with several multiple and single RTMs checking for workload excess after balancing of workload in several combinations of allocation of aerodromes to available RTMs and with different preferences for dividing aerodromes. Validation of such a development is expected to be carried out mainly with fast-time or gaming exercises as the number of required RTM platforms for shadow-mode or real-time simulation operations should surpass the suspected number of available platforms in SESAR 2020. If required, though, NLR (AT-One) would again contribute to the set-up of several RTMs with real-time and shadow-mode simulation platforms.

4.1.1.3 ANS CR (B4)

Organisation	3 ANS CR (B4) ANSP
Description	Air Navigation Services of the Czech Republic (ANS CR), the state enterprise provides public Air Traffic Services in the airspace of the Czech Republic, at Prague Airport and 3 regional Airports of Brno, Ostrava and Karlovy Vary. En route services are provided as integrated with the MIL. It provides specialized aviation training in its own Training Centre of ANS CR/Czech Air Navigation Institute (CANI) and offers also the training for pilots in its subsidiary company the Czech Aviation Training Centre (CATC) on aircraft simulators, both units being part of the Aviation Academy Group. The part of ANS CR organization is the Flight Inspection Service Unit providing the flight checking within Czech Airspace as well as outside on a commercial basis. ANS CR is a member of the FAB Central Europe (FAB CE). ANS CR is constituent entity of B4 Consortium..
Previous experience	Not applicable
Entity Profile matching the task	Not applicable, ANS CR initially will not participate directly in this action.
Contribution	Support to participating members of B4 Consortium if required.

4.1.1.4 LPS SR (B4)

Organisation	4 LPS SR (B4) ANSP
Description	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. With a total staff of 495 (including 114 ATCOs) and altogether nine Operational units, among them one ACC (Bratislava), two APPs (Bratislava, Košice), five TWRs (Bratislava, Košice, Piešťany, Poprad, Žilina) and Central ATS Reporting Office (Bratislava), LPS SR controls the Slovak airspace (Bratislava FIR) of the total size of 48,800 km2 and provides ATC services at five designated Slovak international airports as well as within small parts of the Hungarian airspace. In 2015, LPS SR provided services to 467,863 IFR flights, marking an annual 7.2% increase, which was preceded by a 9.8% increase in 2014 caused by substantial re-routings due to total closure of parts of the neighbouring Ukraine´s airspace, while ensuring the highest standards of safety (acceptable level of safety for incidents of the severity A and B in 2014: 0.35 ALS/TLS) and minimal average delays (average en-route ATFM delay per flight in 2014: 0.14 min/flight) without significant additional costs or increases in number of ATCOs. LPS SR (B4) is constituent entity of B4 Consortium, composed of four ANSPs from Central and Eastern part of Europe and their Linked Third Parties. LPS SR is a Member of the FAB CE and a founding member of the Gate One, a regional platform of Central and Eastern European ANSPs
Previous experience	On-going and previous projects: • **Upgrade of the E2000 system (system upgrade, 2015 – 2019)**: upgrade of E2000 system to enable compliance with the SES operational requirements in the region as part of FAB establishment. • **Functional integration of ASM/ATFCM processes (international cooperation, 2010 – present)**: optimisation of the flow of air traffic and the management of airspace within FAB CE. • **Air-ground Radio-Communication System (infrastructure upgrade, 2014 – 2017)**: upgrade of radio stations to allow VoIP interfaces. • **HETA Harmonisation (international cooperation, 2016)**: harmonization of transition altitude at 10 000 ft. (TA10K project) within FIR Bratislava, Wien and Budapest. • **GAMMA – Global ATM Security Management (FP7, 2013 – 2016)**: addressing security issues in the new global ATM scenarios created by the SES. • **Mode S Station Mošník (infrastructure construction, 2008 – 2015)**: construction of a new SSR/Mode S radar to improve coverage in the Eastern part of airspace of the Slovak Republic. • **ACCEPTA – Accelerating EGNOS adoption in Aviation (FP7, 2012 – 2014)**: implementation and publication of RNP approach procedures at Bratislava/M. R. Stefanik airport and Košice airport for all instrument RWY ends. • **AIM systems development and operation (systems development, 2001 – 2014)**: design, implementation, testing and operations of systems used for

	processing of static and dynamic data and the creation of AIM. • **Design and transformation of AIPs (international cooperation, 2006 – 2008)**: transformation of three AIPs (United Arab Emirates, Greece, Mongolia) from an 8-part to a 3-part structure as subcontractor for Avitech Ltd. **European AIP Study (international study, 2003 – 2004)**: study contract awarded by European Commission to STASYS with support of LPS SR.
Entity Profile matching the task	LPS SR (B4) with its Linked Third Party (MicroStep-MIS Ltd.) has a strong experience in this area of interest supported by great competencies in the following areas: • Computer science and software development; • MET system laboratory and operational infrastructure (NWP models, live data, historical datasets of selected data); • Provision of expertise and experts: aviation MET experts, analysis, software design, programming/implementation, testing, project management, quality management, service administration; Product portfolio of IMS4 product line: AWOS, AWDSS, climatological database, models (NWP, visibility, dispersion/air transport of pollutants, runway status ...), MET radar data processing.
Contribution	LPS SR (B4), together with its Linked Third Party (MicroStep-MIS Ltd.), intends to contribute in terms of operational improvement (OIs) – SDM-0207, particularly to Enablers: METEO-03c, METEO-04c. The main objective of LPS SR in this area is to participate in solutions regarding the provision of MET data to the controller including local weather for several remote aerodromes (e.g. make a fully automated MET system (automatic data processing from various sensors installed at remote aerodrome)).

4.1.1.5 ON (B4)

Organisation	**5 ON (B4) ANSP**
Description	Valstybes imone „Oro navigacija", Air Navigation Service provider in Lithuania, was founded in 1995 as independent, 100% State owned enterprise. It operates under the supervision of the Ministry of Transport and Communications. Valstybes imone „Oro navigacija" provides air navigation services in Lithuanian airspace and in airspace over the part of Baltic Sea offering its users air traffic management services, communication, navigation and surveillance services as well as an aeronautical information services. It operates one combined En-route/TMA control centre at Vilnius, 3 TMA control centres at Lithuania's international airports, each year providing safe and efficient air traffic control services to almost 230 thousands movements. It continues to maintain 0 min/flight delays level and to meet users expectations while flexibly and in cost effective way accommodating increase of the traffic up to 10%. Valstybes imone "Oro navigacija" is constituent entity of B4 Consortium, composed of four ANSPs from Central and Eastern part of Europe and their Linked Third Parties (further - L3Ps). B4 Consortium is a member of A6+ on SESAR 2020 Programme content. Valstybes imone „Oro navigacija" (further – ON) together with Polish ANSP PANSA forms Baltic FAB, and it is also a member of GATE ONE (joining 11 ANSPs), a regional platform of Central and Eastern European ANSPs.
Previous experience	Valstybes imone „Oro navigacija" experts have scientific expertise in Data analysis, they are active and successful in various areas related to the performance assessment, certification and standardization, inter alia gap analysis, tasks prioritization and criteria definition, accumulation and analysis of lessons learned for further dissemination and risk mitigation, focusing on processes and resources optimization, efficient solution finding and recommendation formulation. Significant achievements were made for Regional COM Infrastructure developments, network simulation capabilities, (IT) network processes synchronization and in the area of Security / Safety and Technical & Human Factors assessments and training. ON and L3Ps have developed and integrated testing and validation platforms used for approbation of technological solutions, measurement and assess the performance, reliability and resilience of various systems and components, including Cyber Defence solutions. Valstybes imone „Oro navigacija" is quite experienced in generation of the testing and validation generic and specific scenarios for various operating environments (OEs), is well equipped with performance measuring and assessment, compliance evaluation and monitoring tools; moreover, they participate in the development of these tools. Valstybes imone „Oro navigacija" has developed and integrated (basing on ATM and non-ATM technologies) testing and validation platforms to approbate the technical and technological solutions and to assess the performance, reliability and resilience of various systems and components, inter alia for CyberSecurity solutions. Previous projects, performed by Valstybes imone „Oro navigacija": • 2007 Valstybes imone „Oro navigacija" Participation in simulation of "Reduced wake turbulence separation" in Braunschweig; • 2008-2012 Valstybes imone „Oro navigacija" data exchange network

	implementation; • 2014-2015 Valstybes imone „Oro navigacija" Mobile tower implementation for the 4 aerodromes contingency purpose; • 2014-2015 The project „Legal Time Distributing System", No. VP1-3.1-ŠMM-06-V-01-033 of the „Eureka" program „Implementation of the projects for scientific research and technology development" – theoretical modelling, dissemination. Publications: [1] R. Miškinis, D. Smirnov E. Urba, B. Dzindzelėta. Timing and synchronization in mobile telecommunication networks // IEEE Proceedings 2011 of Joint Frequency Control Symposium and European Frequency and Time Forum. – P. 665 – 669. [2]R. Miškinis, D. Smirnov E. Urba, B. Dzindzelėta. Improving Timing Capabilities in 3G Mobile Networks // European Frequency and Time Forum 2012. – P. 368 – 370. [3]R. Miškinis, D. Jokubauskis, D. Smirnov, E. Urba, B. Malyško, B. Dzindzelėta, and K. Svirskas. Timing over a 4G (LTE) mobile network // In: Proceedings of 28th European Frequency and Time Forum. Neuchatel, Switzerland, June 23-26, 491 (2014). [4] E. Urba, R. Miškinis, D. Smirnov, D. Jokubauskis, B. Malyško. Teisinio laiko skleidimo sistema, kuriama vykdant programos Eureka" projektą = Legal Time Distributing System of the „Eureka" program // Mokslo Lietuva (elektronic publication), June 2, 2015. [5] Amaro Carmona Manuel Angel, Rudinskas Darius, Barrado Cristina, Design of a flight management system to support four-dimensional trajectories // Aviation, Vilnius: Technika. ISSN 1648-7788. Vol. 19, no. 1 (2015) p. 58-65
Entity Profile matching the task	Valstybes imone „Oro navigacija" has an extensive experience in implementation and maintenance of state of art enterprise G/G data network, including Cyber security areas. Experience in usage of innovative and unique technical solutions such as dense wavelength division multiplex under SWIM concept has already significantly enhanced G/G network and will contribute while reaching PJ.05 project targets. Know-how in ATM systems modernization to ensure compliance with the SESAR requirements and to define a single interoperability solution for the Baltic FA as well as SWIM concept implementation through integration of air traffic management and airport services will suite excellently for remote ATS provision solutions. Experience in integrated aeronautical information Briefing modernization and integrated aeronautical information database installation according to "SWIM Concept" is also in place. The latest project implemented in Lithuania in terms of ATS provision is SWIM-based mobile ATC Tower (MATC), suitable for integration within RTWR/RTC.
Contribution	Valstybes imone „Oro navigacija" contribution is planned through the development of at least 2 remote tower centres (RTC) and further their secure connection together into one network relaying on via common Regional COM infrastructure with already implemented several SWIM solutions. The evolution from Multiple airports being controlled by one RTC scenario/solution towards clustering/ coupling of 2 RTCs via standardized interfaces will ensure integrated remotely provided ATS for certain amount of low to medium traffic density aerodromes. Initially the RTWR test platform (RTWR TP) in Vilnius (possibility to move this platform to Siauliai military-civil airport) and Gdansk will be connected in order to investigate technologies needed (sufficiency vs efficiency), operational environment, contingency (inter alia mobile TWR) and interoperability issues for cross border

operations.

The possibility to integrate Approach Controllers working positions on each RTCs will be assessed.

It will be also focused on RTCs‘ data interchange processes synchronization when master clock controls all those processes and for the cases when this synchronization is affected/lost or processes becomes conflicting. The expected validation outputs will contain data on reliability and quality of the service and will inter alia guide on justification of performance parameters/thresholds needed.

Contribution of Valstybes imone „Oro navigacija” to the Project PJ.05 project would consist also via participation in various validation activities:

- for PJ.05-02: V2,V3-Real Time Simulation (RTS) in Vilnius (or Siauliai) and Gdansk using RTWR TP within contribution to SDM -0207, SDM-0208 operational improvement (OI).
- for PJ.05-03: V2,V3-Real Time Simulation (RTS) in Vilnius (or Silauliai) and Gdansk using RTWR TP within contribution to 0209, 0210 operational improvement (OIs).

4.1.1.6 PANSA (B4)

Organisation	6 PANSA (B4) ANSP
Description	PANSA (Polish Air Navigation Services Agency) is the national entity acting pursuant to the Act on the Polish Air Navigation Services Agency (2006) to provide air navigation services in Poland. PANSA provides air traffic management services, communication, navigation and surveillance services as well as an aeronautical information services in the Polish airspace and in airspace over the part of Baltic Sea. It operates one combined En-route/TMA control centre at Warsaw, 3 independent TMA control centres (Gdańsk, Kraków, Poznań) and 14 tower units at Polish international airports. Each year PANSA, being one of the biggest ANSPs in the Central and Eastern part of Europe, provides safe, effective and highly efficient air traffic control services to almost 700 thousands movements. 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. PANSA is a Member of the Baltic FAB and Gate One, a regional platform of Central and Eastern European ANSPs.
Previous experience	Not applicable
Entity Profile matching the task	Not applicable, PANSA initially will not participate directly in this action.
Contribution	Support to participating members of B4 Consortium if required.

4.1.1.7 ACG/COOPANS

Organisation	**7 ACG/COOPANS**	**ANSP**
Description	Austro Control is a state-owned limited liability company. Location: The headquarter is located in Vienna and subdivisions are situated in Linz, Salzburg, Klagenfurt, Graz and Innsbruck. 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 Governance structure: A Supervisory Board and a Management Board is responsible for the corporate governance. An audit committee is also established. 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 Austro Control is a member of COOPANS Consortium consisting of 5 Air Navigation Service Providers: Austro Control (ACG/COOPANS), Croatia Control (CCL/COOPANS), Irish Aviation Authority (IAA), Naviair/COOPANS and Luftfartsverket (LFV/COOPANS). Cooperation between COOPANS partners goes beyond SESAR – partners has for a long time worked together with THALES AIR SYS under a common framework agreement in a joint program based on the incremental development of a common ATM platform. The overarching goal for COOPANS is to enable each individual ANSP to achieve financial savings through cost, resource, and competence sharing and to meet the EU objective of harmonizing ATM systems. This work is now expanded to Research & Innovation by the establishment of the COOPANS Consortium. 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. The enterprise is certified according to ISO 9001.	
Previous experience	Austro Control has participated in SESAR via NORACON consortium in the following WPs: WP1 SESAR2020 preparation: 00.15 WP3 Validation infrastructure adaptation and integration: 03.03.02, 03.03.03 WP5 TMA Operations: 05.03.00, 05.06.02, 05.06.04, 05.06.07, 05.07.02, 05.09 WP6 Airport Operations: 06.05.05, 06.06.01, 06.07.01, 06.08.08, 06.09.03 WP7 Network Operations: 07.05.04 WP8 Information Management: 08.01.01, 08.01.06, 08.03.03, 08.03.06, 08.03.10 WP10 En-Route & Approach ATM Systems: 10.02.01, 10.02.03, 10.03.01, 10.03.08, 10.07.01, 10.10.03 WP12 Airport Systems : 12.02.01, 12.06.03 WP13 Network Information Management Systems: 13.02.02 WP14 SWIM Technical Architecture: 14.02.03, 14.04	

	WP16 R&D Transversal Areas: 16.01.01, 16.06.01, 16.06.01.b WP B Target Concept and Architecture Maintenance: B.04.05 WP C: Master Plan Maintenance C.02, C.03 Furthermore ACG/COOPANS has already conducted a study on the applicability of the Remote Tower Concept for Austrian airports.
Entity Profile matching the task	ACG/COOPANS has been studying the technical implication of remote tower systems and has built up considerable experience in this area. Specific expertise relevant for the project: • ATM systems requirements • Safety concepts & Safety Assessments Development and implementation of ATM systems & Tools (common development and implementation of TopSky)
Contribution	ACG/COOPANS will contribute to PJ.05 mainly with engineers who will participate in concept developments and technical architecting.

4.1.1.8 CCL/COOPANS

Organisation	8 CCL/COOPANS ANSP
Description	Croatia Control is a state-owned limited liability company. Location: The company headquarters is located in Velika Gorica and the subsidiaries (regional ATC centres) are located in Pula, Rijeka, Lošinj, Split/Brač, Zadar, Dubrovnik and Osijek. Divisions: Air Traffic Management, Technical Division, Aeronautical Meteorology, Military Operations and Human Resources Management, Legal and Financial Affairs. Governance structure: Company Assembly, Supervisory Board and Management-Director General. The Company Assembly consists of the Minister of the Maritime Affairs, Transport and Infrastructure – Chairman, Minister of Finance and the Minister of Defence. The Supervisory Board monitors the activities of the organization. The Director General manages and represents the organization. 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: • Air Traffic Services (ATS) • Communication, Navigation and Surveillance Services (CNS) • Aeronautical Information Services (AIS) • Aeronautical Meteorological Services (MET) Croatia Control is a member of COOPANS Alliance consisting of 5 Air Navigation Service Providers: Austro Control (ACG/COOPANS), Croatia Control (CCL/COOPANS), Irish Aviation Authority (IAA), Naviair/COOPANS and LFV/COOPANS. The cooperation between COOPANS partners goes beyond SESAR – partners have for a long time worked together with THALES AIR SYS under a common framework agreement in a joint program based on the incremental development of a common ATM platform. The overarching goal for COOPANS is to enable each individual ANSP to achieve financial savings through cost, resource, and competence sharing and to meet the EU objective of ATM systems harmonisation. This cooperation is now expanded to Research & Innovation by the establishment of the COOPANS Consortium. Croatia Control has many years of experience, both in the delivery of Air Traffic Services and the design of concepts as in the development, validation and implementation of Air Traffic Management tools. Croatia Control is ISO 9001, ISO 14001 and BS OHSAS 18001 certified.
Previous experience	Croatia Control has no experiences in Remote Tower operations nor in development. But, our COOPANS partner LFV/COOPANS is very experienced in such operations and Croatia Control will participate in the project in very close cooperation with LFV/COOPANS.
Entity Profile matching the task	Croatia Control as a part of COOPANS has a long experience in cooperating with industry partner THALES AIR SYS at expert and management level for the development of core ATM system EUROCAT-E and Topsky since 2001. TopSky is one of the most modern ATM systems in the world, and Croatia Control together

	with COOPANS partners are continuing to develop the ATM system in anticipation of future European Mandates and SESAR in a cost efficient manner. Many of the Croatia Control's experts had been working in EUROCT-E developments and implementation, and now are working with COOPANS partners and THALES AIR SYS 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. Croatia Control has experience in many areas related to this project, as for example: • Development and supervision of operational concepts • Safety concepts & Safety Assessments • CWP design • Development and implementation of ATM systems and tools • Validation and Integration • Human Performance Assessment • ATM expert – Operations • ATFCM Expert – Operations ATC User Requirements
Contribution	Croatia Control will participate with operational experts (ATCOs) and engineers with focus on concepts and operational issues.

4.1.1.9 IAA/COOPANS

Organisation	**9 IAA/COOPANS**	**ANSP**
Description	Irish Aviation Authority is a state owned limited liability company Locations: The headquarter is located in Dublin and subdivisions are located in Shannon and Cork 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. Governance structure: Irish Aviation Authority has a Board of Directors having responsibility for the corporate governance. Irish Aviation Authority (IAA) is a member of COOPANS Consortium consisting of 5 Air Navigation Service Providers: Austro Control (ACG/COOPANS), Croatia Control (CCL/COOPANS), Irish Aviation Authority (IAA), Naviair/COOPANS and LFV/COOPANS. Cooperation between COOPANS partners goes beyond SESAR – partners has for a long time worked together with THALES AIR SYS under a common framework agreement in a joint program based on the incremental development of a common ATM platform. The overarching goal for COOPANS is to enable each individual ANSP to achieve financial savings through cost, resource, and competence sharing and to meet the EU objective of harmonizing ATM systems. This work is now expanded to Research & Innovation by the establishment of the COOPANS Consortium. 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. The enterprise is certified ISO 9001.	
Previous experience	Irish Aviation Authority (IAA) has participated in SESAR via NORACON consortium in the following WPs: WP5 TMA Operations (5.3, 5.6.1,5.6.4, 5.6.7, 5.9), WP6 Airport Operations (6.7.1), WP 10 En-Route & Approach ATM Systems (10.2.1, 10.3.8, 10.10.3), WP 16 R&D Transversal Areas (16.4.3, 16.6.1), WP C Master Plan Maintenance (C3)	
Entity Profile matching the task	Not applicable, Irish Aviation Authority (IAA) will not initially participate directly in this action	
Contribution	Support to participating COOPANS members if required.	

4.1.1.10 LFV/COOPANS

Organisation	10 LFV/COOPANS	ANSP
Description	Luftfartsverket (LFV/COOPANS) is a state enterprise with headquarter located in Norrköping, Sweden. LFV/COOPANS has subdivisions located in 22 different sites, most important being in Stockholm (Arlanda) and Malmö (Sturup), where the two area control centres are located. LFV/COOPANS has three main divisions: - Operational Systems & Development - ATM Operations - Sales, International Affairs & Business Development All supported by corporate services. Governance Structure: LFV/COOPANS has a Board of Directors having responsibility for the corporate governance. The Director general is appointed by the Board of Directors. LFV/COOPANS is a member of COOPANS Consortium consisting of five Air Navigation Service Providers: Austro Control (ACG/COOPANS), Croatia Control (CCL/COOPANS), Irish Aviation Authority (IAA), Naviair/COOPANS and LFV/COOPANS. Cooperation between COOPANS partners goes beyond SESAR-partners has for a long time worked together with THALES AIR SYS under a common framework agreement in a joint program based on the incremental development of a common ATM platform. The overarching goal for COOPANS is to enable each individual ANSP to achieve financial savings through cost, resource, and competence sharing and to meet the EU objective of harmonizing ATM systems. This work is now expanded to Research & Innovation by the establishment of the COOPANS Consortium. LFV/COOPANS has many years of experience, both in the delivery of Air Traffic Services; design of concepts and in development, validation and implementation of Air Traffic Management tools. LFV/COOPANS has an extensive experience and a close interaction with the industry and Swedish Transport Agency, developing new technology. The effect of this is a flexible product portfolio of functional and cost efficient solutions, like the development of Remote Tower Services (RTS) that went from idea to reality in record time. The enterprise is certified ISO 9001.
Previous experience	LFV/COOPANS has participated, contributing to and also been leading projects in SESAR 1 via NORACON Consortium in the following WPs: WP1 SESAR2020 preparation: 00.14, 00.15 WP3 Validation infrastructure adaptation and integration: 03.01.01, 03.02.01, 03.02.02, 03.03.02, 03.03.03 WP4 En-route Operations : 04.08.04, 04.10 WP5: TMA Operations 05.03.00, 05.06.01 (Lead), 05.06.02, 05.06.04, 05.06.07, 05.07.02, 05.09 WP6 Airport Operations: 06.06.02, 06.07.01, 06.08.01, 06.08.02, 06.08.04, 06.08.08,

	06.09.03(Lead) WP7 Network Operations: 07.05.02, 07.05.03, 07.05.04 WP8 Information Management: 08.00 (Lead), 08.01.03, 08.01.04, 08.01.05, 08.01.06, 08.01.09, 08.03.00, 08.03.03, 08.03.04, 08.03.06, 08.03.10 WP9 Aircraft Systems : 09.48 WP10 En-Route & Approach ATM Systems: 10.02.01, 10.02.03, 10.03.01, 10.03.08, 10.04.04, 10.07.01, 10.09.04, 10.10.03 WP12 Airport Systems : 12.02.01, 12.04.06, 12.04.07, 12.04.08, 12.04.10 WP14 SWIM Technical Architecture: 14.01.03, 14.04 WP15 Non-Avionic CNS System: 15.01.06, 15.01.07, 15.02.04, 15.04.05.a, 15.04.05.b WP16 R&D Transversal Areas: 16.01.02, 16.04.01, 16.04.03, 16.04.04, 16.05.04, 16.06.01.b WP B Target Concept and Architecture Maintenance: B.04.01, B.04.02, B.04.03, B.04.05 WPC Master Plan Maintenance: C.02, C.03 LFV/COOPANS started out with Remote Towers in the early projects of ROT and ART before SESAR 1 which also was one of the inputs to SESAR Remote project. Of special relevance to this project is WP 06.09.03 Remote & virtual TWR and the supporting projects in WP 12. The developed OFA- documents e.g. OSED, also included results from WP 06.08.04. LFV/COOPANS is also part of the LSD.02.05 RTO – Remote Tower Operations project with its new operational concept for airports with very low traffic levels.
Entity Profile matching the task	Expertise is present in the company in many areas: • Remote airport ATC • Development and supervision of operational concepts • Safety concepts & Safety Assessments • Airport safety support tools • Collaborative Decision Making • Air traffic forecast/Capacity planning incl. runway capacity enhancement • CWP design • Development and implementation of ATM systems & Tools (common development and implementation of TopSky) • Trajectory management (core functionality in TopSky) • Development and implementation of safety and monitoring tools (core functionality in TopSky – 4D MTCD) • Flight procedures, special approach procedures (incl. RNAV) • Performance Based Navigation • Integration, validation and analysis of test result

	• Extended lab environment including NARSIM and THALES AIR SYS IBP • Participation in European deployment activities (IDSG) • Human performance assessment For the Remote tower program in SESAR 2020, PJ.05, LFV/COOPANS is the first and so far only ANSP whom has implemented Remote Towers in real operations. LFV/COOPANS has two implemented and a third planned airport connected to Sundsvall RTC. That enables trials with live data to reach a full V3 maturity. LFV/COOPANS has also been the leading OFA coordinator, within NORACON, for the fruitful project P.06.09.03 and the delivery of three V3 mature solutions, single, multiple and contingency remote tower concepts.
Contribution	LFV/COOPANS will lead PJ.05.02 and the OSEDs for entire PJ.05. LFV/COOPANS have a long history of remote towers and several ATCOs experienced from working remotely as well as skilled engineers on both research and operative implementations of remote towers. All of this will contribute to the future research within Remote Tower Services (RTS).

4.1.1.11 Naviair/COOPANS

Organisation	11 Naviair/COOPANS ANSP
Description	Naviair/COOPANS is a 100% state owned company originating in "Statens Luftfartsvæsen" founded in 1938. Headquarter is located in Copenhagen (TWR/APP/En-route) and subdivisions are located in Roskilde, Billund, Århus, Rønne and Ålborg (TWR/APP) and in Vagar & Nuuk (FIS/FIC). Naviair/COOPANS has three main divisions - Operations, Technical Maintenance and ATM Projects & Engineering supported by Corporate Services. Naviair/COOPANS is a member of COOPANS Consortium consisting of 5 Air Navigation Service Providers: Austro Control (ACG/COOPANS), Croatia Control (CCL/COOPANS), Irish Aviation Authority (IAA/COOPANS), Luftfartsverket (LFV/COOPANS) and Naviair/COOPANS. Cooperation between COOPANS partners goes beyond SESAR – partners has for a long time worked together with THALES AIR SYS under a common framework agreement in a joint program based on the incremental development of a common ATM platform. The overarching goal for COOPANS is to enable each individual ANSP to achieve financial savings through cost, resource, and competence sharing and to meet the EU objective of harmonizing ATM systems. This work is now expanded to Research & Innovation by the establishment of the COOPANS Consortium. Naviair/COOPANS has many years of experience, both in the delivery of Air Traffic Services; design of concepts and in development, validation and implementation of Air Traffic Management tools. The company is certified ISO 9001.
Previous experience	Naviair/COOPANS has participated in SESAR via NORACON consortium in the following WPs: WP1 SESAR2020 preparation 00.14, 00.15 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 WP6 Airport Operations: 6.8.4 WP7 Network Operations: 7.5.4 WP 8 Information Management: 08.1.3, 8.1.5, 8.1.9, 8.3.4, 8.3.10 WP 10 En-Route & Approach ATM Systems: 10.2.1, 10.2.3, 10.3.1, 10.3.8, 10.9.4, 10.10.3 WP 14 SWIM Technical Architecture: 14.1.3, 14.4 WP 16 R&D Transversal Areas: 16.2.3, 16.6.2 WP B Target Concept and Architecture Maintenance: B4.2, B4.3, B4.5 WP C Master Plan Maintenance: C2 & C3 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. Naviair/COOPANS has since 1997 experience with arrival/departure management through the development of the Maestro arrival manager which is now an integrated part of the ATM-system.

Entity Profile matching the task	Not applicable, Naviair/COOPANS will not initially participate directly in this action
Contribution	Support to participating COOPANS members if required

4.1.1.12 DFS

Organisation	**12 DFS** **ANSP**
Description	DFS Deutsche Flugsicherung GmbH (DFS) is responsible for air traffic control in Germany and is headquartered in the town of Langen. It is a company organised under private law and 100% owned by the Federal Republic of Germany. The main business of air navigation services provided by DFS is defined by the tasks set out in Section 27c of the German Aviation Act (LuftVG). DFS provides air traffic services as a sovereign function, coordinates the air traffic flow and manages airspace utilisation (as a company entrusted with State functions). For this purpose, it develops and operates air traffic service systems as well as communications, surveillance and navigation systems. DFS operates control centres in Langen, Bremen, Karlsruhe and Munich, a unit within the Maastricht Upper Area Control Centre of EUROCONTROL as well as 16 control towers at Germany's designated international airports. With its approximately 5,900 operational and administrative staff, DFS ensures that approximately three million flights under instrument flight rules (IFR) reach their destinations safely and on time each year.
Previous experience	Previous projects: SESAR 1 (2010-2016): DFS contributed to OFA 06.03.01 Remote Tower by leading several validation exercises (realtime simulation as well as passive shadow mode trials) • EXE-06.08.04-VP-638 (V2 Single Remote Tower, Shadow Mode small airport) • EXE-06.08.04-VP-639 (V2 Single Remote Tower, Shadow Mode medium airport) • EXE-06.08.04-VP-640 (V3 Single Remote Tower, Shadow Mode medium airport) • EXE-06.08.04-VP-641 (V2 Multiple Remote Tower, Realtime Simulation) DFS has provided the validation platform and prototypes for these exercises together with FRQ (FSP) and DLR (AT-One). Based on the experience gained in these exercises DFS contributed to development of OSED /Safety and Performance Report / Human Performance Report which were developed in close cooperation with NORACON. Based on the work provided for OFA 06.03.01 (P06.08.04), DFS contributes to the demonstration 2.5 LSD-RTO within the consortium of ANSPs, Industry and Airspace Users. DFS has been contributing to standardisation (EUROCAE WG100) and regulation (EASA NPA).
Entity Profile matching the task	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 implementing Single Remote Tower Services at the small airports already and intends to continue this strategy with Multiple Remote Tower Services.
Contribution	DFS will be the solution leader for WP3 ‘Remotely Provided Air Traffic Services

from a Remote Tower Center with a flexible allocation of aerodromes to Remote Tower Modules'. In addition to this DFS will be part of the content consolidation team.

DFS intends to develop and validate a prototype that can be used for providing remote ATS to airports with frequent simultaneous movements and offering the flexibility to allocate airports to different RTMs (Remote Tower Modules). DFS intends to focus on development of CWP considering human performance guidelines and providing automation support in order to reduce ATCO monitoring workload.

DFS will contribute to solution 03 with a V2 validation addressing SDM-0210 where DFS will provide the validation platform (Real-time Simulator) 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 development of validation Report.

DFS will contribute to the documents that will be developed for the V2 datapack for solution 03 (i.e. OSED / SPR / INTEROP).

4.1.1.13 ENAV

Organisation	13 ENAV ANSP
Description	ENAV is one of the major European Air Navigation Service Providers in terms of volume of controlled airspace, number of flights managed, investments in technology innovation and R&D. ENAV is a Joint-Stock Company, 100% owned by the Italian Ministry of Economy and Financial Planning, in charge of the provision of air navigation services within the airspace and the airports placed under its own responsibility by the Italian Government. In particular, the Company has the responsibility for the provision of the following institutional services: • Air Traffic Control; • Aeronautical communications and radio-navigation; • Aeronautical Information Service and Management, • Aeronautical cartography and obstacle charts; • Airspace and flight procedure design; • Airport air-side operations design; • Aeronautical meteorology; • Maintenance and logistics management of CNS/ATM systems; • Flight inspection; • Recruitment, Training and Licensing of ANS Personnel; • R&D and studies on any matter related to ATS. Staffed by more than 4.100 people, its H.Q. are located in Rome; Its ATS infrastructure includes 4 ACC, 19 APP units, 27 TWR units and 20 AFIS units plus a broad variety of CNS/ATM systems and assets spread all over the country to guarantee continuous operations, extensive service cover and adequate systems redundancy. About 2.0 million flights per year are safely managed in a complex operating scenario with significant operational and economic performance results internationally acknowledged. ENAV has an outstanding expertise in Air Traffic Management operations and services, in the development and validation of concepts, system prototypes and procedures for the continuous improvement of its operational performance, in providing its staff with a continuous competency up-dating and operational training, in assisting the supply industry to design and engineer new systems to safely support the ATM operational personnel in their highly demanding tasks. About its involvement in international activities/panels, ENAV is member of SJU since 2007, member of the SDA Consortium in charge of the SESAR Deployment management, member of A6 Group (strategic alliance amongst some of the largest and most influential European ANSP), member of CANSO (Civil Air Navigation Services Organization), member of European CANSO CEO Committee (EC3) as well as member of ESSP (European Satellite Services Provider).

	In addition to the above participation, ENAV experts are actively involved in the most important committees, working groups, expert panels dealing with CNS/ATM matters with special regard to ADS, ASAS, A-SMGCS, VHF digital communication systems, Satellite Navigation Systems (e.g. EGNOS and Galileo), advanced automated Flight Data Processing Systems and Surveillance Data Processing Systems (e.g. 4-Flight/Coflight). In line with its mission, ENAV, through its participation in the BLUE MED FAB, is playing a leading role in the Mediterranean Area by promoting synergies with other Service Providers and of neighbouring regions in support of the Single European Sky Implementation. ENAV Group includes the three 100% controlled companies: Techno Sky S.r.l., SICTA and ENAV Asia-Pacific. More recently, ENAV invested 61M$ by purchasing 12,5% of Aireon, a U.S. Company, founded by Iridium group and owned 51% by NAV CANADA. The company intends to deploy the first global surveillance satellite system by 2018, exploiting ADS-B OUT technology and the mandates which will impose, to most commercial aviation around the world, to equip their aircraft with ADS-B OUT transponders.
Previous experience	ENAV is involved in R&D, strategic planning, technical co-operation and service provision programs with international organizations (e.g. SESAR Joint Undertaking, EUROCONTROL, European Commission, ESSP) and foreign countries, aiming at contributing to the advancement of ATM technology and processes and at improving the service level provided. ENAV has a long lasting experience in international initiatives and has been participating, managing, coordinating and actively contributing to several international projects and large scale researches, developments and validations. Previous R&D projects: • SESAR 1 (WPB, WPC, WP3, WP4, WP5, WP6, WP7, WP8, WP10, WP12, WP13, WP14, WP15, WP16) • SESAR 1 Very Large Scale Demonstrations: o ATC Full Datalink (AFD) o WE-FREE o MEDALE o RACOON o FREE SOLUTIONS • BEYOND (H2020, 2015-2017) • DARWIN (H2020, 2015-2018) • SAWSOC (FP7, 2013-2016) • GAMMA (FP7, 2013-2017) • FUTURE SKY SAFETY (H2020, 2015-2019) • OPTIMAL (FP6, 2004-2008)

	• AD4 (FP6, 2005-2007)
Entity Profile matching the task	ENAV is responsible for the air navigation services at different Italian civil airports where, from the Control Towers, it manages the take-offs, landings and final approaches to the airport, the departure phase from the same airport and the ground movements of aircraft. On the ports in which minor volumes of traffic are registered, ENAV provides the sole Flight Information Service (AFIS). In the current economic context, where the revision/limitation of costs is a key driver for the resources' and investments' planning, ENAV, starting from its experience on RACOOC VLSD, wants to continue investing its R&D effort on the provision of ATC Services and on the sharing of ATS services. Additionally ENAV has recently launched an internal Working Group, involving key persons from the Operational, Technical and International Strategies Directorates, to develop a roadmap for Remote TWR implementation over low traffic density Italian airports and elaborate specific case-studies, covering potential deployment scenarios, operational and technical requirements.
Contribution	ENAV will contribute to both solutions PJ.05.02 and PJ.05.03 On the solution PJ.05.02 ENAV will contribute to the V3 maturity of the solution and will contribute to the drafting and consolidation of the OSED as well to the other contractual deliverables "Data Pack". ENAV will use TBA3D, available with A-SMGCS Level2, to conduct research and development and to validate the solution to be addressed. On the solution PJ.05.03 ENAV will contribute to the drafting and consolidation of the OSED as well to the other contractual deliverables "Data Pack".

4.1.1.14 FRQ (FSP)

Organisation	14 FRQ (FSP)	Ground Industry
Description	**FRQ (FSP),** member of SESAR1, is an international expert for communication and information systems for control centres with safety-critical tasks. FRQ (FSP) maintains a worldwide network of subsidiaries and local representatives in more than 50 countries to ensure closeness to our customers. FRQ (FSP) 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. FRQ (FSP) is member of the Frequentis SESAR Partners (FSP) consortium together with the companies HC (FSP) and ATOS (FSP) and was founded in 2014 for the main purpose of joining SESAR2020 activities. Frequentis SESAR Partners is member of the SESAR Joint Undertaking. 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.	
Previous experience	FRQ (FSP) has successful ATM related projects in more than 100 countries worldwide with about 25,000+ installed working positions. • 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. • FRQ (FSP) is also active in the area of Remote Tower / Video based surveillance over the last 5 years and runs currently an implementation project for rollout of single remote tower solution with DFS in Germany. FRQ (FSP) is participating in various projects in SESAR 1; in the field of Remote Tower in SESAR Projects 12.4.6 and 12.4.7.	
Entity Profile matching the task	FRQ (FSP) will bring the following expertise profiles: • Experience and technical know-how in development of safety critical systems for air traffic control towers (user interfaces and backend services) • Safety expertise • Service oriented architectures • Expertise in IT infrastructure and cyber-security • Competence in SWIM infrastructure and SWIM services • Specific Remote Tower Experience out of implementation projects and SESAR 1.	
Contribution	FRQ (FSP) will contribute as industry partner and provide part of a multi tower	

validation platform for solution 2 together with HC (FSP) and AT ONE member DLR (AT-One). FRQ (FSP) will focus on implementation of prototype for an integrated multi remote tower working position including voice, flight data and visualisation based on a service oriented platform.

In Solution 3 FRQ (FSP) will provide parts of the validation platform for a validation with DFS with focus on visualisation, enhanced voice services and video based surveillance. FRQ (FSP) will provide a service oriented integration platform to combined DFS and FRQ (FSP) module to an integrated Multi Remote Tower system.

FRQ (FSP) will also lead the INTEROP Specification and coordinate work between partners.

4.1.1.15 ATOS (FSP)

Organisation	**15 ATOS (FSP)** **Ground Industry**
Description	**ATOS (FSP)** is a company within Atos SE (Societas Europaea) group. ATOS (FSP) is a leader in digital services with 2014 pro forma annual revenue of €10 billion and 86,000 employees in 66 countries. Serving a global client base, the Group provides Consulting & Systems Integration services, Managed Services, Cloud operations, Big Data & Security solutions, as well as transactional services. Throughout Europe, more than 300 ATOS (FSP) ATM experts provide solutions and architecture support to Air Navigation Service Providers, Airports, Airlines and Eurocontrol Network Manager. ATOS (FSP) is member of the Frequentis SESAR Partners consortium together with the companies HC (FSP) and FRQ (FSP) and was founded in 2014 for the main purpose of joining SESAR2020 activities. Frequentis SESAR Partners is member of the SESAR Joint Undertaking. 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.
Previous experience	Not applicable
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.

4.1.1.16 HC (FSP)

Organisation	**16 HC (FSP)** **ANSP**
Description	**Hungarocontrol Zrt (HC (FSP))**. is a state-owned company in Hungary, which provides air navigation services in the Hungarian airspace and (on a NATO assignment) in the upper airspace over Kosovo, trains air control personnel and conducts air navigation research and development. HC (FSP) is member of the Frequentis SESAR Partners consortium together with the companies ATOS (FSP)and FRQ (FSP) and was founded in 2014 for the main purpose of joining SESAR2020 activities. Frequentis SESAR Partners is member of the SESAR Joint Undertaking. 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.
Previous experience	HC (FSP) has more than 50 years of experience in ATM and it has implemented several technical and operational updates for the entire Hungarian airspace. Since its foundation, it has a very strong relation with universities and scientific centres. HC (FSP) is active in ATM research, in SESAR 1 demonstration activities (REACT-Plus), won a grant of SESAR JU for a Large Scale Demonstration project (Budapest 2.0).
Entity Profile matching the task	HC (FSP) will bring the following expertise profiles: • Operational Expertise • Service oriented architectures • Specific Remote Tower Experience out of implementation projects and SESAR 1.
Contribution	With Hungarocontrol's contribution the multiple remote tower discipline including a medium size airport can be assessed in solution 2 together with FRQ (FSP). Combining small regional airport with a medium size one might result an aerodrome independent solution which can be adapted in differently equipped airport including differentiation in traffic, service level, surveillance and layout. In our concept, the ATCO workload is planned to be tested and possible limitations shall be set including human factors, safety and training issues to determine a feasible, cost effective service provision for multiple airports.

4.1.1.17 INDRA

Organisation	17 INDRA	Ground Industry
Description	Indra Sistemas S.A. (henceforth Indra) is a global technology, innovation and talent company being on the cutting edge of high value-added solutions and services for the Transport & Traffic, Energy & Industry, Public Administration & Healthcare, Financial Services, Security & Defence, Telecom and Media sectors. The company operates in more than 149 countries and has more than 39,000 employees worldwide, focusing on developing innovative solutions investing 6-8% of annual revenue in R&D and playing a leading role in SESAR. Focused on Transport & Traffic sector, Indra has developed air traffic management systems that are deployed across the world, with over 4,000 installations in 160 countries. With the aim to provide our Customers with comprehensive, full and turnkey solutions, Indra product range covers the whole range of Air Traffic Management Systems, including Surveillance, Automation, Communications, Simulators and NAVAIDs. Indra has proven its expertise in the development and implementation of TWR systems since its arrival to the ATM market. Indra has been in charge of the modernization, update, design, manufacture, installation and maintenance of the whole set of TWR systems that manage the air traffic at all the Spanish airports (SACTA) for over 25 years, while being able to satisfy dozens of customers from non-domestic markets in several continents with A-SMGCS solutions and Air Traffic Control Systems . 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) constituted by ENAIRE (Spain), DFS (Germany), NATS (United Kingdom) and LVNL (The Netherlands), with Indra as industrial partner. Since 2009, Indra is full member of the SESAR Joint Undertaking, participating in more than 120 projects within the Programme and co-leading both WP10 (En Route and Approach ATC) and WP12 (Airports), as well as playing a key role in many projects under WP14 (SWIM), WP15 (Non-Avionics CNS) and WP13 (NIMS).
Previous experience	Previous projects: Indra has participated in the OFA 06.03.01 Remote Tower technical projects: • 12.04.07 – Remotely Operated Tower for Multiple Controlled Airports • 12.04.08 – Remotely Operated Tower for Contingency Indra has contributed to the definition of technical requirements based on the 06.09.03 Operational Concept for Single, Multiple and Contingency Remote Towers. In the scope of 12.04.08, Indra has provided two to iterative prototypes for Contingency operations to support the following exercises with ENAIRE. • EXE-06.08.04-VP-751 (V2 Remote Contingency Tower) Validation in Gerona/Costa-Brava airport 2014 • EXE-06.08.04-VP-752 (V3 Remote Contingency Tower) Validation in Gerona/Costa-Brava airport 2015 Indra is contributing to standardisation by participating in the EUROCAE WG100.
Entity Profile	Indra has the in-depth experience and products necessary to undertake any Air

matching the task	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. Besides the Remote Tower technical projects, along SESAR 1 Indra has led to the most important technical projects under WP 12 "Airport Systems" such as 12.03.03 "Enhanced Surface Routing", 12.04.03 "Enhanced FDPs at airports", 12.05.04 "A-CWP" and actively contribute to 12.03.01 "Improved surveillance for surface management", 12.03.02" Enhanced Surface Safety Nets", 12.03.04 "Enhanced Surface Guidance" and 12.04.04 "Integration of Departure Management and Surface Management". Indra, as a ground industry, will provide its expertise on management, analysis, definition and implementation of Tower ATC systems and in particular for PJ05 all the background gained from the SESAR 1 Remote Tower project and the prototypes developed.
Contribution	Indra will contribute to all Data Pack deliverables, being focused on technical requirements (Technical Specification), software and platform definition, development and configuration in order to be used in validation activities. Indra will also provide support to the definition of operational requirements and the validation activities to be performed by Avinor ANS and Indra Navia. WP2 Based on the results obtained from V3 validation in SESAR1 Indra will contribute to improve the Controller Working Position to enable ATCO/AFISO to provide air traffic service in several airports at a time in a highly flexible way. In addition short term planning tools from PJ02-08 will be integrated with the objective to allow a flexible allocation of aerodromes according to the workload, traffic and complexity. WP3 Based on the prototypes from SESAR 1, WP2 and PJ02-08 solutions, Indra will contribute to the definition and implementation of the Remote Tower Centre (RTC) supervisor support system integrated with long term planning tools to enable a predictive and flexible allocation of aerodromes connected to different controller working positions time in advance.

4.1.1.18 AIRTEL (NATMIG)

Organisation	**18 AIRTEL (NATMIG)** **Ground Industry**
Description	Airtel ATN Ltd is a part of North European ATM Industry Group (NATMIG) Consortium. NATMIG is a member of SESAR 1. The NATMIG consortium consists of Airtel ATN (SME - Ireland), Saab AB (multinational industrial concern - Sweden) and Stiftelsen SINTEF (non-profit research foundation - Norway). Airtel is an SME which has an extensive line of ATN & FANS data link products and technology used in 35 countries worldwide. Its operational systems include ATN/OSI routers deployed on more than 2,500 aircraft. Its ground systems include Air/Ground Data Link Servers deployed in several European Countries and Air/Ground routers used in VDL Mode-2 networks. It provides data link test and monitoring equipment. It has developed experimental version of future data link systems such as ATN/IPS, SATCOM and AeroMACS. Airtel is providing Test and Monitoring equipment to the FAA DCIS program. It has extended its research collaboration to include organisations in China. It is also providing Data Link networking equipment in collaboration with Russian companies. Airtel also provides Data Link test services and products in support of Aircraft Data Link certification for ACARS, FANS and ATN/OSI, in particular EU Data Link and US DCIS aircraft testing.
Previous experience	Not applicable.
Entity Profile matching the task	Not applicable, Airtel (NATMIG) initially will not participate directly in this action.
Contribution	Support to participating NATMIG members if required

4.1.1.19 SAAB (NATMIG)

Organisation	19 SAAB (NATMIG)	Ground Industry
Description	Saab is a part of North European ATM Industry Group (NATMIG) Consortium. NATMIG is a member of SESAR 1. The NATMIG consortium consists of Airtel ATN (SME - Ireland), Saab AB (multinational industrial concern - Sweden) and Stiftelsen SINTEF (non-profit research foundation - Norway). Saab Saab is a global supplier in the ATM domain and Saab has a long history of developing and delivering ATM solutions. Saab has pioneered future concepts such as the Remote Tower, which in operational use in Sweden and is undergoing trails in several other countries. In total, Saab has deployed 240 ATM systems and subsystems to serve over 60 customers in 40 countries. Our air traffic management systems and tools serve 18 of the 20 busiest airports in the world, 10 of the 12 largest Air Navigation Service Providers (ANSPs), and the 3 largest airlines by passenger count. Saab ATM systems guide 2 million aircraft movements each month via our airport surface safety systems. In addition to delivering large multi-airport programs, Saab has a long history of ATM thought leadership, applied research, development and implementation of concepts and programs supporting ATM advancement. Saab has been involved in all aspects of future aviation safety and efficiency advancements - from early concept development to implementation of tools and systems. All this experience and knowledge will be brought into the project and the solutions.	
Previous experience	Saab • Remotely Operated Tower (ROT), Proof-of-concept project in collaboration with LFV/COOPANS at Ängelholm airport controlled from Malmö airport, 2006-2009 • The Advanced Remote Tower (ART) project with 4 other partners (LFV/COOPANS, NLR (AT-ONE), Equipe and LYYN) at Ängelholm airport controlled from Malmö airport, 2007-2009 Remote tower projects in SESAR Saab 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, ongoing installation • LSD, Groningen from Amsterdam, ongoing installation <u>Other remote tower validations</u> • Australia, Alice Springs controlled from Adelaide (1500km) 2013 • Remote runway surveillance (Polderbahn) at Schiphol, operational 2015 • Ongoing validations in US, Leesburg executive airport Saab participates actively in the standardisation committee for remote towers, EUROCAE WG-100.
Entity Profile matching the task	Saab intends to bring the long experience with platforms and validation in to PJ.05. By the end of October 2014 LFV/COOPANS 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.
Contribution	<u>WP2</u> Based on the V3 multiple platform from SESAR1 Saab will contribute to improve remote tower services for more than one airport, work to be addressed is different kind of environments in order to demonstrate the amount of airports to be controlled at one time, considering the mix of 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. <u>WP3</u> Based on the multiple platform from WP2 Saab 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. SWIM infrastructure, the need for the role of a RTC supervisor, technical aspects (e.g. network, like a seamless integration of air/ground multi sensor tracking).

4.1.1.20 SINTEF (NATMIG)

Organisation	20 SINTEF (NATMIG)	Ground Industry
Description	SINTEF is a part of North European ATM Industry Group (NATMIG) Consortium. NATMIG is a member of SESAR 1. The NATMIG consortium consists of Airtel ATN (SME - Ireland), Saab AB (multinational industrial concern - Sweden) and Stiftelsen SINTEF (non-profit research foundation - Norway). SINTEF carries out contract research in a wide range of scientific and technical areas. Our business model spans from basic research with main focus on applied research to commercialisation of results into new business ideas. SINTEF employs more than 2250 employees from 70 different countries. The main office is in Trondheim, Norway, and SINTEF has offices in several locations both in Norway and abroad. Our business area SINTEF ICT is continuously specialising in leading edge information and communications technology (ICT), and forms the technology basis for our ATM activities. SINTEF ICT provides research based expertise and technology in the areas of: micro- and sensor systems, electronics, communication, optical systems, computational software, information systems as well as security and safety. Through previous participation in SESAR 1 and other ATM related projects, SINTEF has established close collaborations with both ANSPs (AVINOR, LFV/COOPANS, AUSTROCONTROL, ENAV) and equipment manufacturers (Saab). In relation to Remote Tower, SINTEF contributes their expertise in the fields of 3D/4D geometric modelling and visualisation, and information assurance and resilience engineering. SINTEF will bring forward results and experience from SESAR P12.04.09, which provided initial research into the use of 3D technologies in remote tower. Improving ATCO situational awareness becomes an increasingly important challenge when dealing with multiple aerodromes simultaneously. By coupling 3D models with remote tower video in the CWP, 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. SINTEF has leading expertise in the field of 3D/4D modelling and brings decades of experience in both leading and participating in EU projects. SINTEF also has significant experience in information assurance and resilience engineering. SINTEF has contributed resilience expertise in SESAR project "Application of resilience & robustness guidance to remote tower and ASAS" regarding application of resilience assessment for Multiple Remote Towers in Sweden and Norway. The resilience of the remote tower centre for MRTWR will be validated against issues of network availability, quality of service, and security. Validation will be conducted by adapting an assessment method developed for SESAR 16.06.01b, and based on Resilience Engineering principles.
Previous experience	SINTEF has extensive experience from many projects both within and outside of SESAR that relate to the proposed activities in remote tower. These include SESAR P12.04.09, where SINTEF developed two prototypes for 3D enhanced remote tower solutions and gained valuable stakeholder feedback through presenting at validation workshops VP-062 and VP-063. The work was developed alongside EU fp7 project IQmulus (FP7-ICT-2011-318787), also led by SINTEF, where they have gained leading international experience in generating functional 3D models.

	Relevant publications include: • V. Skytt, O.J.D. Barrowclough & T. Dokken (2015). Locally refined spline surfaces for representation of terrain data. Computers & Graphics, 49, 58-68. • O.J.D. Barrowclough, H.E. Swendgaard, T. Dokken & O. Andersen (2015). Geometric modelling for 3D support to remote tower air traffic control operations, 5th International Air Transport and Operations Symposium (ATOS). SINTEF was also active in the following SESAR projects: PJ16.2.3, which builds on EUROCONTROL work to produce the security risk assessment methodology for SESAR and will further develop assessment scenarios and the methodology for assessment of ICT risks; PJ16.06.01b, which consists of the development of a method grounded in Resilience Engineering to assess how future ATM/ANS functional systems support resilient operations, and of a guidance document for project 16.06.01 SESAR Safety Reference Material (MRTWR was a case study).
Entity Profile matching the task	The geometry group at SINTEF will work closely with NATMIG partner Saab in this PJ, by bringing their 3D modelling solutions developed in SESAR 12.04.09 up to a higher technology readiness level through integration and validation in a remote tower platform. We see 3D technologies as a key enabler in the safe and cost effective use of multiple remote tower solutions in the future. The Information and Communication Technology group at SINTEF will also collaborate with Saab by providing their conceptual and methodological expertise to ensure information assurance issues can be flexibly managed in the MRTWR concept. Resilience engineering is seen as a relevant discipline to understand, assess and address those issues in the complex ATM system.
Contribution	SINTEF will contribute to both WP2 and WP3. WP2: SINTEF will contribute to improving remote tower services for more than one airport, by integrating their 3D technologies into a remote tower solution based on the V3 multiple platform from SESAR1. Work to be addressed includes validating improvements to ATCO situational awareness through coupling 3D model with video as well as automation of runway incursion alarms based on improved detection. It will also include technical aspects, such as network quality of service and other resilience/redundancy related issues. WP3: Based on the multiple platform from WP2, SINTEF will provide methodological and conceptual tools for the validation and implementation of a resilient, flexible allocation of aerodromes to Remote Tower Modules (RTM), particularly in the face of disruptions to information assurance. The investigation of such capability will consider infrastructure issues (e.g., based on SWIM capacity), interface design issues (e.g., successful handover between RTMs, which allows for situational awareness), and process issues (e.g., organizational requirements).

4.1.1.21 EUROCONTROL

Organisation	**21 EUROCONTROL**	**Intergovernmental Organisation**
Description	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: • The Network Manager has extended the role of the former Central Flow Management Unit to proactively manage the entire ATM Network (nearly ten million flights every year), in close liaison with ANSPs, airspace users, the military and airports. • The Maastricht Upper Area Control Centre provides an air traffic control service for the Netherlands, Belgium, Luxembourg and northern Germany. • The Central Route Charges Office handles billing, collection and redistribution of aviation charges. • The Organisation is developing the Centralised Services initiative, which will open up some services to market competition on a pan-European level, generating significant savings and making for greater operational efficiency. • It supports the European Commission, EASA and National Supervisory Authorities in their regulatory activities. • It provides a unique platform for civil-military aviation coordination in Europe. • Finally, EUROCONTROL is a major player in European ATM research, development and validation and in this respect makes the largest contribution to the SESAR Joint Undertaking.	
Previous experience	Previous projects: SESAR 1 (WP6.9.3, WP12.4.7)	
Entity Profile matching the task	- Safety Expert - HP expert - Operational Expertise	
Contribution	EUROCONTROL will lead SPR tasks and contribute to its content, from initial development to final update based on validation results performed by partners. EUROCONTROL will contribute to OSED and CBA developments. EUROCONTROL will participate to validation exercises to ensure coherency with SPR.	

4.1.1.22 ADP (SEAC2020)

Organisation	**22 ADP (SEAC2020) Airport**
Description	ADP (SEAC2020) operates the 3 Paris airports: • Paris-Charles de Gaulle, 2nd largest airport in Europe and 9th worldwide, • Paris-Orly, 2nd largest airport in France, dedicated to point to point traffic, • Paris-le Bourget, the leading business airport in Europe. and 10 aerodromes in Paris area plus one heliport. Paris airports welcomed 95.4 million of passengers in 2015, serving 365 destinations in 121 countries thanks to 168 airlines. The 3 Paris airports account for 1.7% of French GDP (6% of regional GDP). ADP (SEAC2020) also manages directly or indirectly 37 airports worldwide and exports its talent and expertise to 4 continents. ADP (SEAC2020) is ranked among the 100 most sustainable companies in the world (Global 100) and wants to become the benchmark for airport CSR (Corporate Social Responsibility), basing its efforts on the ISO 26000 standard.
Previous experience	Not applicable, ADP (SEAC2020) initially will not participate directly in this action.
Entity Profile matching the task	Not applicable, ADP (SEAC2020) initially will not participate directly in this action.
Contribution	Support to participating SEAC2020 members when required.

4.1.1.23 MUC (SEAC2020)

Organisation	**23 MUC (SEAC2020) Airport**
Description	Flughafen München GmbH (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 20-year success story. It has a track record for steady growth, from 12 million to 38 million passengers per year, and from an airport to a self-contained city. Our company has significantly expanded its business activities: We're not only an international hub, but rather an urban centre offering a wide range of goods and services. More and more, we're marketing the airport as a world of experience or offering real estate and consulting services. Services are now offered far beyond Munich. 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 neighbours and the people 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.
Previous experience	Not applicable, Flughafen München GmbH (SEAC2020) initially will not participate directly in this action.
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.

4.1.1.24 ZRH (SEAC2020)

Organisation	**24 ZRH (SEAC2020) Airport**
Description	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. 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.
Previous experience	Not applicable, Flughafen Zürich AG (SEAC2020) initially will not participate directly in this action.
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.

4.1.1.25 HAL (SEAC2020)

Organisation	**25 HAL (SEAC2020)** **Airport**
Description	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 75 million passengers a year to over 180 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 76,000 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 Skytrax as the Best Airport in Western Europe and are the highest rated European hub airport in the benchmark passenger satisfaction survey ASQ with 81% of passengers rating Heathrow as 'very good' or 'excellent'. This combined with our commitment to being a responsible airport, being a good neighbour to our local communities and taking a lead on environmental measures, gives passengers a strong reason to keep choosing Heathrow.
Previous experience	Not applicable, Heathrow Airport Limited (SEAC2020) initially will not participate directly in this action.
Entity Profile matching the task	Not applicable, Heathrow Airport Limited (SEAC2020) initially will not participate directly in this action.
Contribution	Support to participating SEAC2020 members when required.

4.1.1.26 SNBV (SEAC2020)

Organisation	**26 SNBV (SEAC2020) Airport**
Description	Schiphol Nederland B.V. (SEAC2020) 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. In 2015 Schiphol Airport welcomed over 58 million passengers, using 450.000 flights to/from 322 destinations worldwide. For this Amsterdam Airport consists of a complex system of terminals, concourses, aircraft parking aprons and runways. 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. Schiphol Nederland B.V. (SEAC2020) 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.
Previous experience	Not applicable, Schiphol Nederland B.V. (SEAC2020) initially will not participate directly in this action.
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.

4.1.1.27 Swed(SEAC2020)

Organisation	27 Swed(SEAC2020) Airport
Description	Swed(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. In 2014, Swed(SEAC2020) had a net revenue of SEK 5.7 billion and some 3,500 employees. The Swedavia group of airports served in 2014 around 35,7 million passengers. Stockholm-Arlanda Airport is Sweden's largest airport (23,1 aircraft movements 2015) 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. Stockholm-Arlanda Airport operates three runways which are subject to strict environmental conditions. Capacity is in 2016 84 aircraft movements per hour. In total some 20000 people work at the airport.
Previous experience	Swed(SEAC2020) is currently involved in SESAR1 as a member of NORACON. Swed(SEAC2020) is active in a number of Work Package 6 projects both as project leader and as project contributor. Swed(SEAC2020) has also been involved in validation exercises under the SJU/AIRE umbrella. Examples of various Swed(SEAC2020) engagement below: • WP6.6.2 as Project Leader for "Integration of Airport/Airline/Ground Handlers/ATC. • Swed(SEAC2020) has been contributing to: • WP6.7.1 "Airport safety support tools", • WP6.8.8 "Enhanced arrival procedures to "reduce occupancy time using GBAS & P03 - Curved Approach based on GBAS, • WP6.9.3 "Remote & Virtual tower. Swed(SEAC2020) airports (Stockholm-Arlanda airport / Göteborg-Landvetter airport) have been participating in SJU/AIRE exercises "Green Connections", "MINT" and "VINGA". Swed(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"..
Entity Profile matching the task	Swed(SEAC2020) operates large, medium-sized and small regional airports. As such Swed(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. Swed(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. Examples of unique skills, knowledge and experience with respect to airport

	operations and ATM at Airports, includes: • Operating large, medium and regional airports, • Airside & Landside Operations, • Winter operations at airports of different sizes, • Capacity Management & Enhancement, • Strategic Planning & Forecasting, • Performance Management, • Information Technology, • Safety Management, • Environmental Management in varying weather conditions, Contingency & Crisis Management.
Contribution	Swed(SEAC2020) will contribute to project PJ05 with knowledge and experience of current airport operations management, both for airside and landside. The contribution will focus on concept development and participation in the preparation and execution of validation exercises related to solutions WP2 and WP3. Where applicable Swed(SEAC2020) will provide operational data as well as operational experts for simulation/gaming activities as part of the planned validation exercises.

4.1.1.28 AVINOR (SEAC2020)

Organisation	**28 AVINOR (SEAC2020)** **Airport/ANSP**
Description	AVINOR (SEAC2020) is a public limited company that operates a nationwide combined network of airports and navigation system in Norway. This includes towers and control centres, ground services and the development of commercial services at the airports. The 3000 employees and 46 airports in the network handled approximately 50 million passengers and around 830000 aircraft movements in 2014. AVINOR (SEAC2020) has well-established experience in safe airport operations at airports of different sizes and traffic volumes; and with different weather conditions. The company is used to implementing multi-airport solutions in a cost-efficient way. Oslo Airport, the largest airport in AVINOR (SEAC2020) network, has been in operation since 1998 and welcomed 24.3 million passengers in 2014. Oslo Airport has two parallel runways that are utilised for mixed mode parallel operations. Oslo Airport is currently expanding its capacity to be able to handle 28 million passengers in 2017.
Previous experience	Not applicable, AVINOR (SEAC2020) initially will not participate directly in this action.
Entity Profile matching the task	Not applicable, AVINOR (SEAC2020) initially will not participate directly in this action.
Contribution	Support to participating SEAC2020 members when required.

4.1.1.29 FINMECCANICA

Organisation	29 FINMECCANICA	Ground Industry
Description	LEONARDO - FINMECCANICA SPA is a global player in the high-tech sectors and a major operator worldwide in the Aerospace, Defence and Security sectors. Finmeccanica is based in ltaly, has about 47,000 employees (latest updates 11/30/2015), of whom about 37% abroad, and in 2014 recorded 14.6 billion euro in revenues and received orders in the amount of 15.6 billion. Gianni De Gennaro has been the President since 4 July 2013 and Mauro Moretti has been the CEO and General Manager since 15 May 2014. Finmeccanica designs and creates products, systems, services and integrated solutions both for the defence sector and for public and private customers of the civil sector, both in Italy and abroad. The wide range of defence and security solutions that Finmeccanica offers Governments, private citizens and institutions includes every possible intervention scenario: airborne and terrestrial, naval and maritime, space and cyberspace. In close contact with local customers and partners, Finmeccanica works every day to strengthen global security, provide essential physical protection and cybersecurity services for people, territories and infrastructure networks and supports scientific and technological research. Finmeccanica operates in about 20 countries with offices and industrial plants in all of the five continents and can rely on a very large network of subsidiaries, joint ventures and international partnerships, with significant industrial presence in three main markets, United Kingdom, Poland and United States and structured partnerships in the most important high potential markets in the world. The new Finmeccanica is the culmination of a radical renewal and transformation process: from a financial holding company to a great integrated industry focused on four activity sectors: • Helicopters • Aeronautics • Aerostructures • Electronics Defence and Security Systems • Space Finmeccanica operates through seven divisions that have inherited the activities of its 100% owned companies (AgustaWestland, Alenia Aermacchi, Selex ES, OTO Melara and WASS): • Helicopters • Aircraft • Aerostructures • Airborne & Space Systems • Land & Naval Defence Electronics • Defence Systems • Security & Information Systems Finmeccanica also retains Parent Company and Corporate Centre functions for

	participated companies and joint ventures not included in the divisional scope. These are: the US subsidiary DRS Technologies, which deals with the supply of products, services and integrated support for the military, intelligence agencies and defence companies; ATR, the joint venture established with Airbus Group for the manufacture of regional aircraft; MBDA, the joint venture established with BAE Systems and Airbus Group for missile systems; Telespazio and Thales Alenia Space, the two joint ventures established with Thales as part of the Space Alliance, for satellite services and the manufacture of satellites and orbiting infrastructures, respectively.
Previous experience	Publications: [1] Ernsdorf, T., Stiller, B., Beckmann, B., Weipert, A., Kauczok, S., Hannesen, R. (2014): Inter-comparison of X-band radar and lidar low-level wind measurement for air traffic control (ATC). Presented at 8th European Conference on Radar in Meteorology and Hydrology (ERAD), Garmisch-Partenkirchen, Germany. [2] Hannesen, R., Weipert, A, (2014): Airport Wind Field Measurement Using Multiple Doppler Radars. In: Polaris Innovation Journal 17, Selex ES Technical Review. [3] Kauczok, S., Schiefer, C. (2012): Aerodrome Weather Surveillance by Tailored Sensor Suites. In: Skyway No. 58, Oct. 2012. [4] Weipert, A., Kauczok, S., Hannesen, R. ,Ernsdorf. T., Stiller, B. (2014): Wind shear detection using radar and lidar at Frankfurt and Munich airports. Presented at 8th European Conference on Radar in Meteorology and Hydrology (ERAD), Garmisch-Partenkirchen, Germany. [5] Weipert A. (2013): Met Support for ATM. In: Air Traffic Technology International 2014, P. 101-102. [6] Weipert A., Hannesen R. (2012): Shear Stress: The quality of on-time wind alerts for airports is essential. In: Met. Technology. Int. May 2012, p. 74ff [7] Weipert A., Hannesen R. (2008): Enhanced Weather Information for Air Traffic Controllers Using Comprehensive Sensor and Data Assimilation Procedures. Presented at 5th European Radar Conference (EuRAD 2008), Amsterdam, The Netherlands. Previous projects: [1] SESAR1 (WP3, WP4, WP5, WP6, WP7, WP8, WP9, WP10, WP12, WP13, WP14, WP15, WP16 and WPB) especially to be mentioned here 12.06.03 and 15.04.09.a, b and c, EXE-06.05.05-VP-668 (V2), EXE-06.03.01-VP-669 (V3) [2] LuFo (Luftfahrtforschungsprogramm, German national research program, 2012-2015): WeAC Weather Information for ATM and CDM. [3] ITaRS (FP7, 2012-2016): Synergy of different remote sensing technologies for meteorological purposes by strengthening the cooperation between private companies and research organizations.
Entity Profile matching the task	Selex ES GmbH as 100% Finmeccanica subsidiary brings the meteorological knowledge in the aviation sector. Worldwide, Selex ES GmbH has a leading position in the design, manufacturing and installation of weather radar systems and multiple-sensor installations and integration of weather data for airport applications. For SESAR 1 Selex ES GmbH collected requirements, designed and developed prototypes and proved their functionality and usefulness (MET products and HMIs tailored to stakeholder needs) during validations for high density airports including e.g. APOC and DCB stakeholders.

	For PJ05 these capabilities will be adapted to the needs of Remote Tower services, using SWIM services for MET products and tailoring the products for displaying and representation needs.
Contribution	Basic information available at remote airports is already taken into account. But using further equipment (e.g. VIS or IR cameras anyhow available at remote airports) for estimation of cloud base and cloud amount is a new feature. How the comprehensive weather information can be displayed in the OTW screens (MET phenomena, select/deselect features, etc.) have to be determined. Finmeccanica/Selex ES GmbH will collect requirements for MET information for remote aerodromes. Not only small airports are addressed but also airports with higher density because RTC will also deal with contingency situations and provide services to such airports. Higher density airports have other equipment of MET sensors and further needs for MET information which results in different requirements not only for phenomena but also on a spatial and temporal scale. Based on these requirements solutions will be developed for 2D/3D integration in the screens and finally an evaluation of usefulness of available MET information will take place during validations. See further description in section for linked third party.

4.1.1.30 THALES AIR SYS

Organisation	30 THALES AIR SYS	Industry
Description	**Thales Air Systems SAS, from takeoff to touchdown and everything in between.** World leader in ATM, Thales Air Systems SAS offers integrated gate-to-gate solutions, from pre-flight to landing, ensuring airport safety, efficient traffic handling operations, data sharing on aircraft and seamless handover operations between territories. Thales Air Systems SAS has the largest installed base of solutions and technologies with over 360 TopSky - ATM Solutions, 7,000 navaids, 700 surveillance radars, and 1,800 ADS-B and multilateration equipment. Thales Air Systems SAS is trusted by key ATM decision makers across 170 nations, and helps key decision makers master complexity and make timely decisions for better outcomes. **At the forefront of all major modernization initiatives around the world** Growing aircraft numbers make Air Traffic Management more complex. Thales Air Systems SAS solutions help to make the skies safer, greener and more efficient. A key player in all major ATM modernization initiatives, ICAO Aviation System Block Upgrades (ASBU), SESAR and NextGen, Thales Air Systems SAS focuses on international harmonization. Our product roadmaps are aligned with ICAO ASBU concepts, NextGen and SESAR.	
Previous experience	**THALES AIR SYS**: Relevant Projects: **SESAR 1**: THALES AIR SYS has been involved in all SESAR 1 Work Packages. THALES AIR SYS has been Co-Leader for : • WP10 (En-Route & Approach ATC Systems) • WP 14 (SWIM technical architecture) • WP 15 (Communication, Navigation, Surveillance) **4-FLIGHT**: THALES AIR SYS is delivering the future innovative Air Traffic Management system for France, 4-Flight. DSNA 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 AIR SYS's latest generation human machine interface (TopSky - Controller HMI) and sophisticated new controller tools, to better detect conflicts, facilitate traffic analysis **COFLIGHT**: Coflight is a new advanced Flight Data Processing System (FDPS), jointly developed by DSNA and ENAV and Skyguide ANSPs, together with industrial partners THALES AIR SYS and Selex. 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 AIR SYS as industry provider. IAA/COOPANS, LFV/COOPANS, Naviair/COOPANS, 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, with TopSky - ATC (potentially) deployed in 15 interconnected civil and military ATC centres. Modernization 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 com 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	Thales defines Remote Tower innovations and solutions as anything that breaks with the past and creates value, as perceived by customers, in terms of processes, organisational models, technical solutions or the way a company does business. These innovations and solutions will be relevant for the present PJ05 tasks and objectives
Contribution	THALES AIR SYS will provide platforms, designed with HungaroControl Zrt and B4/Oro Navigacjia. Platforms will explore objectives to cover PJ05 solution 2 and solution 3 OI steps and enablers (safety performance with Human factors and machine learning tools, cost saving and flexibility with planning, rostering and, what if tools…), with different environments and goals to avoid overlapping : • **Budapest** (sol 3): one medium airport with two regional airports with focus on supervisor position tasks and functions (optimum dynamic airport allocation vs safety…), RTC coupling • **Vilnius** (sol 2 and 3): up to 7 minor airports (including military/civilian) with focus on existing CNS infrastructure resilience, contingency capabilities between RTC (inter alia mobile tower) For both platform, in wave one, simulated cameras will be used to cover all HungaroControl Zrt and Oro Navigacjia airports environments and adverse conditions and to minimize effort and costs. In wave two, simulated cameras and real cameras will be mixed during the validation exercises. THALES AIR SYS will contribute to: • The development of Technical Specifications according to the operational specifications defined

- The prototypes integration into the validation platforms
- Support to the validations phases and exercises

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

- Project Manager, PCI Leader and SGA Coordinator
    - **Jörn Jakobi (AT-One)** (♂): Diploma in Psychology (1999). Since 2000 he is as a human factors expert with DLR (AT-ONE) institute of flight guidance in Braunschweig where he works in the domain of airport airside traffic management with the focus on A-SMGCS and Remote Tower concept operations and validation. Within the EU A-SMGCS projects EMMA and EMMA2 from 2004 – 2009 he acted as the project coordinator of the sub-project "concept". In the German nationally funded project VICTOR 2008 - 2012, led by DFS, he worked as the DLR (AT-One) project coordinator responsible for the validation of a new multiple remote tower concept. Since 2010 he works as a business developer for DLR (AT-One) with main focus on remote tower operations. In 2014 he became chairman of the EUROCAE WG100 "Remote & Virtual Tower".
- Work Package 2 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 LFV/COOPANSs 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 LFV/COOPANSs, newly started, remote technology research program including remote tower and remotely piloted aircrafts.
- Work Package 3 Leader
    - **Dr. Rainer Kaufhold (DFS)** (♂): Diploma in Mechanical Engineering (1992), PhD in Mechanical Engineering (1998). From 1998 – 2009 he worked in the DFS research department on planning tools for airport operations in the tactical and pre-tactical phase with a focus on AMAN and DMAN. In 2009 he joined the DFS tower business unit and since then has been working in SESAR 1 as project manager and OFA coordinator. During his career he was project manager of several national and international research projects with many partners from ANSPs and Industry involved. Since a couple of years his focus is among others on remote tower applications.

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

4.2.1 Linked to DLR (AT-One)

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[3]	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	

[3] 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).

4.2.2 Linked to NLR (AT-One)

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[4]	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	

4.2.3 Linked to ANS CR (B4)

Objective	
Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	N
NO	
Does the participant envisage that part of its work is performed by linked third parties[5]	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	

[4] 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).

[5] A third party that is an affiliated entity or has a legal link to a participant implying a collaboration not limited to the action. (Article 14 of the Model Grant Agreement).

4.2.4 Linked to LPS SR (B4)

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[6]	Y

MicroStep-MIS

In developing Solution PJ.05-02 LPS SR will cooperate with **MicroStep-MIS** company, which will participate in this project as a meteorological experts and prototype provider, given its long-term experience is fundamental for development of the operational concept, as well as, for the validation purposes.

Besides its expert capacity, further illustrated hereinafter, the company was invited to carry out the project tasks also on the basis of its close partnership with LPS SR, particularly demonstrated by the common development of a complex ATM solution and its joint exhibition to industry stakeholders (ATC Global 2014 exhibition in Beijing), as well as development of new business opportunities through devising of a joint ATM solution proposal (ATC Global 2015 exhibition in Dubai).

MicroStep-MIS is a private limited liability company specialized in development, production and marketing of monitoring and information systems, processing of measured data and numerical modelling with more than 20 years of experience.

Close and intensive collaboration of LPS SR and MicroStep-MIS is considered as vital for a successful completion of the proposed work given the amount of experience and expertise the two parties have accumulated together in the field of aviation meteorology through mutual cooperation. The knowledge the partnership brings to the project is indistinguishable and not attributable to LPS SR or MicroStep-MIS only, and is greater than the sum of skills and efforts each party shall provide individually. Yet, the difference in the amount of contribution of each party in terms of effort is inevitable, and stems from intrinsically varying nature and quality of the tasks and skills the two subjects will provide. While the work of the beneficiary will be in a number of instances subject to the use of scarce personnel resources (e.g. using ATCOs or vital active ATM experts) for key tasks and therefore more time-limited, the linked third party´s contribution will be more time-consuming, though not reliant on critical staff, hence resulting in a seemingly disproportionate effort distribution.

The company´s key fields of activity include meteorology and climatology, aviation systems, road weather information systems, hydrology and marine systems, radiation monitoring systems, seismology, air quality and emission monitoring, crisis management systems, flood warnings, fire forest protection, and system integration.

MicroStep-MIS operates worldwide and it offers its core customer groups – stakeholders ranging from airports, meteorological and seismological institutes, environmental authorities, to industry and municipalities – a number of aviation monitoring systems, including IMS4 AWOS, IMS4 AWOS LITE, IMS4 Wind System, IMS4 RVR, IMS4 ARWIS IMS4 Pilot Briefing, IMS4 LLWAS, IMS4 ATIS/VOLMET, IMS4 Aeronautical Climatological Database, IMS4 AWDSS, Regional weather prediction model, Radar based thunderstorm nowcasting, Fog prediction model, Integrated Glide Slope Area Monitoring System for all weather conditions,

Since December 2012, the company has been also a certified Air Navigation Service Provider of

[6] A third party that is an affiliated entity or has a legal link to a participant implying a collaboration not limited to the action. (Article 14 of the Model Grant Agreement).

meteorological observations and reports (METAR/SPECI), forecasts (TAF), aeronautical climatological information and service for operators and flight crew members (Briefing).	
Does the participant envisage the use of contributions in kind provided by third parties (Articles 11 and 12 of the General Model Grant Agreement)	Y
LPS SR may in some cases use in kind contributions provided by third parties for implementation of certain project tasks	

4.2.5 Linked to ON (B4)

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[7]	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	

4.2.6 Linked to PANSA (B4)

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[8]	N
NO	

[7] A third party that is an affiliated entity or has a legal link to a participant implying a collaboration not limited to the action. (Article 14 of the Model Grant Agreement).

[8] 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
NO	

4.2.7 Linked to ACG (COOPANS)

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[9]	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	

4.2.8 Linked to CCL/COOPANS

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[10]	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

[9] 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).

[10] 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).

NO

4.2.9 Linked to IAA/COOPANS

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[11]	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	

4.2.10 Linked to LFV/COOPANS

Objective	
Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	Y
LFV/COOPANS has a frame agreement with Eltel Networks Infranet AB (Eltel) and Combitech Aktiebolag (Combitech). LFV/COOPANS is planning in WP2 to use subcontractor with expertise in project lead, concept development, coordination and validations.	
Does the participant envisage that part of its work is performed by linked third parties[12]	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

[11] 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).

[12] 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).

NO

4.2.11 Linked to Naviair/COOPANS

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[13]	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	

4.2.12 Linked to DFS

Objective	
Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	Y
Currently some system functionality is included in the tower simulator while others is already implemented in pre-industrial prototypes that are linked to the simulator. For solution 03 validations the simulator needs to be extended by additional interfaces to make data available to the pre-industrial prototypes developed for the validations. This link is required as an increased interaction between the prototypes will be required. The subcontractor will be defined during project execution.	
Does the participant envisage that part of its work is performed by linked third parties	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	

[13] 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).

4.2.13 Linked to ENAV

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

SICTA

SICTA - Advanced Systems for Air Traffic Control - is the Research Branch of ENAV Group. SICTA is an internal subsidiary company, namely the SICTA Consortium, which is 100% controlled by ENAV Group as of July 2012.

SICTA's staff is made up of highly skilled professionals like Air Traffic Management experts, Systems experts, Systems and software engineers, operational concept and simulation experts (both fast and real time), validation and demonstration experts.

Established in 1993 SICTA boasts a solid tradition of research and applied studies in ATM/CNS. It conducts research, development, validation and demonstration activities related to the Innovation in the Air Traffic Management domain participating in National and European research projects, playing an important role in the European field as the Italian R&D lab for ATM/CNS.

The multi-year experience gained on ATC/ATM topics both in operational as well in innovative contexts makes of SICTA a dynamic company ready to act as a joining link between today operations and future solutions. The daily proximity with ENAV operational staff allows SICTA's resources to full understand key issues in the ATC/ATM domain and to strongly contribute into the investigation of solutions addressing them.

SICTA participation is quite significant from an ENAV perspective considering it brings an important piece of transversal technical, operational and management expertise.

On the basis of the considerations and skills depicted above and taking into account that SICTA, as part of the ENAV Group, is to all effects same as an ENAV department, the ENAV and SICTA in kind contribution is to be considered as a single block.

SICTA will support ENAV in the preparation, execution and post-processing of validation activities as well as in the drafting and delivery of contractual documentation.

NEXTANT APPLICATIONS & INNOVATIVE SOLUTION SRL – (NAIS)

Established at the end of 2006, 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 the frame of the WP2 NAIS will support ENAV in the analysis, design and development of the visual reproduction of the multiple remote aerodrome views (e.g. static/dynamic visual features/cues also encompassing the visual representation of MET information, PTZ functionalities, 3D virtual scenarios reconstruction). Additional contributions (WP2 and WP3) will concern with the support in the analysis of Interoperability aspects and the specification of Safety / Performance requirements focusing on Cyber-security, Network quality of Service, Resilience / Redundancy Issues.

NAV CANADA

NAV CANADA is the worlds' second largest ANSP with the responsibility to provide ANS to over 19 million km^2 of domestic airspace handling over 12 million aircrafts movements each year. Much of the vast area that has to be managed is remote, sparsely populated and has limited infrastructure.

NAV CANADA has a long term program to evaluate and install advanced technology to improve Air Navigation Service (ANS) performance and efficiency. To this end we have invested over $2B in new technology, including remote services, since 1996 when NAV CANADA first took over operation of domestic ANS.

NAV CANADA provides ATS at the following domestic facilities:

- 7 Area Control Centres (ACC), 1 for each Flight Information Region (FIR) across 5 time zones
- 41 Control Towers
- 56 Flight Service Stations (FSS)
- 8 Flight Information Centres (FIC)
- 51 Community Aerodrome Reporting Services (CARS)

In addition

- Remote Advisory Service (RAAS) is provided from 23 of 56 FSS to 38 aerodromes (see figure aside)
- Automated Weather Observation & Reporting (AWOS) supply remote observations
    - 77 AWOS (Automated Weather Information System)
    - 5 LWIS (Limited Weather Information System)
    - 148 Weather Cameras

Following the collaboration between ENAV and NAV CANADA in the RACOON Large Scale Demonstration, NAV CANADA will contribute to both solutions PJ.05-02 and PJ.05-03 by supporting ENAV on the planned activities such as RTS validation and solution data pack elaboration. NAV CANADA will share its operational experience as well as its technological expertise with ENAV and PJ05 team members.

NAV CANADA is linked to ENAV through the sharing of a strategic plan for cooperation in several ATM related domains, as established in the framework of an Agreement for Cooperation (AfC) addressing various areas of development, such as Research & Development, Commercial Activities and Organisational Development (the AfC is attached to Appendix B – Technical Part of the ENAV application to the SJU Call for Final Membership – Ref. SJU/LC/0122-CFP). Such plans may well include joint and coordinated efforts to be injected in SESAR to foster the development of specific key features of the SESAR 2020 Programme. ENAV and NAV CANADA have also a well-established commercial partnership in AIREON, a U.S. Company for the provision of global satellite-based surveillance, and in the ENAV national project on the TWR architecture renewal, where NAV CANADA will be providing the new TWR suite. Within this framework, NAV CANADA is already participating in the SESAR VLD RACOON on Remote Tower concept, a two-year very large scale demonstration project coordinated by ENAV aiming at demonstrating

the feasibility and the applicability of remote tower operations in the Italian context. Following this collaboration, NAV CANADA will contribute to both solutions PJ.05-02 and PJ.05-03 by supporting ENAV on RTS validation and solution data pack elaboration. NAV CANADA will share its operational experience as well as its technological expertise with ENAV and PJ05 team members.

NAV CANADA is linked to ENAV through the sharing of a strategic plan for cooperation in several ATM related domains, as established in the framework of an Agreement for Cooperation (AfC) addressing various areas of development, such as Research & Development, Commercial Activities and Organizational Development. Such plans may well include joint and coordinated efforts to be injected in SESAR to foster the development of specific key features of the SESAR 2020 Programme.

ENAV and NAV CANADA have also a well-established commercial partnership in AIREON, a U.S. Company for the provision of global satellite-based surveillance. In the airport domain, NAV CANADA is supporting ENAV in the national deployment project on the TWR architecture renewal, where NAV CANADA will be providing the new TWR suite, as well as in the SESAR VLD RACOON on Remote Tower concept, a two-year very large scale demonstration project coordinated by ENAV aiming at demonstrating the feasibility and the applicability of remote tower operations in the Italian context. Following these collaborations mainly on the new TWR suite, NAV CANADA will support ENAV on the execution of the validation activities planned in the solution integrating new prototypes technologies into the ENAV Tower Simulator platform.

The above LTP(s) are Companies which are either bound to ENAV through shared ownership (i.e. our affiliate SICTA) or are linked to ENAV through the sharing of a strategic plan for cooperation in several ATM related domains, as established in the framework of an Agreement for Cooperation (AfC) addressing various areas of development, such as Research & Development, Commercial Activities and Organisational Development (the AfC is attached to Appendix B – Technical Part of the ENAV application to the SJU Call for Final Membership – Ref. SJU/LC/0122-CFP). Such plans may well include joint and coordinated efforts to be injected in SESAR to foster the development of specific key features of the SESAR 2020 Programme.

SICTA participation is quite significant from an ENAV perspective considering it brings an important piece of transversal technical, operational and management expertise. SICTA, as part of the ENAV Group and bound to ENAV through shared ownership, is to all effects same as an ENAV department and their in kind contribution is to be considered as a single block. For this reason , their overall contribution is to be considered joint and as main part of the contribution, consequently more significant than the other LTPs.

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	

4.2.14 Linked to FRQ (FSP)

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	Y
The affiliates / Linked 3rd party to Frequentis AG, the Frequentis Romania S.R.L is contributing to this action. Frequentis Romania S.R.L. is integrated into the research and development process of Frequentis AG, hence its contribution is to be seen as a joint activity. Frequentis Romania SRL is an affiliate of	

Frequentis AG and is specialised on software development providing support for the mother company in the safety-critical domains of air traffic control, public safety, public transport and maritime. The company has contributed to SESAR 1 projects in WP12 and will continue its contribution in the scope of related airport / Tower activities in SESAR 2020. Frequentis Romania SRL is an affiliate of Frequentis AG and is specialised on software development and will supporting in development of the Prototype.
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

4.2.15 Linked to ATOS (FSP)

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[14] 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

4.2.16 Linked to HC (FSP)

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

[14] 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 its work is performed by linked third parties[15]	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	

4.2.17 Linked to 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	Y

For the present proposal Indra Navia AS and Avinor Flysikring AS are linked third party of Indra Sistemas S.A. , as declared in the Indra Proposal for Membership Accession -REF. SJU/LC/0122-CFP, dated 28-January-2016.

Indra Navia AS

Indra Navia AS (henceforth Indra Navia) is a wholly-owned subsidiary of the Spanish company Indra Sistemas, S.A.

Based in Oslo and Horten, 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.

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.

Through continuous technological development, Indra Navia facilitates the modernisation of air traffic management capabilities and ensures state-of-the-art technology. The company 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

[15] 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).

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. 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 PJ05 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 1 CWP, which will be the used for multiple remote tower modules.

In particular Indra Navia will participate in the following tasks:

- T.05-02.01 V2 Concept Development (INTEROP)
- T.05-02.02 V2 Technical Specification
- T.05-02.04 V2 Validation Plan
- T.05-02.05 V2 Prototyping and Platform Development
- T.05-02.06 V2 Validations
- T.05-02.11 V2 Concept Development (INTEROP)
- T.05-02.12 V3 Technical Specification
- T.05-02.14 V3 Validation Plan
- T.05-02.15 V3 Prototyping and Platform Development
- T.05-02.16 V3 Validations
- T.05-03.01 V2 Concept Development (INTEROP)
- T.05-03.02 V2 Technical Specification
- T.05-03.04 V2 Validation Plan
- T.05-03.05 V2 Prototyping and Platform Development
- T.05-03.06 V2 Validations

INDRA, the beneficiary, will centralize and manage the work and the documentation to be produced, whilst in terms of platform development, the LTP Indra Navia has the major role.

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 the airports.

In the frame of the PJ05, 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.

In particular Avinor ANS will participate in the following tasks:

- T.05-02.01 V2 Concept Development (OSED/SPR)
- T.05-02.03 V2 Cost Benefit Analysis
- T.05-02.04 V2 Validation Plan
- T.05-02.06 V2 Validations
- T.05-02.11 V3 Concept Development (OSED/SPR)
- T.05-02.13 V3 Cost Benefit Analysis
- T.05-02.14 V3 Validation Plan
- T.05-02.16 V3 Validations
- T.05-03.01 V2 Concept Development (OSED/SPR)
- T.05-03.03 V2 Cost Benefit Analysis
- T.05-03.04 V2 Validation Plan
- T.05-03.06 V2 Validations

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	

4.2.18 Linked to AIRTEL (NATMIG)

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[16]	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	

4.2.19 Linked to SAAB (NATMIG)

Objective	
Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	Y
Within the simulation and verification phase Saab AB will use the 100 % affiliate, Saab Technologies s.r.o. Training & Simulation in Czech Republic. They will be responsible for creating 3D-models and 3D databases of airports. These airports will be used in the simulation environment provided by Saab AB	
Does the participant envisage that part of its work is performed by linked third parties	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	

4.2.20 Linked to SINTEF (NATMIG)

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

[16] 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 its work is performed by linked third parties[17]	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	

4.2.21 Linked to EUROCONTROL

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

4.2.22 Linked to ADP (SEAC2020)

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

[17] 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 its work is performed by linked third parties[18]	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	

4.2.23 Linked to MUC (SEAC2020)

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[19]	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	

4.2.24 Linked to ZRH (SEAC2020)

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

[18] 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).

[19] 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 its work is performed by linked third parties[20]	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	

4.2.25 Linked to HAL (SEAC2020)

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[21]	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	

4.2.26 Linked to SNBV (SEAC2020)

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

[20] 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).

[21] 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 its work is performed by linked third parties[22]	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	

4.2.27 Linked to SWED(SEAC2020)

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[23]	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	

4.2.28 Linked to AVINOR (SEAC2020)

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

[22] 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).

[23] 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 its work is performed by linked third parties[24]	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	

4.2.29 Linked to FINMECCANICA

Objective	
Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	N
NO	
Does the participant envisage that part of its work is performed by linked third parties[25]	Y

Selex ES GmbH, formerly known as Selex Systems Integration GmbH or Gematronik Weather Radar Systems, is a German engineering company and is one of the top companies in the meteorological market. Selex ES GmbH is a 100% affiliated company of Finmeccanica and will be renamed to Finmeccanica likely also in 2016.

More than 50 years of experience, reliability and a professional approach to challenges have contributed to the company's excellent reputation among experts in meteorology, the aviation sector and other related fields.

Worldwide, Selex ES GmbH has a leading position in the design, manufacturing and installation of weather radar systems and holistic adverse weather monitoring solutions for aviation applications comprising of radar, lidar and ground based wind shear systems (LLWAS).

Up to now, close to 400 systems have been successfully put into operation in 75 different countries all over the world. Today, Selex ES GmbH focuses on providing customized systems, turn-key solutions for aviation applications and integrated information systems while also being sensitive to individual customer needs.Selex ES GmbH will participate in this project as Meteorological experts to provide relevant weather information to Remote Tower Centre (RTC). Basic information available at remote airports is already taken into account. But using further equipment (e.g. VIS or IR cameras anyhow available at remote airports) for estimation of cloud base and cloud amount is a new feature. How the comprehensive weather information can be displayed in the OTW screens (MET phenomena, select/deselect features, etc.) have to be

[24] 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).

[25] 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).

determined.

MET phenomena to be discussed for displaying:

- Standard AWOS data (including cloud base and amount also in IR)
- Wind shear (along 3° glide path), cross wind
- Thunderstorms, lightning, heavy rain, turbulence, hail as polygon overlays
- Echo classification (biological scatter)
- Thinking beyond Europe (where Remote Tower is definitely an option in countries such as Canada, Australia, Russia) we must also consider dust or sand storms, snow storms, fog

Selex ES GmbH will collect requirements for MET information for remote aerodromes. Not only small airports are addressed but also airports with higher density because RTC will also deal with contingency situations and provide services to such airports. Higher density airports have other equipment of MET sensors and further needs for MET information which results in different requirements not only for phenomena but also on a spatial and temporal scale.

Based on these requirements solutions will be developed for 2D/3D integration in the screens (selectable/deselectable) and finally an evaluation of usefulness of available MET information will take place during validations. This may consider also how warnings can be/must be presented to the ATCO.

Beside the provision of MET data obtained at the airport, Selex will also cover the integration of relevant MET products available via SWIM in collaboration with PJ18-04. This includes processing, representation and potential warnings and will cover MET forecasts if requested.

Current plans include one V2 and one V3 validation exercise with HC (FSP) as Host, FRQ (FSP) and DLR (AT-One) for WP2, and validation exercise with DFS (Host), FRQ (FSP) and DLR (AT-One) for WP3.

For relevant publications see section 4.1.1.11 Finmeccanica.

Justification why contribution of Selex as linked LTP is higher than Finmeccanica:

As described above Selex ES GmbH is a 100% affiliated company of Finmeccanica and will be renamed to Finmeccanica likely also in 2016. Thus Selex ES and Finmeccanica are one company. As described in the PJ05 work share the main focus of Finmeccanica/ Selex ES GmbH is related to MET. Selex ES GmbH is the MET Centre of Excellence within the Finmeccanica group and therefore has been decided to be responsible for the execution of the MET related Tasks with Finmeccanica involvement in PJ05. The MET experts of Finmeccanica are located at Selex ES GmbH and they are the main contributors to PJ05. This is the reason why the man hours for Selex ES GmbH as formal LTP are significantly higher than for the beneficiary Finmeccanica.

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

4.2.30 Linked to THALES AIR SYS

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[26]	Y
Thales Air Systems plans to involve Linked Third Parties to undertake part of its work in this project: **Searidge**: Searidge Technologies is a Canadian company providing Remote Tower and Surface Optimization solutions to airports and Air Navigation Service Providers. Searidge Technologies is recognized in the ANSP and airport community for providing state of the art video processing and enhancement solutions supporting the development of advanced Remote Tower and Surface operations solutions. In this project, Thales Air Systems has teamed with Searidge Technologies, who will act as a Linked Third Party of Thales Air Systems . Searidge Technologies will primarily provide some of the video acquisition and processing capabilities required for the Validation platforms used in the project and will bring valuable expertise and field experience contributing to the development of advanced Remote Tower concepts. Canada is a non-EU country for which access to EC co-funding is only granted on a case-by-case basis and has to be duly justified. In the context of this project Thales Air Systems believes that Searidge Technologies' access to the project and to EC co-funding of their contributions is fully justified and essential in order to secure the timely provision of some of the state of the art elements required for our validation platforms and that the expertise and field experience of Searidge Technologies will also prove highly valuable in the context of other project activities such as concept development and validation.	
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	

[26] 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).

5. Ethics and Security

5.1 Ethics

All participants of the PJ05 Remote Tower project will conform to national and European legislation and regulations. In relation to this project these include:

- The Charter of Fundamental Rights of the EU
- Directive 95/46/EC of the European Parliament and of the Council of 24 October 1995 on the protection of individuals with regard to the processing of personal data and on the free movement of such data

During the project WP1 will ensure compliance with ethics. This means that WP1 will verify that all documents from the PJ05 Remote Tower project are following European ethical rules and the ethical rules of the concerned country. Furthermore WP1 will provide support for all WPs regarding ethical issues.

During project Kick-off Meeting, WP1 will conduct an information session in order to draw attention to, and inform partners of all relevant ethical issues. Furthermore, WP1 will provide publicly available literature (e.g. Ethical Procedures, Risks and Safe-guards, etc.) to provide all participants with the opportunity to learn more about appropriate ethical standards and practices in research.

In the following sub-section further explanation is given for the self-assessment presented in the Proposal Submission Forms “Ethics issue table”. This is to provide an overview about the potential ethical issues and handling relating to research activities in the PJ05 Remote Tower project.

5.1.1 Humans

In PJ.05 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 selected through the management of operational divisions of the involved partners, depending on the requirements for the specific validation exercise (e.g. air traffic controller licence for specific sectors or type of airspace), availability, and willingness to contribute to the SESAR programme. Within these activities, observations, instantaneous self-assessments and interviews may be conducted in all PJ.05 solutions.

Participants of these validation activities will be clearly informed of the research goals, the methodology of data protection in a presentation of the project and in interviews at the beginning of the study. 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.

Section: Humans		YES	NO	Information to be provided	Documents to be provided
Does your research involve human participants?		X		Confirmation about obtained Informed consent of the participants.	Examples of "informed consent form"
If YES:	Are they volunteers for social or human sciences research?		X		
	Are they persons unable to give informed consent (including children/minors)?		X		
	Are they vulnerable individuals or groups?		X		
	Are they children/minors?		X		
	Are they patients?		X		
	Are they healthy volunteers for medical studies		X	Note: The project will use healthy volunteers, but in the project no medical studies are foreseen.	
Does your research also involve physical interventions on the study participants?			X		

To ensure that participants in validation exercises or demonstrations are aware of their position and rights from an ethical perspective, they will be asked to review and sign the following form:

Participant Agreement Form
SESAR 2020 Validation/Demonstration activities

Full title of project/solution:

Full title of validation/demonstration activity and dates:

Name and contact details of project/solution leader:

	Please Initial or Tick Here
I am aware of the main aspects of the Validation/Demonstration Plan for the above SESAR 2020 activity.	
I confirm that I have had the opportunity to ask questions.	
I understand that my answers to any questionnaire related to human factors aspects (evaluation of workload, situational awareness, human machine interface usability…) will remain anonymous.	
Should I not wish to answer any particular question(s), I am free to decline.	
I give permission for members of the research team to have access to my anonymised responses. I understand that my name will not be linked with the research materials, and I will not be identified or identifiable in the outputs that result from the research without my agreement.	
I agree to take part in the above validation/demonstration activity.	

Name of Participant	Date	Signature
Name of Project/Solution Leader	Date	Signature

This form should be signed and dated by all parties after the participant receives a copy of the participant information sheet and any other written information provided to the participants. A copy of the signed and dated participant agreement form should be kept with the project's main documents which must be kept in a secure location.

5.1.2 Protection of Personal Data

In advance and during the action execution, personal data will be acquired. This data will be protected regarding article 8 – protection of personal data – of the European Charter of Fundamental Rights and the Treaty on the Functioning of the European Union. These personal data will be collected and processed fully in accordance with the Directive 95/46/EC of the European Parliament on the protection of individuals with regard to the processing of personal data and on the free movement of such data.

Personal data collected and further processed concern mainly all the technical and/or operational experts contributing to the action, either during its whole duration or playing a punctual or temporal role, for the purpose of the needed mutual contact among involved parties, exercises preparation and execution, meeting and logistic arrangements and communication activities. For the latter, personal data collection from the people to which communication is aimed at, is also envisaged.

In the context of this action, collected personal data would comprise information identifying the person designated by its organization. Typically, personal data would relate to the following:

- Name;
- Identification Number (ID);
- Company position / action role;
- Business contact details (e-mail address, business telephone number, mobile telephone number, fax number, postal address, company and department);
- Level of qualification, professional experience.

Under no circumstances these personal data will refer to racial or ethnic origin, political opinions, economical situation, religious or philosophical beliefs, trade-union membership, physical and mental health, sex life, or any other sensitive data.

Section: Protection of Personal Data		YES	NO	Information to be provided	Documents to be provided
Does your research involve personal data collection and/or processing?		X			
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		

5.1.3 Misuse

The PJ05 Remote Tower project is part of the SESAR 2020 program and as such will be supervised by the SESAR Joint Undertaking and its members of the Administration Board. Several independent advisors are included in that body: e.g. Staff Representative, Airspace User, Military, and Scientific Community Representative. The SJU has or will expand on the development of a strategy on how to deal with possible risks regarding misuse and possible consequences during the project execution inside of SESAR 2020.

In the case that ethical issues arise unexpectedly during the project, the project coordinator will contact the Commission immediately and provide detailed information on the issue and how the project team intend to handle it.

5.1.4 Other Ethics Issues

At this stage of the project proposal there are no other ethics issues that should be taken into consideration. In the case that other ethical issues arise unexpectedly during the project, the project coordinator will contact the Commission immediately and provide detailed information on the issue and how the project team intend to handle it.

5.2 Security[27]

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		

[27] 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).*

5.3 Global budget approach taken by the SJU members

The following Candidate Members:

- AIRBUS SAS
- AT-ONE Consortium
- B4 Consortium
- COOPANS Consortium
- DASSAULT
- DFS
- DGAC/DSNA
- ENAIRE
- ENAV
- FINMECCANICA
- FREQUENTIS SESAR PARTNERS (FSP)
- HONEYWELL Aerospace
- INDRA SISTEMAS SA
- NATMIG Consortium
- NATS
- SEAC2020 Consortium
- SKYGUIDE
- THALES Avionics
- THALES Air Systems

have actively participated to the SESAR2020 dialogue phase, launched by SESAR JU, considering the 28 Projects (18 IRV, 3 transversal and 7 VLD) as part of a unique Work Programme.

During the dialogue phase the Candidate Members, have supported SESAR JU both in DoW preparation and in the estimation of the effort per project.

Then SESAR JU published, in the SESAR2020 Multi-annual Work Programme, an indicative co-financing estimation per Project, per Stakeholder Group (Service Providers, Airborne Manufacturing Industry, Ground Manufacturing Industry) and per Wave (Waves 1 and 2).

In view of the response to be given in a short period, the Candidate Members decided to start the preparation activities before the official launch of the call for proposal, using the available documents published by SESARJU (i.e. SESAR2020 Multi-annual Work Programme) in order to have more available time for the proposal preparation.

A deep and comprehensive analysis of the required work was done, bringing to a revision of the estimated effort necessary to perform the activities. In such analysis also the interests to invest from both Service Providers and Manufacturing Industries were taken into account.

The result was a limited different co-financing distribution among the 28 Projects.

The Candidate Members have collectively decided to maintain these limited differences because the revised values were more close to the described activities while keeping the overall maximum co-financing for W1 and per Stakeholder group.

The rationale for maximum co-financing deviation is explained at project level.

The following table contains the allocation of co-financing required to support Wave 1 (extracted from the SESAR2020 Multi-annual Work Programme) and the co-financing distribution agreed by the Candidate Members for the 28 Projects for Wave 1:

Topic	NAME OF PROJECT	Max Co-financing Value Wave 1	Co-financing agreed by Candidate Members
1	PJ.19 Content Integration	**€8.320.000**	**€7.435.972**
2	PJ.20 Master plan maintenance	**€3.510.000**	**€3.327.673**
3	PJ.22 Validation and Demonstration Engineering	**€4.940.000**	**€2.057.315**
	TOTAL TRANSVERSAL WAVE 1 & 2	**€16.770.000**	**€12.820.960**
4	PJ.02 Increased Runway and Airport Throughput	**€13.845.000**	**€15.567.448**
5	PJ.03a Integrated Surface Management	**€12.220.000**	**€12.871.907**
6	PJ.03b Airport Safety Nets	**€8.125.000**	**€8.176.582**
7	PJ.04 Total Airport Management	**€10.465.000**	**€8.909.071**
8	PJ.05 Remote Tower for Multiple Airports	**€6.630.000**	**€9.013.622**
9	PJ.07 Optimised Airspace Users Operations	**€3.640.000**	**€2.247.337**
10	PJ.08 Advanced Airspace Management	**€2.730.000**	**€2.738.354**
11	PJ.09 Advanced DCB	**€7.020.000**	**€7.153.377**
12	PJ.01 Enhanced arrivals and departures	**€17.680.000**	**€17.500.332**
13	PJ.06 Trajectory Based Free Routing	**€6.045.000**	**€6.029.406**
14	PJ.10 Separation Management En-Route and TMA	**€25.935.000**	**€26.392.522**
15	PJ.11 Enhanced Air and Ground Safety Nets	**€5.265.000**	**€5.478.828**
16	PJ.13 Air Vehicle Systems	**€10.140.000**	**€9.305.099**
17	PJ.14 CNS	**€22.880.000**	**€23.213.553**
18	PJ.15 Common Services	**€6.435.000**	**€5.784.518**
19	PJ.16 CWP - HMI	**€11.635.000**	**€12.861.755**
20	PJ.17 SWIM Infrastructures	**€9.490.000**	**€9.757.251**
21	PJ.18 4D Trajectory Management	**€21.125.000**	**€22.238.685**
	TOTAL SESAR 2020 PROJECTS WAVE 1	**€201.305.000**	**€205.239.645**
	TOTAL TRANSVERSAL & PROJECTS WAVE 1	**€218.075.000**	**€218.060.605**
22	PJ.28 Integrated Airport Operations (incl. TBS)	**€4.300.000**	**€4.700.889**
23	PJ.24 Network Collaborative Management	**€3.600.000**	**€4.227.146**
24	PJ.23 Flexible Airspace Management and Free Route	**€4.400.000**	**€1.443.374**
25	PJ.25 Arrival Management extended to en-route Airspace	**€4.000.000**	**€3.913.885**
26	PJ.26 Enhanced Terminal Airspace using RNP-Based Operations	**€2.400.000**	**€539.333**
27	PJ.27 Flight Information Exchange	**€6.100.000**	**€6.079.170**
28	PJ.31 Initial Trajectory Information Sharing	**€17.200.000**	**€19.226.798**
	TOTAL VLD WAVE 1	**€42.000.000**	**€40.130.595**
	TOTAL SESAR 2020 PPP (TRANSVERSAL, IR & VLDs) WAVE 1	**€260.075.000**	**€258.191.201**

References

[1] European Commission: **H2020 CALL: SESAR2020 IR-VLD WAVE1**, http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/calls/h2020-sesar-2015-2.html#c,topics=callIdentifier/t/H2020-SESAR-2015-2/1/1/1&callStatus/t/Forthcoming/1/1/0&callStatus/t/Open/1/1/0&callStatus/t/Closed/1/1/0&+identifier/desc, Brussels, 22 October 2015.

[2] SESAR Joint Undertaking: **SESAR 2020 Multi Annual Work Program**, Edition 1.0, Brussels, 01 July 2015.

[3] SESAR Joint Undertaking: **Annual Work Programme* 2015**, Amendment n°1 Edition 00.01.01, Brussels, 20 October 2015.

[4] SESAR Joint Undertaking: **Introduction to the SESAR 2020 Programme Execution**, Edition 01.00.01, Brussels, 12th October 2015.

Abbreviations

This list extends the list given in [2] and [3].

ATM	Air Traffic Management
CAT	Category
EC	European Commission
EPMB	Extended Project Management Board
EU	European Union
H2020	HORIZON 2020 (research and innovation program of the EU, 2014-2020)
IP	Internet Protocol
IR	Industrial Research project
MAWP	Multi Annual Work Programme [2]
NSA	National Supervisory Authorities
PCIL	Project Content Integration Lead
PCIT	Project Content Integration Team
PEG	Programme Execution Guidance [4]
PJ00	Project No. 00 described in [2] corresponds to the Topic of the call
PJ00-01	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
PTZ	Pan Tilt Zoom
RTM	Remote Tower Module
SES	Single European Sky
SESAR	Single European Sky ATM Research
SJU	SESAR Joint Undertaking
SL	Solution Lead
TA	Transversal Action
VLD	Very Large Demonstration
VMC	Visual Meteorological Conditions
WAN	Wide Area Network
WP	Work Package

ESTIMATED BUDGET FOR THE ACTION (page 1 of 4)

	Estimated eligible[1] costs (per budget category)									EU contribution			Additional information		
	A. Direct personnel costs				B. Direct costs of subcontracting	C. Direct costs of fin. support	D. Other direct costs	E. Indirect costs[2]	Total costs	Reimbursement rate %	Maximum EU contribution[3]	Maximum grant amount[4]	Information for indirect costs	Information for auditors	Other information:
	A.1 Employees (or equivalent) A.2 Natural persons under direct contract A.3 Seconded persons [A.6 Personnel for providing access to research infrastructure]		A.4 SME owners without salary A.5 Beneficiaries that are natural persons without salary				D.1 Travel D.2 Equipment D.3 Other goods and services D.4 Costs of large research infrastructure						Estimated costs of in-kind contributions not used on premises	Declaration of costs under Point D.4	Estimated costs of beneficiaries/ linked third parties not receiving EU funding
Form of costs[6]	Actual	Unit[7]	Unit[8]		Actual	Actual	Actual	Flat-rate[9] 25%							
	(a)	Total (b)	No hours	Total (c)	(d)	(e)	(f)	(g)=0,25x ((a)+(b)+ (c)+(f) +[(h1)+(h2)]- (m))	(i)= (a)+(b)+(c)+ (d)+(e)+(f)+ (g)+(h1)+(h2)+(h3)	(j)	(k)	(l)	(m)	Yes/No	
1. DLR (AT-One)	268453.00	0.00	0	0.00	0.00	0.00	24689.00	73285.50	366427.50	70.00	256499.25	52024.46	0.00	No	
2. NLR (AT-One)	231607.00	0.00	0	0.00	0.00	0.00	56394.00	72000.25	360001.25	70.00	252000.88	51112.07	0.00	No	
3. ANS CR (B4)	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	70.00	0.00	0.00	0.00	No	
4. LPS SR (B4)	21780.00	0.00	0	0.00	0.00	0.00	3020.00	6200.00	31000.00	70.00	21700.00	4401.30	0.00	No	
- MicroStep-MIS[14]	148500.00	0.00	0	0.00	0.00	0.00	22660.00	42790.00	213950.00	70.00	149765.00	30376.08	0.00	No	
Total beneficiary 4	170280.00	0.00	0.00	0.00	0.00	0.00	25680.00	48990.00	244950.00		171465.00	34777.38	0.00		
5. ON (B4)	157894.00	0.00	0	0.00	0.00	0.00	20570.00	44616.00	223080.00	70.00	156156.00	31672.34	0.00	No	
6. PANSA (B4)	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	70.00	0.00	0.00	0.00	No	
7. ACG/COOPANS	211840.00	0.00	0	0.00	0.00	0.00	31760.00	60900.00	304500.00	70.00	213150.00	43232.14	0.00	No	
8. CCL/COOPANS	114820.00	0.00	0	0.00	0.00	0.00	17180.00	33000.00	165000.00	70.00	115500.00	23426.29	0.00	No	
9. IAA/COOPANS	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	70.00	0.00	0.00	0.00	No	
10. LFV/ COOPANS	1674310.00	0.00	0	0.00	250000.00	0.00	403061.00	519342.75	2846713.75	70.00	1992699.63	404169.26	0.00	No	
11. Naviair/ COOPANS	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	70.00	0.00	0.00	0.00	No	
12. DFS	785500.00	0.00	0	0.00	40000.00	0.00	62500.00	212000.00	1100000.00	70.00	770000.00	156175.23	0.00	No	
13. ENAV	67844.00	0.00	0	0.00	0.00	0.00	8156.00	19000.00	95000.00	70.00	66500.00	13487.86	0.00	No	
- Nav Canada[14]	43200.00	0.00	0	0.00	0.00	0.00	4800.00	12000.00	60000.00	70.00	42000.00	8518.65	0.00	No	
- SICTA[14]	68400.00	0.00	0	0.00	0.00	0.00	7600.00	19000.00	95000.00	70.00	66500.00	13487.86	0.00	No	
- NAIS[14]	72000.00	0.00	0	0.00	0.00	0.00	8000.00	20000.00	100000.00	70.00	70000.00	14197.75	0.00	No	
Total beneficiary 13	251444.00	0.00	0.00	0.00	0.00	0.00	28556.00	70000.00	350000.00		245000.00	49692.12	0.00		
14. FRQ (FSP)	970874.43	0.00	0	0.00	0.00	0.00	103000.00	268468.61	1342343.04	70.00	939640.13	190582.49	0.00	No	
- FRQ RO[14]	243718.57	0.00	0	0.00	0.00	0.00	24750.00	67117.14	335585.71	70.00	234910.00	47645.62	0.00	No	
Total beneficiary 14	1214593.00	0.00			0.00	0.00	127750.00	335585.75	1677928.75		1174550.13	238228.11	0.00		
15. ATOS (FSP)	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	70.00	0.00	0.00	0.00	No	
16. HC (FSP)	110509.00	0.00	0	0.00	0.00	0.00	285348.00	98964.25	494821.25	70.00	346374.88	70253.47	0.00	No	

ESTIMATED BUDGET FOR THE ACTION (page 2 of 4)

	Estimated eligible[1] costs (per budget category)									EU contribution			Additional information		
	A. Direct personnel costs				B. Direct costs of subcontracting	C. Direct costs of fin. support	D. Other direct costs	E. Indirect costs[2]	Total costs	Reimbursement rate %	Maximum EU contribution[3]	Maximum grant amount[4]	Information for indirect costs	Information for auditors	Other information:
	A.1 Employees (or equivalent) A.2 Natural persons under direct contract A.3 Seconded persons [A.6 Personnel for providing access to research infrastructure]		A.4 SME owners without salary A.5 Beneficiaries that are natural persons without salary				D.1 Travel D.2 Equipment D.3 Other goods and services D.4 Costs of large research infrastructure						Estimated costs of in-kind contributions not used on premises	Declaration of costs under Point D.4	Estimated costs of beneficiaries/ linked third parties not receiving EU funding
Form of costs[6]	Actual	Unit[7]	Unit[8]		Actual	Actual	Actual	Flat-rate[9] 25%							
	(a)	Total (b)	No hours	Total (c)	(d)	(e)	(f)	(g)=0,25x ((a)+(b)+ (c)+(f) +[(h1)+(h2)]- (m))	(i)= (a)+(b)+(c)+ (d)+(e)+(f)+ (g)+(h1)+(h2)+(h3)	(j)	(k)	(l)	(m)	Yes/No	
17. INDRA	232886.00	0.00	0	0.00	0.00	0.00	12257.00	61285.75	306428.75	70.00	214500.13	43505.98	0.00	No	
- Avinor ANS[14]	77328.00	0.00	0	0.00	0.00	0.00	0.00	19332.00	96660.00	70.00	67662.00	13723.54	0.00	No	
- Indra Navia[14]	803232.00	0.00	0	0.00	0.00	0.00	100012.00	225811.00	1129055.00	70.00	790338.50	160300.39	0.00	No	
Total beneficiary 17	1113446.00	0.00			0.00	0.00	112269.00	306428.75	1532143.75		1072500.63	217529.91	0.00		
18. AIRTEL (NATMIG)	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	70.00	0.00	0.00	0.00	No	
19. SAAB (NATMIG)	802722.00	0.00	0	0.00	36700.00	0.00	356489.00	289802.75	1485713.75	70.00	1039999.63	210937.90	0.00	No	
20. SINTEF (NATMIG)	343572.00	0.00	0	0.00	0.00	0.00	27857.00	92857.25	464286.25	70.00	325000.38	65918.20	0.00	No	
21. EUROCONTROL															1001590.00
22. ADP (SEAC2020)	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	70.00	0.00	0.00	0.00	No	
23. MUC (SEAC2020)	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	70.00	0.00	0.00	0.00	No	
24. ZRH (SEAC2020)	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	70.00	0.00	0.00	0.00	No	
25. HAL (SEAC2020)	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	70.00	0.00	0.00	0.00	No	
26. SNBV (SEAC2020)	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	70.00	0.00	0.00	0.00	No	
27. Swed(SEAC2020)	57600.00	0.00	0	0.00	0.00	0.00	6400.00	16000.00	80000.00	70.00	56000.00	11358.20	0.00	No	
28. AVINOR-SEAC2020	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	70.00	0.00	0.00	0.00	No	
29. FINMECCANICA	29714.00	0.00	0	0.00	0.00	0.00	0.00	7428.50	37142.50	70.00	25999.75	5273.40	0.00	No	
- Selex ES GmbH[14]	242600.00	0.00	0	0.00	0.00	0.00	33000.00	68900.00	344500.00	70.00	241150.00	48911.24	0.00	No	
Total beneficiary 29	272314.00	0.00			0.00	0.00	33000.00	76328.50	381642.50		267149.75	54184.64	0.00		
30. THALES AIR SYS	199942.86	0.00	0	0.00	0.00	0.00	19000.00	54735.72	273678.58	70.00	191575.01	38856.19	0.00	No	

ESTIMATED BUDGET FOR THE ACTION (page 3 of 4)

	Estimated eligible[1] costs (per budget category)									EU contribution			Additional information		
	A. Direct personnel costs				B. Direct costs of subcontracting	C. Direct costs of fin. support	D. Other direct costs	E. Indirect costs[2]	Total costs	Reimbursement rate %	Maximum EU contribution[3]	Maximum grant amount[4]	Information for indirect costs	Information for auditors	Other information:
	A.1 Employees (or equivalent) A.2 Natural persons under direct contract A.3 Seconded persons [A.6 Personnel for providing access to research infrastructure]		A.4 SME owners without salary A.5 Beneficiaries that are natural persons without salary				D.1 Travel D.2 Equipment D.3 Other goods and services D.4 Costs of large research infrastructure						Estimated costs of in-kind contributions not used on premises	Declaration of costs under Point D.4	Estimated costs of beneficiaries/ linked third parties not receiving EU funding
Form of costs[6]	Actual	Unit[7]	Unit[8]		Actual	Actual	Actual	Flat-rate[9]							
								25%							
	(a)	Total (b)	No hours	Total (c)	(d)	(e)	(f)	(g)=0,25x ((a)+(b)+ (c)+(f) +[(h1)+(h2)]- (m))	(i)= (a)+(b)+(c)+ (d)+(e)+(f)+ (g)+(h1)+(h2)+(h3)	(j)	(k)	(l)	(m)	Yes/No	
- Searidge[14]	350000.00	0.00	0	0.00	0.00	0.00	70000.00	105000.00	525000.00	70.00	367500.00	74538.18	0.00	No	
Total beneficiary 30	549942.86	0.00			0.00	0.00	89000.00	159735.72	798678.58		559075.01	113394.37	0.00		
Total consortium	8330846.86	0.00		0.00	326700.00	0.00	1708503.00	2509837.47	12875887.33		9013121.17	1828086.09	0.00		1001590.00

ESTIMATED BUDGET FOR THE ACTION (page 4 of 4)

(1) See Article 6 for the eligibility conditions
(2) The indirect costs covered by the operating grant (received under any EU or Euratom funding programme; see Article 6.5.(b)) are ineligible under the GA. Therefore, a beneficiary that receives an operating grant during the action's duration cannot declare indirect costs for the year(s)/reporting period(s) covered by the operating grant (see Article 6.2.E).
(3) This is the theoretical amount of EU contribution that the system calculates automatically (by multiplying all the budgeted costs by the reimbursement rate). This theoretical amount is capped by the 'maximum grant amount' (that the Commission/Agency decided to grant for the action) (see Article 5.1).
(4) The 'maximum grant amount' is the maximum grant amount decided by the Commission/Agency. It normally corresponds to the requested grant, but may be lower.
(5) Depending on its type, this specific cost category will or will not cover indirect costs. Specific unit costs that include indirect costs are: costs for energy efficiency measures in buildings, access costs for providing trans-national access to research infrastructure and costs for clinical studies.
(6) See Article 5 for the forms of costs
(7) Unit : hours worked on the action; costs per unit (hourly rate) : calculated according to beneficiary's usual accounting practice
(8) See Annex 2a 'Additional information on the estimated budget' for the details (costs per hour (hourly rate)).
(9) Flat rate : 25% of eligible direct costs, from which are excluded: direct costs of subcontracting, costs of in-kind contributions not used on premises, direct costs of financial support, and unit costs declared under budget category F if they include indirect costs
(10) See Annex 2a 'Additional information on the estimated budget' for the details (units, costs per unit).
(11) See Annex 2a 'Additional information on the estimated budget' for the details (units, costs per unit, estimated number of units, etc)
(12) Only specific unit costs that do not include indirect costs
(13) See Article 9 for beneficiaries not receiving EU funding
(14) Only for linked third parties that receive EU funding

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

STICHTING NATIONAAL LUCHT- EN RUIMTEVAARTLABORATORIUM (NLR (AT-One)) NL6, 41150373, established in Anthony Fokkerweg 2, AMSTERDAM 1059CM, Netherlands, VAT number NL002760551B01, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('2')

in Grant Agreement No 730195 ('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 'Remote Tower for Multiple Airports (PJ05 Remote Tower)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

RIZENI LETOVEHO PROVOZU CESKE REPUBLIKY STATNI PODNIK (ANS CR (B4)) SP, 49710371, established in Navigacni 787, Jenec 25261, Czech Republic, VAT number CZ49710371, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('3')

in Grant Agreement No 730195 ('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 'Remote Tower for Multiple Airports (PJ05 Remote Tower)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

LETOVE PREVADZKOVE SLUZBY SLOVENSKEJ REPUBLIKY, STATNY PODNIK (LPS SR (B4)) SK9, 35778458, established in IVANSKA CESTA 93, BRATISLAVA 823 07, Slovakia, VAT number SK2020244699, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('4')

in Grant Agreement No 730195 ('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 'Remote Tower for Multiple Airports (PJ05 Remote Tower)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

VALSTYBES IMONE ORO NAVIGACIJA (ON (B4)) LT7, 210060460, established in RODUNIOS KEL 2, VILNIAUS 02188, Lithuania, VAT number LT100604610, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('5')

in Grant Agreement No 730195 ('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 'Remote Tower for Multiple Airports (PJ05 Remote Tower)'.

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

Algimantas RAŠIUS with ECAS id nrascial signed in the Participant Portal on 04/11/2016 at 08:02:40 (transaction id SigId-1089-LiE4we7BNA7hO1qZbIki0Lpw6jzsyjgqWlMivPZGYPer6VHAhCDxa6Z0WFezY5yTRr5rWzZV4eACTVVcLoUCnu0-PHslUMVSXYCXfnvHIid7u4-pJiywEDCIa3W0UT0yc5xVOJbPpENnUAEN8LbjL6y77G). Timestamp by third party at Fri Nov 04 08:02:47 CET 2016

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

POLSKA AGENCJA ZEGLUGI POWIETRZNEJ (PANSA (B4)), 140886771, established in UL. WIEZOWA 8, WARSZAWA 02 147, Poland, VAT number PL5222838321, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('6')

in Grant Agreement No 730195 ('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 'Remote Tower for Multiple Airports (PJ05 Remote Tower)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

AUSTRO CONTROL OSTERREICHISCHE GESELLSCHAFT FUR ZIVILLUFTFAHRT MBH (ACG/COOPANS) GMBH, FN71000M, established in WAGRAMER STRASSE 19, WIEN 1220, Austria, VAT number ATU37259408, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('7')

in Grant Agreement No 730195 ('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 'Remote Tower for Multiple Airports (PJ05 Remote Tower)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

CROATIA CONTROL, CROATIAN AIR NAVIGATION SERVICES LTD (CCL/COOPANS) DOO, 080328617, established in RUDOLFA FIZIRA 2, VELIKA GORICA 10410, Croatia, VAT number HR33052761319, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('8')

in Grant Agreement No 730195 ('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 'Remote Tower for Multiple Airports (PJ05 Remote Tower)'.

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

Alen SAJKO with ECAS id nsajalen signed in the Participant Portal on 31/10/2016 at 15:15:10 (transaction id SigId-6775-kf7DQHlpzZqjzyxnGbC2zPQ4Y1g69i4RPysW6yIgzyTjC2H8zr6zrWHw6wtfQzcq6uSqzJIbtn8pDXPyC3pOt0Pp-Jj71zxYb8yrI8GmV4asVNa-tYAzfO3WTnu76riuqkbizmzYRMkkIxg7rpRe8y2SGaL0). Timestamp by third party at Mon Oct 31 15:15:18 CET 2016

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

UDARAS EITLIOCHTA NA HEIREANN THE IRISH AVIATION AUTHORITY (IAA/ COOPANS) LTD, 211082, established in D'OLIER STREET 11-12 THE TIMES BUILDING, DUBLIN D02 T449, Ireland, VAT number IE8211082B, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('9')

in Grant Agreement No 730195 ('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 'Remote Tower for Multiple Airports (PJ05 Remote Tower)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

LUFTFARTSVERKET (LFV/COOPANS), 2021000795, established in HOSPITALSGATAN 30, NORRKOPING 602 27, Sweden, VAT number SE202100079501, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('10')

in Grant Agreement No 730195 ('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 'Remote Tower for Multiple Airports (PJ05 Remote Tower)'.

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

Björn WAHLSTRÖM with ECAS id nwahlsbj signed in the Participant Portal on 07/11/2016 at 11:38:12 (transaction id SigId-629-fSAae8u7yQdcZGkW1zwdXFLI44Ga0moddixHAxCibnlm2kapBazPMzzt8OZxaXCXzxJYScacCPoZnYAdwbSvBVC-Jj71zxYb8yrSvqV41qjZ8q-QgLGgLkqj9LjJtzIkfb8Rd1IT3lxodVMrOK3gzHkTNOm). Timestamp by third party at Mon Nov 07 11:38:20 CET 2016

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

NAVIAIR (Naviair/COOPANS) DK18, 26059763, established in NAVIAIR ALLE 1, KASTRUP 2770, Denmark, VAT number DK26059763, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('11')

in Grant Agreement No 730195 ('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 'Remote Tower for Multiple Airports (PJ05 Remote Tower)'.

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

Susanne ISAKSEN with ECAS id nisakssu signed in the Participant Portal on 01/11/2016 at 11:17:24 (transaction id SigId-10858-6VPKrIUkufEFyM5p1kWdsYKDQLFamAn9jTqObFCPjwBDI3ctl5UY6y WclLTs3KAzMhjvl65lfagFKs78fe5okG-Jj71zxYb8yrI8GmV4asVNa-LkIbslhDJf3E77Fpzhi9ae1EzoDlMLL74KmWNQme072m). Timestamp by third party at Tue Nov 01 11:17:31 CET 2016

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

DFS DEUTSCHE FLUGSICHERUNG GMBH (DFS) GMBH, HRB34977, 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 730195 ('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 'Remote Tower for Multiple Airports (PJ05 Remote Tower)'.

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

Gerhard TAUSS with ECAS id ntaussge signed in the Participant Portal on 31/10/2016 at 15:22:44 (transaction id SigId-6912-EZMdWVjWHdH8LzY3YTUzHAIRIOTDrBCSfkiihd9QBZjVS7kGJDe5dTPh15D9yeWgwlyn1vQapQroToFTPPxRXU-Jj71zxYb8yrl8GmV4asVNa-0S0MS7zOnC8fTKkqc6oBLazsiYvjOumkHcSqlNoQVhcm). Timestamp by third party at Mon Oct 31 15:22:51 CET 2016

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

ENAV SPA (ENAV) SPA, 965162/CF97016000586, established in VIA SALARIA 716, ROMA 00138, Italy, VAT number IT02152021008, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('13')

in Grant Agreement No 730195 ('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 'Remote Tower for Multiple Airports (PJ05 Remote Tower)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

FREQUENTIS AG (FRQ (FSP)) AG, FN72115B, established in Innovationsstrasse 1, WIEN 1100, Austria, VAT number ATU14715600, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('14')

in Grant Agreement No 730195 ('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 'Remote Tower for Multiple Airports (PJ05 Remote Tower)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

ATOS BELGIUM (ATOS (FSP)) NV, 401848135, established in DA VINCILAAN 5, ZAVENTEM 1930, Belgium, VAT number BE0401848135, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('15')

in Grant Agreement No 730195 ('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 'Remote Tower for Multiple Airports (PJ05 Remote Tower)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

HUNGAROCONTROL MAGYAR LEGIFORGALMI SZOLGALAT ZARTKORUEN MUKODO RESZVENYTARSASAG (HC (FSP)) RT, 0110045570, established in IGLO UTCA 33 35, BUDAPEST 1185, Hungary, VAT number HU13851325, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('16')

in Grant Agreement No 730195 ('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 'Remote Tower for Multiple Airports (PJ05 Remote Tower)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

INDRA SISTEMAS SA (INDRA) SA, M11339, established in AVENIDA DE BRUSELAS 35, ALCOBENDAS MADRID 28108, Spain, VAT number ESA28599033, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('17')

in Grant Agreement No 730195 ('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 'Remote Tower for Multiple Airports (PJ05 Remote Tower)'.

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

Jesús Angel GARCÍA SÁNCHEZ with ECAS id ngarcike signed in the Participant Portal on 03/11/2016 at 13:05:35 (transaction id SigId-24774-2WlANCr4bcFAzxpkSxNcfYzVgAocrbvhKyRYCAhGsG2kXrD0LR2tIXpun4NMXFl9XigWWvDC9Jzl6zjcBHpMVPu-Jj71zxYb8yrI8GmV4asVNa-vW59huF4WBYZISJ9C6znVCPHh9XqstxzJ9hRRFZwnN5G).
Timestamp by third party at
Thu Nov 03 13:05:45 CET 2016

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

AIRTEL ATN LIMITED (AIRTEL (NATMIG)) LTD, 287698, established in 2 HARBOUR SQUARE CROFTON ROAD, DUN LOAGHAIRE DUBLIN A96D6R0, Ireland, VAT number IE8287698U, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('18')

in Grant Agreement No 730195 ('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 'Remote Tower for Multiple Airports (PJ05 Remote Tower)'.

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

Norman STEWART with ECAS id nstewano signed in the Participant Portal on 31/10/2016 at 13:22:03 (transaction id SigId-5402-w2JGSUDjgEztzo8osRHQRQQ07lzUP3KCLPTCoIAvMdSzNcJT4M2dm1MzLbJK5zKcCieaC4VxPduNHioCQx4VqnCG-Jj71zxYb8yrI8GmV4asVNa-TUkKiXFqpTokWsuppTq8rhs909eAju2tmfCClrQu7bu). Timestamp by third party at
Mon Oct 31 13:22:10 CET 2016

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

SAAB AKTIEBOLAG (SAAB (NATMIG)) AB, 5560360793, established in ., LINKOPING 58188, Sweden, VAT number SE556036079301, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('19')

in Grant Agreement No 730195 ('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 'Remote Tower for Multiple Airports (PJ05 Remote Tower)'.

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

Lars SJÖSTRÖM with ECAS id nsjoestl signed in the Participant Portal on 31/10/2016 at 12:09:44 (transaction id SigId-4635-fmbg7ptKYb7wkddeRQvh3XoKx6RtB4vshny7iYd8zrFSNPJW7zf32XFS4BMmzqFk9UKSWb7kKHU29Qom11LUzzL-Jj71zxYb8yrI8GmV4asVNa-lvSeWr0Lpf2jJK9ZVOLx5leJfIscT9edp6rqDsILAzf). Timestamp by third party at Mon Oct 31 12:09:52 CET 2016

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

STIFTELSEN SINTEF (SINTEF (NATMIG)) NO1, 948007029, established in STRINDVEIEN 4, TRONDHEIM 7034, Norway, VAT number NO948007029MVA, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('20')

in Grant Agreement No 730195 ('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 'Remote Tower for Multiple Airports (PJ05 Remote Tower)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

EUROCONTROL - EUROPEAN ORGANISATION FOR THE SAFETY OF AIR NAVIGATION (EUROCONTROL), N/A, established in Rue de la Fusée 96, BRUXELLES 1130, Belgium, VAT number not applicable, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('21')

in Grant Agreement No 730195 ('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 'Remote Tower for Multiple Airports (PJ05 Remote Tower)'.

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 (ADP (SEAC2020)) FR39, 552016628, established in BOULEVARD RASPAIL 291, PARIS 75014, France, VAT number FR33552016628, ('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 730195 ('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 'Remote Tower for Multiple Airports (PJ05 Remote Tower)'.

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

gerard BATISTELLA with ECAS id nbatisge signed in the Participant Portal on 01/11/2016 at 19:36:28 (transaction id SigId-13115-1KN3WvkcdraRizIpmEiODFDk9xOzcxw4FsHZ9gWJm5KXYjr0bN03wOEOpj82KuA2hxEYzRrjzyzI5jnK9SHYpUd-Jj71zxYb8yrI8GmV4asVNa-UQKeW93EvQAbVYiNmwDEpk5fy8Q44LareFVfPTgt66m). Timestamp by third party at Tue Nov 01 20:36:56 CET 2016

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

FLUGHAFEN MUNCHEN GMBH (MUC (SEAC2020)) GMBH, HRB5448, 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 ('23')

in Grant Agreement No 730195 ('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 'Remote Tower for Multiple Airports (PJ05 Remote Tower)'.

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)) AG, CHE101921104, 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 ('24')

in Grant Agreement No 730195 ('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 'Remote Tower for Multiple Airports (PJ05 Remote Tower)'.

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)) LTD, 1991017, 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 ('25')

in Grant Agreement No 730195 ('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 'Remote Tower for Multiple Airports (PJ05 Remote Tower)'.

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

Mark BURGESS with ECAS id nbgessma signed in the Participant Portal on 09/11/2016 at 18:16:48 (transaction id SigId-30684-JPeKJQUGzgcBjXA8yHSoYzXli8X0pecVgzM2b3CJlhJYze8V2KgHQM763D43QybOmYs3wQzi88FFPPmzUXueCVl0-PHslUMVSXYCEbaUOEcOk1C-rMkcYm6IXbYGS4UT51rmmHcpMdYeXZYHjihsGYnSPzP). Timestamp by third party at
Wed Nov 09 18:16:56 CET 2016

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

SCHIPHOL NEDERLAND B.V. (SNBV (SEAC2020)) BV, 34166584, 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 ('26')

in Grant Agreement No 730195 ('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 'Remote Tower for Multiple Airports (PJ05 Remote Tower)'.

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

Koos NOORDELOOS with ECAS id nnoordko signed in the Participant Portal on 01/11/2016 at 08:48:56 (transaction id SigId-9985-YdRzuunzOKLh8zxwWBtwBdVOLadeO2qyia2LDK5DVF5LpSelBWwwApV0PJYJVj99dO3lMEzxwq2MEwTwvsatvNu-Jj71zxYb8yrI8GmV4asVNa-XvKMhlobddAjjWEJfUK6NZfznali2zt06lzH9y5N4rlm). Timestamp by third party at
Tue Nov 01 08:49:03 CET 2016

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

SWEDAVIA AB (Swed(SEAC2020)) AB, 5567970818, 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 ('27')

in Grant Agreement No 730195 ('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 'Remote Tower for Multiple Airports (PJ05 Remote Tower)'.

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

Per ARENHAGE with ECAS id narenhpe signed in the Participant Portal on 31/10/2016 at 13:57:15 (transaction id SigId-5747-m2lszpMb4HtouZ1crI91X7Ws1mlbNhnN88BqGDzRzdDk2niXajP8us1thcKr1UKsqcsFzr6uzczsyWIiLMzVCFSG-Jj71zxYb8yrI8GmV4asVNa-vqCOyWS9KrJPyYOG8HkmjdEILD87LgnegCrT6KWc1CO).
Timestamp by third party at
Mon Oct 31 13:57:22 CET 2016

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

AVINOR AS (AVINOR-SEAC2020) AS, 985198292, 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 ('28')

in Grant Agreement No 730195 ('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 'Remote Tower for Multiple Airports (PJ05 Remote Tower)'.

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

Abdul Basit MOHAMMAD with ECAS id nmohaulb signed in the Participant Portal on 08/11/2016 at 09:42:25 (transaction id SigId-2978-rTMyzMKVYyzk8uaPaTOqbQoWl7LnbTuU9B3JnLRJFfucABr1LrhlyBlhoGNiNIPN2m80APkl5ErqBd9w13QfnF-PHslUMVSXYCEbaUOEcOk1C-N3uI6DoAWmPqEYLKKqbTY4hdH8LClbG7tdI9gr6VrtC). Timestamp by third party at Tue Nov 08 09:42:41 CET 2016

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

LEONARDO - FINMECCANICA SPA (FINMECCANICA) SPA, 7031/CF00401990585, established in PIAZZA MONTE GRAPPA 4, ROMA 00195, Italy, VAT number IT00881841001, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('29')

in Grant Agreement No 730195 ('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 'Remote Tower for Multiple Airports (PJ05 Remote Tower)'.

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

Ernesto DE PIERI with ECAS id npierern signed in the Participant Portal on 31/10/2016 at 19:10:15 (transaction id SigId-9155-B1BP1zpjvnGjQVIMTjKzzMqHUvgR6IG9roVZspm4eCZrIzG82HtsCk5fSnVHJwdOPzpEtzMmT9T4I9VzmSjUAqCy-Jj71zxYb8yrI8GmV4asVNa-ZgNDkt0zf8XSHyV1UAwhChgH1LU6dSS70LDTbhxo4GJ). Timestamp by third party at Mon Oct 31 19:10:22 CET 2016

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

THALES AIR SYSTEMS SAS (THALES AIR SYS) SAS, 319159877, established in AVENUE CHARLES LINDBERGH 3, RUNGIS 94150, France, VAT number FR15319159877, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('30')

in Grant Agreement No 730195 ('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 'Remote Tower for Multiple Airports (PJ05 Remote Tower)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3a

DECLARATION ON JOINT AND SEVERAL LIABILITY OF LINKED THIRD PARTIES

MICROSTEP-MIS SPOL SRO (MicroStep-MIS) SRO, 35791489, established in CAVOJSKEHO 1, BRATISLAVA 84104, Slovakia, VAT number SK2020223271, ('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 4 **LETOVE PREVADZKOVE SLUZBY SLOVENSKEJ REPUBLIKY, STATNY PODNIK (LPS SR (B4))** SK9, 35778458, established in IVANSKA CESTA 93, BRATISLAVA 823 07, Slovakia, VAT number SK2020244699, ('the beneficiary'),

hereby accepts joint and several liability with the beneficiary

for any amount owed to the Commission by the beneficiary under Grant Agreement No 730195 (PJ05 Remote Tower), up to the maximum EU contribution indicated, for the linked third party, in the estimated budget (see Annex 2).

The linked third party irrevocably and unconditionally agrees to pay amounts requested under this Declaration to the Commission, immediately and at first demand.

For the linked third party
[forename/surname/function]

Done in English at [place], on [date]

ANNEX 3a

DECLARATION ON JOINT AND SEVERAL LIABILITY OF LINKED THIRD PARTIES

CONSORZIO SICTA SISTEMI INNOVATIVIPER IL CONTROLLO DELTRAFFICO AEREO (SICTA) IT4, 516936/CF02790511212, established in VIA FULCO RUFFO DI CALABRIA, NAPOLI 80144, Italy, VAT number IT02790511212, ('the linked third party'), represented for the purpose of signing this Declaration on joint and several liability by its legal representative(s) [forename and surname, function of the legal representative(s) of the linked third party],

linked to beneficiary No 13 **ENAV SPA (ENAV)** SPA, 965162/CF97016000586, established in VIA SALARIA 716, ROMA 00138, Italy, VAT number IT02152021008, ('the beneficiary'),

hereby accepts joint and several liability with the beneficiary

for any amount owed to the Commission by the beneficiary under Grant Agreement No 730195 (PJ05 Remote Tower), up to the maximum EU contribution indicated, for the linked third party, in the estimated budget (see Annex 2).

The linked third party irrevocably and unconditionally agrees to pay amounts requested under this Declaration to the Commission, immediately and at first demand.

For the linked third party
[forename/surname/function]

Done in English at [place], on [date]

ANNEX 3a

DECLARATION ON JOINT AND SEVERAL LIABILITY OF LINKED THIRD PARTIES

NEXTANT APPLICATIONS & INNOVATIVE SOLUTION SRL (NAIS) SRL, 1111048CF0866598100, established in VIA ALBENGA 33, ROMA 00183, Italy, VAT number IT08665981000, ('the linked third party'), represented for the purpose of signing this Declaration on joint and several liability by its legal representative(s) [forename and surname, function of the legal representative(s) of the linked third party],

linked to beneficiary No 13 **ENAV SPA (ENAV)** SPA, 965162/CF97016000586, established in VIA SALARIA 716, ROMA 00138, Italy, VAT number IT02152021008, ('the beneficiary'),

hereby accepts joint and several liability with the beneficiary

for any amount owed to the Commission by the beneficiary under Grant Agreement No 730195 (PJ05 Remote Tower), up to the maximum EU contribution indicated, for the linked third party, in the estimated budget (see Annex 2).

The linked third party irrevocably and unconditionally agrees to pay amounts requested under this Declaration to the Commission, immediately and at first demand.

For the linked third party
[forename/surname/function]

Done in English at [place], on [date]

ANNEX 3a

DECLARATION ON JOINT AND SEVERAL LIABILITY OF LINKED THIRD PARTIES

INDRA NAVIA AS (Indra Navia) AS, 914785200, established in OLAF HELSETS VEI 6, OSLO 0619, 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 17 **INDRA SISTEMAS SA (INDRA)** SA, M11339, 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 Commission by the beneficiary under Grant Agreement No 730195 (PJ05 Remote Tower), up to the maximum EU contribution indicated, for the linked third party, in the estimated budget (see Annex 2).

The linked third party irrevocably and unconditionally agrees to pay amounts requested under this Declaration to the Commission, immediately and at first demand.

For the linked third party
[forename/surname/function]

Done in English at [place], on [date]

ANNEX 3a

DECLARATION ON JOINT AND SEVERAL LIABILITY OF LINKED THIRD PARTIES

SELEX ES GMBH (Selex ES GmbH) GMBH, HRB17453, established in RAIFFEISENSTRASSE 10, NEUSS 41470, Germany, VAT number DE221370499, ('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 29 **LEONARDO - FINMECCANICA SPA (FINMECCANICA)** SPA, 7031/CF00401990585, established in PIAZZA MONTE GRAPPA 4, ROMA 00195, Italy, VAT number IT00881841001, ('the beneficiary'),

hereby accepts joint and several liability with the beneficiary

for any amount owed to the Commission by the beneficiary under Grant Agreement No 730195 (PJ05 Remote Tower), up to the maximum EU contribution indicated, for the linked third party, in the estimated budget (see Annex 2).

The linked third party irrevocably and unconditionally agrees to pay amounts requested under this Declaration to the Commission, immediately and at first demand.

For the linked third party
[forename/surname/function]

Done in English at [place], on [date]

ANNEX 3a

DECLARATION ON JOINT AND SEVERAL LIABILITY OF LINKED THIRD PARTIES

SEARIDGE TECHNOLOGIES INC. (Searidge) CA10, 4462424, established in 19 CAMELOT DRIVE, OTTAWA K2G 5W6, Canada, ('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 30 **THALES AIR SYSTEMS SAS (THALES AIR SYS)** SAS, 319159877, established in AVENUE CHARLES LINDBERGH 3, RUNGIS 94150, France, VAT number FR15319159877, ('the beneficiary'),

hereby accepts joint and several liability with the beneficiary

for any amount owed to the Commission by the beneficiary under Grant Agreement No 730195 (PJ05 Remote Tower), up to the maximum EU contribution indicated, for the linked third party, in the estimated budget (see Annex 2).

The linked third party irrevocably and unconditionally agrees to pay amounts requested under this Declaration to the Commission, immediately and at first demand.

For the linked third party
[forename/surname/function]

Done in English at [place], on [date]

ⓘ print format A4 landscape

MODEL ANNEX 4 FOR H2020 GENERAL MGA — MULTI

FINANCIAL STATEMENT FOR *[BENEFICIARY [name]/ LINKED THIRD PARTY [name]]* FOR REPORTING PERIOD [reporting period]

	Eligible[1] costs (per budget category)											Receipts	EU contribution			Additional information
	A. Direct personnel costs				B. Direct costs of subcontracting	*[C. Direct costs of fin. support]*	D. Other direct costs		E. Indirect costs[2]	*[F. Costs of …]*		Total costs	Receipts	Reimbursement rate %	Maximum EU contribution[3]	Requested EU contribution	Information for indirect costs :
	A.1 Employees (or equivalent) A.2 Natural persons under direct contract A.3 Seconded persons *[A.6 Personnel for providing access to research infrastructure]*		A.4 SME owners without salary A.5 Beneficiaries that are natural persons without salary				D.1 Travel D.2 Equipment D.3 Other goods and services	*[D.4 Costs of large research infrastructure]*		*[F.1 Costs of …]*			Receipts of the action, to be reported in the last reporting period, according to Article 5.3.3				Costs of in-kind contributions not used on premises
Form of costs[4]	Actual	Unit	Unit		Actual	Actual	Actual	Actual	Flat-rate[5] 25%	Unit	Unit						
	a	Total b	No hours	Total c	d	*[e]*	f	*[g]*	h=0,25 x (a+b+ c+f+*[g]* + *[i1]*[6] +*[i2]*[6] - o)	No units	Total *[i1]*	Total *[i2]*	j = a+b+c+d+*[e]* +f +*[g]* +h+*[i1]* +*[i2]*	k	l	m	n	o
[short name beneficiary/linked third party]																	

The beneficiary/linked third party hereby confirms that:
The information provided is complete, reliable and true.
The costs declared are eligible (see Article 6).
The costs can be substantiated by adequate records and supporting documentation that will be produced upon request or in the context of checks, reviews, audits and investigations (see Articles 17, 18 and 22).
For the last reporting period: that all the receipts have been declared (see Article 5.3.3).

ⓘ Please declare all eligible costs, even if they exceed the amounts indicated in the estimated budget (see Annex 2). Only amounts that were declared in your individual financial statements can be taken into account lateron, in order to replace other costs that are found to be ineligible.

[1] See Article 6 for the eligibility conditions

[2] The indirect costs claimed must be free of any amounts covered by an operating grant (received under any EU or Euratom funding programme; see Article 6.2.E). If you have received an operating grant during this reporting period, you cannot claim any indirect costs.

[3] This is the *theoretical* amount of EU contribution that the system calculates automatically (by multiplying the reimbursement rate by the total costs declared). The amount you request (in the column 'requested EU contribution') may have to be less (e.g. if you and the other beneficiaries are above budget, if the 90% limit (see Article 21) is reached, etc).

[4] See Article 5 for the form of costs

[5] Flat rate : 25% of eligible direct costs, from which are excluded: direct costs of subcontracting, costs of in-kind contributions not used on premises, direct costs of financial support, and unit costs declared under budget category F if they include indirect costs (see Article 6.2.E)

[6] Only specific unit costs that do not include indirect costs

ANNEX 5

MODEL FOR THE CERTIFICATE ON THE FINANCIAL STATEMENTS

- **For options [*in italics in square brackets*]: choose the applicable option. Options not chosen should be deleted.**
- **For fields in [grey in square brackets]: enter the appropriate data**

TABLE OF CONTENTS

Terms of Reference for an Independent Report of Factual Findings on costs declared under a Grant Agreement financed by the [BBI][Clean Sky 2][ECSEL][FCH][IMI2] Joint Undertaking under the Horizon 2020 Research and Innovation Framework Programme

This document sets out the '**Terms of Reference (ToR)**' under which

[OPTION 1: [insert name of the beneficiary] ('the Beneficiary')] [OPTION 2: [insert name of the linked third party] ('the Linked Third Party'), third party linked to the Beneficiary [insert name of the beneficiary] ('the Beneficiary')]

agrees to engage

[**insert legal name of the auditor**] ('the Auditor')

to produce an independent report of factual findings ('the Report') concerning the Financial Statement(s)[1] drawn up by the *[Beneficiary] [Linked Third Party]* for the Horizon 2020 grant agreement [insert number of the grant agreement, title of the action, acronym and duration from/to] ('the Agreement'), and

to issue a Certificate on the Financial Statements' ('CFS') referred to in Article 20.4 of the Agreement based on the compulsory reporting template stipulated by the Commission.

The Agreement has been concluded under the Horizon 2020 Research and Innovation Framework Programme (H2020) between the Beneficiary and *[the [Bio Based Industries][Clean Sky 2][ECSEL][Fuel Cells and Hydrogen 2][Innovative Medicines Initiative 2] Joint Undertaking (the "JU"), which receives funding under the Horizon 2020 Research and Innovation Framework Programme (H2020)]*.

The JU is mentioned as a signatory of the Agreement with the Beneficiary only. The JU is not a party to this engagement.

1.1 Subject of the engagement

The coordinator must submit to the JU the final report within 60 days following the end of the last reporting period which should include, amongst other documents, a CFS for each beneficiary and for each linked third party that requests a total contribution of EUR 325 000 or more, as reimbursement of actual costs and unit costs calculated on the basis of its usual cost accounting practices (see Article 20.4 of the Agreement). The CFS must cover all reporting periods of the beneficiary or linked third party indicated above.

The Beneficiary must submit to the coordinator the CFS for itself and for its linked third party(ies), if the CFS must be included in the final report according to Article 20.4 of the Agreement..

The CFS is composed of two separate documents:

- The Terms of Reference ('the ToR') to be signed by the *[Beneficiary] [Linked Third Party]* and the Auditor;
- The Auditor's Independent Report of Factual Findings ('the Report') to be issued on the Auditor's letterhead, dated, stamped and signed by the Auditor (or the competent public officer) which includes the agreed-upon procedures ('the Procedures') to be performed by the Auditor, and the standard factual findings ('the Findings') to be confirmed by the Auditor.

[1] By which costs under the Agreement are declared (see template 'Model Financial Statements' in Annex 4 to the Grant Agreement).

If the CFS must be included in the final report according to Article 20.4 of the Agreement, the request for payment of the balance relating to the Agreement cannot be made without the CFS. However, the payment for reimbursement of costs covered by the CFS does not preclude the JU, the Commission, the European Anti-Fraud Office and the European Court of Auditors from carrying out checks, reviews, audits and investigations in accordance with Article 22 of the Agreement.

1.2 Responsibilities

The *[Beneficiary] [Linked Third Party]:*

- must draw up the Financial Statement(s) for the action financed by the Agreement in compliance with the obligations under the Agreement. The Financial Statement(s) must be drawn up according to the *[Beneficiary's] [Linked Third Party's]* accounting and book-keeping system and the underlying accounts and records;
- must send the Financial Statement(s) to the Auditor;
- is responsible and liable for the accuracy of the Financial Statement(s);
- is responsible for the completeness and accuracy of the information provided to enable the Auditor to carry out the Procedures. It must provide the Auditor with a written representation letter supporting these statements. The written representation letter must state the period covered by the statements and must be dated;
- accepts that the Auditor cannot carry out the Procedures unless it is given full access to the *[Beneficiary's] [Linked Third Party's]* staff and accounting as well as any other relevant records and documentation.

The Auditor:

- *[Option 1 by default:* is qualified to carry out statutory audits of accounting documents in accordance with Directive 2006/43/EC of the European Parliament and of the Council of 17 May 2006 on statutory audits of annual accounts and consolidated accounts, amending Council Directives 78/660/EEC and 83/349/EEC and repealing Council Directive 84/253/EEC or similar national regulations*]*.
- *[Option 2 if the Beneficiary or Linked Third Party has an independent Public Officer:* is a competent and independent Public Officer for which the relevant national authorities have established the legal capacity to audit the Beneficiary*]*.
- *[Option 3 if the Beneficiary or Linked Third Party is an international organisation:* is an [internal] [external] auditor in accordance with the internal financial regulations and procedures of the international organisation*]*.

The Auditor:

- must be independent from the Beneficiary *[and the Linked Third Party]*, in particular, it must not have been involved in preparing the *[Beneficiary's] [Linked Third Party's]* Financial Statement(s);
- must plan work so that the Procedures may be carried out and the Findings may be assessed;
- must adhere to the Procedures laid down and the compulsory report format;
- must carry out the engagement in accordance with this ToR;
- must document matters which are important to support the Report;
- must base its Report on the evidence gathered;
- must submit the Report to the *[Beneficiary] [Linked Third Party]*.

The Commission sets out the Procedures to be carried out by the Auditor. The Auditor is not responsible for their suitability or pertinence. As this engagement is not an assurance engagement, the Auditor does not provide an audit opinion or a statement of assurance.

1.3 Applicable Standards

The Auditor must comply with these Terms of Reference and with[2]:

- the International Standard on Related Services ('ISRS') 4400 *Engagements to perform Agreed-upon Procedures regarding Financial Information* as issued by the International Auditing and Assurance Standards Board (IAASB);
- the *Code of Ethics for Professional Accountants* issued by the International Ethics Standards Board for Accountants (IESBA). Although ISRS 4400 states that independence is not a requirement for engagements to carry out agreed-upon procedures, the JU requires that the Auditor also complies with the Code's independence requirements.

The Auditor's Report must state that there is no conflict of interests in establishing this Report between the Auditor and the Beneficiary *[and the Linked Third Party]*, and must specify - if the service is invoiced - the total fee paid to the Auditor for providing the Report.

1.4 Reporting

The Report must be written in the language of the Agreement (see Article 20.7).

Under Article 22 of the Agreement, the JU, the Commission, the European Anti-Fraud Office and the Court of Auditors have the right to audit any work that is carried out under the action and for which costs are declared from the European Union budget. This includes work related to this engagement. The Auditor must provide access to all working papers (e.g. recalculation of hourly rates, verification of the time declared for the action) related to this assignment if the JU, the Commission, the European Anti-Fraud Office or the European Court of Auditors requests them.

1.5 Timing

The Report must be provided by *[*dd Month yyyy*]*.

1.6 Other terms

[*The [Beneficiary] [Linked Third Party] and the Auditor can use this section to agree other specific terms, such as the Auditor's fees, liability, applicable law, etc. Those specific terms must not contradict the terms specified above.*]

[legal name of the Auditor]	[legal name of the *[Beneficiary][Linked Third Party]*]
[name & function of authorised representative]	[name & function of authorised representative]
[dd Month yyyy]	[dd Month yyyy]
Signature of the Auditor	Signature of the *[Beneficiary][Linked Third Party]*

[2] Supreme Audit Institutions applying INTOSAI-standards may carry out the Procedures according to the corresponding International Standards of Supreme Audit Institutions and code of ethics issued by INTOSAI instead of the International Standard on Related Services ('ISRS') 4400 and the Code of Ethics for Professional Accountants issued by the IAASB and the IESBA.

Independent Report of Factual Findings on costs declared under a Grant Agreement financed by the [BBI][Clean Sky 2][ECSEL][FCH][IMI2] JU under the Horizon 2020 Research and Innovation Framework Programme

(To be printed on the Auditor's letterhead)

To
[name of contact person(s)], [Position]
[[*Beneficiary's*] [*Linked Third Party's*] name]
[Address]
[dd Month yyyy]

Dear [Name of contact person(s)],

As agreed under the terms of reference dated [dd Month yyyy]

with *[OPTION 1: [insert name of the beneficiary] ('the Beneficiary')] [OPTION 2: [insert name of the linked third party] ('the Linked Third Party'), third party linked to the Beneficiary [insert name of the beneficiary] ('the Beneficiary')],*

we

[name of the auditor] ('the Auditor'),

established at

[full address/city/state/province/country],

represented by

[name and function of an authorised representative],

have carried out the procedures agreed with you regarding the costs declared in the Financial Statement(s)[3] of the *[Beneficiary] [Linked Third Party]* concerning the grant agreement [insert grant agreement reference: number, title of the action and acronym] ('the Agreement'),

with a total cost declared of
[total amount] EUR,

and a total of actual costs and 'direct personnel costs declared as unit costs calculated in accordance with the [*Beneficiary's*] [*Linked Third Party's*] usual cost accounting practices' declared of

[sum of total actual costs and total direct personnel costs declared as unit costs calculated in accordance with the *[Beneficiary's] [Linked Third Party's]* usual cost accounting practices] EUR

and **hereby provide our Independent Report of Factual Findings ('the Report')** using the compulsory report format agreed with you.

The Report

Our engagement was carried out in accordance with the terms of reference ('the ToR') appended to this Report. The Report includes the agreed-upon procedures ('the Procedures') carried out and the standard factual findings ('the Findings') examined.

[3] By which the Beneficiary declares costs under the Agreement (see template 'Model Financial Statement' in Annex 4 to the Agreement).

The Procedures were carried out solely to assist the JU in evaluating whether the [*Beneficiary's*] [*Linked Third Party's*] costs in the accompanying Financial Statement(s) were declared in accordance with the Agreement. The JU draws its own conclusions from the Report and any additional information it may require.

The scope of the Procedures was defined by the Commission. Therefore, the Auditor is not responsible for their suitability or pertinence. Since the Procedures carried out constitute neither an audit nor a review made in accordance with International Standards on Auditing or International Standards on Review Engagements, the Auditor does not give a statement of assurance on the Financial Statements.

Had the Auditor carried out additional procedures or an audit of the *[Beneficiary's] [Linked Third Party's]* Financial Statements in accordance with International Standards on Auditing or International Standards on Review Engagements, other matters might have come to its attention and would have been included in the Report.

Not applicable Findings

We examined the Financial Statement(s) stated above and considered the following Findings not applicable:

Explanation (to be removed from the Report):

*If a Finding was not applicable, it must be marked as '**N.A.**' ('Not applicable') in the corresponding row on the right-hand column of the table and means that the Finding did not have to be corroborated by the Auditor and the related Procedure(s) did not have to be carried out.*

The reasons of the non-application of a certain Finding must be obvious i.e.

i) if no cost was declared under a certain category then the related Finding(s) and Procedure(s) are not applicable;

ii) if the condition set to apply certain Procedure(s) are not met the related Finding(s) and those Procedure(s) are not applicable. For instance, for 'beneficiaries with accounts established in a currency other than euro' the Procedure and Finding related to 'beneficiaries with accounts established in euro' are not applicable. Similarly, if no additional remuneration is paid, the related Finding(s) and Procedure(s) for additional remuneration are not applicable.

List here all Findings considered not applicable for the present engagement and explain the reasons of the non-applicability.

….

Exceptions

Apart from the exceptions listed below, the *[Beneficiary] [Linked Third Party]* provided the Auditor all the documentation and accounting information needed by the Auditor to carry out the requested Procedures and evaluate the Findings.

Explanation (to be removed from the Report):

- *If the Auditor was not able to successfully complete a procedure requested, it must be marked as '**E**' ('Exception') in the corresponding row on the right-hand column of the table. The reason such as the inability to reconcile key information or the unavailability of data that prevents the Auditor from carrying out the Procedure must be indicated below.*
- *If the Auditor cannot corroborate a standard finding after having carried out the corresponding procedure, it must also be marked as '**E**' ('Exception') and, where possible, the reasons why the Finding was not fulfilled and its possible impact must be explained here below.*

List here any exceptions and add any information on the cause and possible consequences of each exception, if known. If the exception is quantifiable, include the corresponding amount.

….

Example (to be removed from the Report):

1. *The Beneficiary was unable to substantiate the Finding number 1 on … because ….*
2. *Finding number 30 was not fulfilled because the methodology used by the Beneficiary to calculate unit costs was different from the one approved by the Commission. The differences were as follows: …*
3. *After carrying out the agreed procedures to confirm the Finding number 31, the Auditor found a difference of _____ EUR. The difference can be explained by …*

Further Remarks

In addition to reporting on the results of the specific procedures carried out, the Auditor would like to make the following general remarks:

Example (to be removed from the Report):

1. *Regarding Finding number 8 the conditions for additional remuneration were considered as fulfilled because …*
2. *In order to be able to confirm the Finding number 15 we carried out the following additional procedures: ….*

Use of this Report

This Report may be used only for the purpose described in the above objective. It was prepared solely for the confidential use of the *[Beneficiary] [Linked Third Party]*, the JU and the Commission, and only to be submitted to the JU in connection with the requirements set out in Article 20.4 of the Agreement. The Report may not be used by the *[Beneficiary] [Linked Third Party]* or by the JU or the Commission for any other purpose, nor may it be distributed to any other parties. The JU or the Commission may only disclose the Report to authorised parties, in particular to the European Anti-Fraud Office (OLAF) and the European Court of Auditors.

This Report relates only to the Financial Statement(s) submitted to the JU by the *[Beneficiary] [Linked Third Party]* for the Agreement. Therefore, it does not extend to any other of the [*Beneficiary's*] [*Linked Third Party's*] Financial Statement(s).

There was no conflict of interest[4] between the Auditor and the Beneficiary *[and Linked Third Party]* in establishing this Report. The total fee paid to the Auditor for providing the Report was EUR _____ (including EUR_____ of deductible VAT).

We look forward to discussing our Report with you and would be pleased to provide any further information or assistance.

[legal name of the Auditor]
[name and function of an authorised representative]
[dd Month yyyy]
Signature of the Auditor

[4] A conflict of interest arises when the Auditor's objectivity to establish the certificate is compromised in fact or in appearance when the Auditor for instance:
- was involved in the preparation of the Financial Statements;
- stands to benefit directly should the certificate be accepted;
- has a close relationship with any person representing the beneficiary;
- is a director, trustee or partner of the beneficiary; or
- is in any other situation that compromises his or her independence or ability to establish the certificate impartially.

Agreed-upon procedures to be performed and standard factual findings to be confirmed by the Auditor

The Commission reserves the right to i) provide the auditor with additional guidance regarding the procedures to be followed or the facts to be ascertained and the way in which to present them (this may include sample coverage and findings) or to ii) change the procedures, by notifying the Beneficiary in writing. The procedures carried out by the auditor to confirm the standard factual finding are listed in the table below.

If this certificate relates to a Linked Third Party, any reference here below to 'the Beneficiary' is to be considered as a reference to 'the Linked Third Party'.

The 'result' column has three different options: 'C', 'E' and 'N.A.':

- 'C' stands for 'confirmed' and means that the auditor can confirm the 'standard factual finding' and, therefore, there is no exception to be reported.
- 'E' stands for 'exception' and means that the Auditor carried out the procedures but cannot confirm the 'standard factual finding', or that the Auditor was not able to carry out a specific procedure (e.g. because it was impossible to reconcile key information or data were unavailable),
- 'N.A.' stands for 'not applicable' and means that the Finding did not have to be examined by the Auditor and the related Procedure(s) did not have to be carried out. The reasons of the non-application of a certain Finding must be obvious i.e. i) if no cost was declared under a certain category then the related Finding(s) and Procedure(s) are not applicable; ii) if the condition set to apply certain Procedure(s) are not met then the related Finding(s) and Procedure(s) are not applicable. For instance, for 'beneficiaries with accounts established in a currency other than the euro' the Procedure related to 'beneficiaries with accounts established in euro' is not applicable. Similarly, if no additional remuneration is paid, the related Finding(s) and Procedure(s) for additional remuneration are not applicable.

Ref	Procedures	Standard factual finding	Result (C / E / N.A.)
A	**ACTUAL PERSONNEL COSTS AND UNIT COSTS CALCULATED BY THE BENEFICIARY IN ACCORDANCE WITH ITS USUAL COST ACCOUNTING PRACTICE**		
	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. (*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)* The Auditor sampled _____ people out of the total of _____ people.		

Ref	Procedures	Standard factual finding	Result (C / E / N.A.)
A.1	**PERSONNEL COSTS** 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) To confirm standard factual findings 1-5 listed in the next column, the Auditor reviewed following information/documents provided by the Beneficiary: o 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; o the payslips of the employees included in the sample; o reconciliation of the personnel costs declared in the Financial Statement(s) with the accounting system (project accounting and general ledger) and payroll system; o information concerning the employment status and employment conditions of personnel included in the sample, in particular their employment contracts or equivalent; o the Beneficiary's usual policy regarding payroll matters (e.g. salary policy, overtime policy, variable pay); o applicable national law on taxes, labour and social security and o any other document that supports the personnel costs declared. 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.	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.	
	Further procedures if 'additional remuneration' is paid To confirm standard factual findings 6-9 listed in the next column, the Auditor: o reviewed relevant documents provided by the Beneficiary (legal form, legal/statutory	6) The Beneficiary paying "additional remuneration" was a non-profit legal entity.	

Ref	Procedures	Standard factual finding	Result (C / E / N.A.)
	obligations, the Beneficiary's usual policy on additional remuneration, criteria used for its calculation…); o recalculated the amount of additional remuneration eligible for the action based on the supporting documents received (full-time or part-time work, exclusive or non-exclusive dedication to the action, etc.) to arrive at the applicable FTE/year and pro-rata rate (see data collected in the course of carrying out the procedures under A.2 'Productive hours' and A.4 'Time recording system').	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.	
	IF ANY PART OF THE REMUNERATION PAID TO THE EMPLOYEE IS NOT MANDATORY ACCORDING TO THE NATIONAL LAW OR THE EMPLOYMENT CONTRACT ("ADDITIONAL REMUNERATION") AND IS ELIGIBLE UNDER THE PROVISIONS OF ARTICLE 6.2.A.1, THIS CAN BE CHARGED AS ELIGIBLE COST TO THE ACTION UP TO THE FOLLOWING AMOUNT: *(A) IF THE PERSON WORKS FULL TIME AND EXCLUSIVELY ON THE ACTION DURING THE FULL YEAR: UP TO EUR 8 000/YEAR;* *(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 IN ACCORDANCE TO ARTICLE 6.2.A.1.*	8) The criteria used to calculate the additional remuneration were objective and generally applied by the Beneficiary regardless of the source of funding used.	
		9) The amount of additional remuneration included in the personnel costs charged to the action was capped at EUR 8,000 per FTE/year (up to the equivalent pro-rata amount if the person did not work on the action full-time during the year or did not work exclusively on the action).	
	Additional procedures in case "unit costs calculated by the Beneficiary in accordance with its usual cost accounting practices" is applied: 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	10) The personnel costs included in the Financial Statement were calculated in accordance with the Beneficiary's usual cost accounting practice. This methodology was consistently	

Ref	Procedures	Standard factual finding	Result (C / E / N.A.)
	factual findings 10-13 listed in the next column: o obtained a description of the Beneficiary's usual cost accounting practice to calculate unit costs;. o reviewed whether the Beneficiary's usual cost accounting practice was applied for the Financial Statements subject of the present CFS; o 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; o 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; o 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.	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.	
	<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> To confirm standard factual findings 14-18 listed in the next column the Auditor reviewed following information/documents provided by the Beneficiary: o the contracts, especially the cost, contract duration, work description, place of work, ownership of the results and reporting obligations to the Beneficiary; o the employment conditions of staff in the same category to compare costs and; o any other document that supports the costs declared and its registration (e.g. invoices,	14) The natural persons reported to the Beneficiary (worked under the Beneficiary's instructions).	
		15) They worked on the Beneficiary's premises (unless otherwise agreed with the Beneficiary).	
		16) The results of work carried out belong to the Beneficiary.	

Ref	Procedures	Standard factual finding	Result (C / E / N.A.)
	accounting records, etc.).	17) Their costs were not significantly different from those for staff who performed similar tasks under an employment contract with the Beneficiary.	
		18) The costs were supported by audit evidence and registered in the accounts.	
	<u>For personnel seconded by a third party and included in the sample (not subcontractors)</u> To confirm standard factual findings 19-22 listed in the next column, the Auditor reviewed following information/documents provided by the Beneficiary: o their secondment contract(s) notably regarding costs, duration, work description, place of work and ownership of the results; o 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; o 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; o any other document that supports the costs declared (e.g. invoices, etc.).	19) Seconded personnel reported to the Beneficiary and worked on the Beneficiary's premises (unless otherwise agreed with the Beneficiary).	
		20) The results of work carried out belong to the Beneficiary.	
		If personnel is seconded against payment: 21) The costs declared were supported with documentation and recorded in the Beneficiary's accounts. The third party did not include any profit.	
		If personnel is seconded free of charge: 22) The costs declared did not exceed the third party's cost as	

Ref	Procedures	Standard factual finding	Result (C / E / N.A.)
		recorded in the accounts of the third party and were supported with documentation.	
A.2	**PRODUCTIVE HOURS** To confirm standard factual findings 23-28 listed in the next column, the Auditor reviewed relevant documents, especially national legislation, labour agreements and contracts and time records of the persons included in the sample, to verify that: o the annual productive hours applied were calculated in accordance with one of the methods described below, o the full-time equivalent (FTEs) ratios for employees not working full-time were correctly calculated. 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 hours can be supported by records, such as national legislation, labour agreements, and contracts. *BENEFICIARY'S PRODUCTIVE HOURS' FOR PERSONS WORKING FULL TIME SHALL BE ONE OF THE FOLLOWING METHODS:* ***A.*** *1720 ANNUAL PRODUCTIVE HOURS (PRO-RATA FOR PERSONS NOT WORKING FULL-TIME)* ***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*	23) The Beneficiary applied method [*choose one option and delete the others*] [**A**: 1720 hours] [**B**: the 'total number of hours worked'] [**C**: 'annual productive hours' used correspond to usual accounting practices]	
		24) Productive hours were calculated annually.	
		25) For employees not working full-time the full-time equivalent (FTE) ratio was correctly applied.	
		If the Beneficiary applied method B. 26) The calculation of the number of 'annual workable hours', overtime and absences was verifiable based on the documents provided by the Beneficiary.	

Ref	Procedures	Standard factual finding	Result (C / E / N.A.)
	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). ***C.** THE STANDARD NUMBER OF ANNUAL HOURS GENERALLY APPLIED BY THE BENEFICIARY FOR ITS PERSONNEL IN ACCORDANCE WITH ITS USUAL COST ACCOUNTING PRACTICES (THIS METHOD IS ALSO REFERRED TO AS 'TOTAL ANNUAL PRODUCTIVE HOURS' IN THE NEXT COLUMN). THIS NUMBER MUST BE AT LEAST 90% OF THE STANDARD ANNUAL WORKABLE HOURS.* *'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 Beneficiary applied method C.* 27) The calculation of the number of 'standard annual workable hours' was verifiable based on the documents provided by the Beneficiary.	
		28) The 'annual productive hours' used for calculating the hourly rate were consistent with the usual cost accounting practices of the Beneficiary and were equivalent to at least 90 % of the 'annual workable hours'.	
A.3	**HOURLY PERSONNEL RATES** I) For unit costs calculated in accordance to the Beneficiary's usual cost accounting practice (unit costs): 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. 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:	29) The Beneficiary applied [*choose one option and delete the other*]: [Option I: "Unit costs (hourly rates) were calculated in accordance with the Beneficiary's usual cost accounting practices"] [Option II: Individual hourly rates were applied]	

Ref	Procedures	Standard factual finding	Result (C / E / N.A.)
	○ reviewed the documentation provided by the Beneficiary, including manuals and internal guidelines that explain how to calculate hourly rates; ○ recalculated the unit costs (hourly rates) of staff included in the sample following the results of the procedures carried out in A.1 and A.2. II) For individual hourly rates: The Auditor: ○ reviewed the documentation provided by the Beneficiary, including manuals and internal guidelines that explain how to calculate hourly rates; ○ recalculated the hourly rates of staff included in the sample following the results of the procedures carried out in A.1 and A.2. *"UNIT COSTS CALCULATED BY THE BENEFICIARY IN ACCORDANCE WITH ITS USUAL COST ACCOUNTING PRACTICES":* *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.* *HOURLY RATE FOR INDIVIDUAL ACTUAL PERSONAL COSTS:* *IT IS CALCULATED BY DIVIDING THE TOTAL AMOUNT OF PERSONNEL COSTS OF AN EMPLOYEE VERIFIED IN LINE WITH PROCEDURE A.1 BY THE NUMBER OF ANNUAL PRODUCTIVE HOURS VERIFIED IN LINE WITH PROCEDURE A.2.*	*For option I concerning unit costs and if the Beneficiary applies the methodology approved by the Commission (CoMUC):* 30) The Beneficiary used the Commission-approved methodology to calculate hourly rates. It corresponded to the organisation's usual cost accounting practices and was applied consistently for all activities irrespective of the source of funding.	
		For option I concerning unit costs and if the Beneficiary applies a methodology not approved by the Commission: 31) The unit costs re-calculated by the Auditor were the same as the rates applied by the Beneficiary.	
		For option II concerning individual hourly rates: 32) The individual rates re-calculated by the Auditor were the same as the rates applied by the Beneficiary.	

Ref	Procedures	Standard factual finding	Result (C / E / N.A.)
A.4	**TIME RECORDING SYSTEM** 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: o description of the time recording system provided by the Beneficiary (registration, authorisation, processing in the HR-system); o its actual implementation; o time records were signed at least monthly by the employees (on paper or electronically) and authorised by the project manager or another manager; o the hours declared were worked within the project period; o 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) ; o the hours charged to the action matched those in the time recording system. *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).*	33) All persons recorded their time dedicated to the action on a **daily/ weekly/ monthly** basis using a **paper/computer-based** system. (*delete the answers that are not applicable)*	
		34) Their time-records were authorised at least monthly by the project manager or other superior.	
		35) Hours declared were worked within the project period and were consistent with the presences/absences recorded in HR-records.	
		36) There were no discrepancies between the number of hours charged to the action and the number of hours recorded.	
	<u>If the persons are working exclusively for the action and without time records</u> For the persons selected that worked exclusively for the action without time records, the Auditor verified evidence available demonstrating that they were in reality exclusively dedicated to the action and that the Beneficiary signed a declaration confirming that they have worked exclusively for the action.	37) The exclusive dedication is supported by a declaration signed by the Beneficiary's and by any other evidence gathered.	

Ref	Procedures	Standard factual finding	Result (C / E / N.A.)
B	**COSTS OF SUBCONTRACTING**		
B.1	**The Auditor obtained the detail/breakdown of subcontracting costs and sampled _____ cost items selected randomly** (*full coverage is required if there are fewer than 10 items, otherwise the sample should have a minimum of 10 item, or 10% of the total, whichever number is highest*). To confirm standard factual findings 38-42 listed in the next column, the Auditor reviewed the following for the items included in the sample: o the use of subcontractors was foreseen in Annex 1; o subcontracting costs were declared in the subcontracting category of the Financial Statement; o supporting documents on the selection and award procedure were followed; o 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). In particular, i. if the Beneficiary acted as a contracting authority within the meaning of Directive 2004/18/EC or of Directive 2004/17/EC, the Auditor verified that the applicable national law on public procurement was followed and that the subcontracting complied with the Terms and Conditions of the Agreement. ii. if the Beneficiary did not fall under the above-mentioned category the Auditor verified that the Beneficiary followed their usual procurement rules and respected the Terms and Conditions of the Agreement..	38) The use of claimed subcontracting costs was foreseen in Annex I and costs were declared in the Financial Statements under the subcontracting category.	
		39) There were documents of requests to different providers, different offers and assessment of the offers before selection of the provider in line with internal procedures and procurement rules. Subcontracts were awarded in accordance with the principle of best value for money. *(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)*	
		40) The subcontracts were not awarded to other Beneficiaries	

Ref	Procedures	Standard factual finding	Result (C / E / N.A.)
	For the items included in the sample the Auditor also verified that: o the subcontracts were not awarded to other Beneficiaries in the consortium; o there were signed agreements between the Beneficiary and the subcontractor; o there was evidence that the services were provided by subcontractor;	of the consortium.	
		41) All subcontracts were supported by signed agreements between the Beneficiary and the subcontractor.	
		42) There was evidence that the services were provided by the subcontractors.	
C	**COSTS OF PROVIDING FINANCIAL SUPPORT TO THIRD PARTIES**		
C.1	**The Auditor obtained the detail/breakdown of the costs of providing financial support to third parties and sampled _____ cost items selected randomly** (*full coverage is required if there are fewer than 10 items, otherwise the sample should have a minimum of 10 item, or 10% of the total, whichever number is highest*). The Auditor verified that the following minimum conditions were met: a) the maximum amount of financial support for each third party did not exceed EUR 60 000, unless explicitly mentioned in Annex 1; b) the financial support to third parties was agreed in Annex 1 of the Agreement and the other provisions on financial support to third parties included in Annex 1 were respected.	43) All minimum conditions were met	

D	OTHER ACTUAL DIRECT COSTS		
D.1	**COSTS OF TRAVEL AND RELATED SUBSISTENCE ALLOWANCES** **The Auditor sampled _____ cost items selected randomly** (*full coverage is required if there are fewer than 10 items, otherwise the sample should have a minimum of 10 item, or 10% of the total, whichever number is the highest*). The Auditor inspected the sample and verified that: o 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; o 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; o no ineligible costs or excessive or reckless expenditure was declared.	44) Costs were incurred, approved and reimbursed in line with the Beneficiary's usual policy for travels.	
		45) There was a link between the trip and the action.	
		46) The supporting documents were consistent with each other regarding subject of the trip, dates, duration and reconciled with time records and accounting.	
		47) No ineligible costs or excessive or reckless expenditure was declared.	
D.2	**DEPRECIATION COSTS FOR EQUIPMENT, INFRASTRUCTURE OR OTHER ASSETS** **The Auditor sampled _____ cost items selected randomly** (*full coverage is required if there are fewer than 10 items, otherwise the sample should have a minimum of 10 item, or 10% of the total, whichever number is the highest*). For "equipment, infrastructure or other assets" [from now on called "asset(s)"] selected in the sample the Auditor verified that: o the assets were acquired in conformity with the Beneficiary's internal guidelines and procedures; o they were correctly allocated to the action (with supporting documents such as delivery	48) Procurement rules, principles and guides were followed.	
		49) There was a link between the grant agreement and the asset charged to the action.	
		50) The asset charged to the action was traceable to the accounting records and the underlying documents.	

	note invoice or any other proof demonstrating the link to the action) o they were entered in the accounting system; o the extent to which the assets were used for the action (as a percentage) was supported by reliable documentation (e.g. usage overview table); 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). 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).	51) The depreciation method used to charge the asset to the action was in line with the applicable rules of the Beneficiary's country and the Beneficiary's usual accounting policy.	
		52) The amount charged corresponded to the actual usage for the action.	
		53) No ineligible costs or excessive or reckless expenditure were declared.	
D.3	**COSTS OF OTHER GOODS AND SERVICES** **The Auditor sampled _____ cost items selected randomly** (*full coverage is required if there are fewer than 10 items, otherwise the sample should have a minimum of 10 item, or 10% of the total, whichever number is highest*). For the purchase of goods, works or services included in the sample the Auditor verified that: o the contracts did not cover tasks described in Annex 1; o 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); o the goods were not placed in the inventory of durable equipment; o the costs charged to the action were accounted in line with the Beneficiary's usual accounting practices; o no ineligible costs or excessive or reckless expenditure were declared (see Article 6 GA). In addition, the Auditor verified that these goods and services were acquired in conformity with the Beneficiary's internal guidelines and procedures, in particular: o if Beneficiary acted as a contracting authority within the meaning of Directive	54) Contracts for works or services did not cover tasks described in Annex 1.	
		55) Costs were allocated to the correct action and the goods were not placed in the inventory of durable equipment.	
		56) The costs were charged in line with the Beneficiary's accounting policy and were adequately supported.	
		57) No ineligible costs or excessive or reckless expenditure were declared. For internal invoices/charges only the cost element was charged, without any mark-ups.	

	2004/18/EC or of Directive 2004/17/EC, the Auditor verified that the applicable national law on public procurement was followed and that the procurement contract complied with the Terms and Conditions of the Agreement. o 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. For the items included in the sample the Auditor also verified that: o 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); *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.*	58) Procurement rules, principles and guides were followed. There were documents of requests to different providers, different offers and assessment of the offers before selection of the provider in line with internal procedures and procurement rules. The purchases were made in accordance with the principle of best value for money. *(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)*	
D.4	**AGGREGATED CAPITALISED AND OPERATING COSTS OF RESEARCH INFRASTRUCTURE** 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. ***In the cases that a positive ex-ante assessment has been issued*** *(see the standard factual findings 59-60 on the next column)**,***	59) The costs declared as direct costs for Large Research Infrastructures (in the appropriate line of the Financial Statement) comply with the methodology described in the positive ex-ante assessment report.	

	The Auditor ensured that the beneficiary has applied consistently the methodology that is explained and approved in the positive ex ante assessment; ***In the cases that a positive ex-ante assessment has NOT been issued*** *(see the standard factual findings 61 on the next column),* The Auditor verified that no costs of Large Research Infrastructure have been charged as direct costs in any costs category; ***In the cases that a draft ex-ante assessment report has been issued with recommendation for further changes*** *(see the standard factual findings 61 on the next column),* • The Auditor followed the same procedure as above (when a positive ex-ante assessment has NOT yet been issued) and paid particular attention (testing reinforced) to the cost items for which the draft ex-ante assessment either rejected the inclusion as direct costs for Large Research Infrastructures or issued recommendations.	60) Any difference between the methodology applied and the one positively assessed was extensively described and adjusted accordingly. 61) The direct costs declared were free from any indirect costs items related to the Large Research Infrastructure.	
E	**USE OF EXCHANGE RATES**		
E.1	a) For Beneficiaries with accounts established in a currency other than euros **The Auditor sampled _____ cost items selected randomly and verified that the exchange rates used for converting other currencies into euros were in accordance with the following rules established in the Agreement** (*full coverage is required if there are fewer than 10 items, otherwise the sample should have a minimum of 10 item, or 10% of the total, whichever number is highest)*: *COSTS INCURRED IN ANOTHER CURRENCY SHALL BE CONVERTED INTO EURO AT THE AVERAGE OF THE DAILY EXCHANGE RATES PUBLISHED IN THE C SERIES OF OFFICIAL JOURNAL OF THE EUROPEAN UNION (https://www.ecb.int/stats/exchange/eurofxref/html/index.en.html), DETERMINED OVER THE CORRESPONDING REPORTING PERIOD.* *IF NO DAILY EURO EXCHANGE RATE IS PUBLISHED IN THE OFFICIAL JOURNAL OF THE EUROPEAN UNION FOR THE CURRENCY IN QUESTION, CONVERSION SHALL BE MADE AT THE AVERAGE OF THE MONTHLY ACCOUNTING RATES ESTABLISHED BY THE COMMISSION AND PUBLISHED ON ITS WEBSITE (http://ec.europa.eu/budget/contracts_grants/info_contracts/inforeuro/inforeuro_en.cfm), DETERMINED OVER THE CORRESPONDING REPORTING PERIOD.*	62) The exchange rates used to convert other currencies into Euros were in accordance with the rules established of the Grant Agreement and there was no difference in the final figures.	

	b) For Beneficiaries with accounts established in euros **The Auditor sampled _____ cost items selected randomly and verified that the exchange rates used for converting other currencies into euros were in accordance with the following rules established in the Agreement** (*full coverage is required if there are fewer than 10 items, otherwise the sample should have a minimum of 10 item, or 10% of the total, whichever number is highest)*: *COSTS INCURRED IN ANOTHER CURRENCY SHALL BE CONVERTED INTO EURO BY APPLYING THE BENEFICIARY'S USUAL ACCOUNTING PRACTICES.*	63) The Beneficiary applied its usual accounting practices.	

[legal name of the audit firm]
[name and function of an authorised representative]
[dd Month yyyy]
<Signature of the Auditor>

ANNEX 6

MODEL FOR THE CERTIFICATE ON THE METHODOLOGY

- **For options [*in italics in square brackets*]: choose the applicable option. Options not chosen should be deleted.**
- **For fields in [grey in square brackets]: enter the appropriate data.**

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Terms of reference for an audit engagement for a methodology certificate in connection with one or more grant agreements financed by [BBI][Clean Sky 2][ECSEL][FCH][IMI2] JU under the Horizon 2020 Research and Innovation Framework Programme

This document sets out the '**Terms of Reference (ToR)**' under which

[OPTION 1: [insert name of the beneficiary] ('the Beneficiary')] [OPTION 2: [insert name of the linked third party] ('the Linked Third Party'), third party linked to the Beneficiary [insert name of the beneficiary] ('the Beneficiary')]

agrees to engage

[**insert legal name of the auditor**] ('the Auditor')

to produce an independent report of factual findings ('the Report') concerning the *[Beneficiary's] [Linked Third Party's]* usual accounting practices for calculating and claiming direct personnel costs declared as unit costs ('the Methodology') in connection with grant agreements financed under the Horizon 2020 Research and Innovation Framework Programme.

The procedures to be carried out for the assessment of the methodology will be based on the grant agreement(s) detailed below:

[title and number of the grant agreement(s)] ('the Agreement(s)')

The Agreement(s) has(have) been concluded between the Beneficiary and the [Bio Based Industries][Clean Sky 2][ECSEL][Fuel Cells and Hydrogen 2][Innovative Medicines Initiative 2] Joint Undertaking ('the JU')

The JU is mentioned as a signatory of the Agreement with the Beneficiary only. The JU is not a party to this engagement.

1.1 Subject of the engagement

According to Article 18.1.2 of the Agreement, beneficiaries *[and linked third parties]* that declare direct personnel costs as unit costs calculated in accordance with their usual cost accounting practices may submit to the JU for approval by the Commission, a certificate on the methodology ('CoMUC') stating that there are adequate records and documentation to prove that their cost accounting practices used comply with the conditions set out in Point A of Article 6.2.

The subject of this engagement is the CoMUC which is composed of two separate documents:

- the Terms of Reference ('the ToR') to be signed by the *[Beneficiary] [Linked Third Party]* and the Auditor;

- the Auditor's Independent Report of Factual Findings ('the Report') issued on the Auditor's letterhead, dated, stamped and signed by the Auditor which includes; the standard statements ('the Statements') evaluated and signed by the *[Beneficiary] [Linked Third Party]*, the agreed-upon procedures ('the Procedures') performed by the Auditor and the standard factual findings ('the Findings') assessed by the Auditor. The Statements, Procedures and Findings are summarised in the table that forms part of the Report.

The information provided through the Statements, the Procedures and the Findings will enable the Commission to draw conclusions regarding the existence of the *[Beneficiary's] [Linked Third Party's]* usual cost accounting practice and its suitability to ensure that direct personnel costs claimed on that

basis comply with the provisions of the Agreement. The Commission draws its own conclusions from the Report and any additional information it may require.

1.2 Responsibilities

The parties to this agreement are the *[Beneficiary] [Linked Third Party]* and the Auditor.

The *[Beneficiary] [Linked Third Party]:*

- is responsible for preparing financial statements for the Agreement(s) ('the Financial Statements') in compliance with those Agreements;
- is responsible for providing the Financial Statement(s) to the Auditor and enabling the Auditor to reconcile them with the *[Beneficiary's] [Linked Third Party's]* accounting and bookkeeping system and the underlying accounts and records. The Financial Statement(s) will be used as a basis for the procedures which the Auditor will carry out under this ToR;
- is responsible for its Methodology and liable for the accuracy of the Financial Statement(s);
- is responsible for endorsing or refuting the Statements indicated under the heading 'Statements to be made by the Beneficiary/ Linked Third Party' in the first column of the table that forms part of the Report;
- must provide the Auditor with a signed and dated representation letter;
- accepts that the ability of the Auditor to carry out the Procedures effectively depends upon the *[Beneficiary] [Linked Third Party]* providing full and free access to the *[Beneficiary's] [Linked Third Party's]* staff and to its accounting and other relevant records.

The Auditor:

- *[Option 1 by default: is qualified to carry out statutory audits of accounting documents in accordance with Directive 2006/43/EC of the European Parliament and of the Council of 17 May 2006 on statutory audits of annual accounts and consolidated accounts, amending Council Directives 78/660/EEC and 83/349/EEC and repealing Council Directive 84/253/EEC or similar national regulations]*.
- *[Option 2 if the Beneficiary or Linked Third Party has an independent Public Officer: is a competent and independent Public Officer for which the relevant national authorities have established the legal capacity to audit the Beneficiary]*.
- *[Option 3 if the Beneficiary or Linked Third Party is an international organisation: is an [internal] [external] auditor in accordance with the internal financial regulations and procedures of the international organisation]*.

The Auditor:

- must be independent from the Beneficiary *[and the Linked Third Party]*, in particular, it must not have been involved in preparing the Beneficiary's *[and Linked Third Party's]* Financial Statement(s);
- must plan work so that the Procedures may be carried out and the Findings may be assessed;
- must adhere to the Procedures laid down and the compulsory report format;
- must carry out the engagement in accordance with these ToR;
- must document matters which are important to support the Report;
- must base its Report on the evidence gathered;
- must submit the Report to the *[Beneficiary] [Linked Third Party]*.

The Commission sets out the Procedures to be carried out and the Findings to be endorsed by the Auditor. The Auditor is not responsible for their suitability or pertinence. As this engagement is not an assurance engagement the Auditor does not provide an audit opinion or a statement of assurance.

1.3 Applicable Standards

The Auditor must comply with these Terms of Reference and with[1]:

- the International Standard on Related Services ('ISRS') 4400 *Engagements to perform Agreed-upon Procedures regarding Financial Information* as issued by the International Auditing and Assurance Standards Board (IAASB);
- the *Code of Ethics for Professional Accountants* issued by the International Ethics Standards Board for Accountants (IESBA). Although ISRS 4400 states that independence is not a requirement for engagements to carry out agreed-upon procedures, the Commission requires that the Auditor also complies with the Code's independence requirements.

The Auditor's Report must state that there was no conflict of interests in establishing this Report between the Auditor and the Beneficiary *[and the Linked Third Party]* that could have a bearing on the Report, and must specify – if the service is invoiced - the total fee paid to the Auditor for providing the Report.

1.4 Reporting

The Report must be written in the language of the Agreement (see Article 20.7 of the Agreement).

Under Article 22 of the Agreement, the JU, the Commission, the European Anti-Fraud Office and the Court of Auditors have the right to audit any work that is carried out under the action and for which costs are claimed from the European Union budget. This includes work related to this engagement. The Auditor must provide access to all working papers related to this assignment if the JU, the Commission, the European Anti-Fraud Office or the European Court of Auditors requests them.

1.5 Timing

The Report must be provided by [dd Month yyyy].

1.6 Other Terms

[The [Beneficiary] [Linked Third Party] and the Auditor can use this section to agree other specific terms, such as the Auditor's fees, liability, applicable law, etc. Those specific terms must not contradict the terms specified above.]

[legal name of the Auditor]	[legal name of the [Beneficiary] [Linked Third Party]]
[name & title of authorised representative]	[name & title of authorised representative]
[dd Month yyyy]	[dd Month yyyy]
Signature of the Auditor Signature	Signature of the *[Beneficiary] [Linked Third Party]*

[1] Supreme Audit Institutions applying INTOSAI-standards may carry out the Procedures according to the corresponding International Standards of Supreme Audit Institutions and code of ethics issued by INTOSAI instead of the International Standard on Related Services ('ISRS') 4400 and the Code of Ethics for Professional Accountants issued by the IAASB and the IESBA.

Independent report of factual findings on the methodology concerning grant agreements financed by the [BBI][Clean Sky 2][ECSEL][FCH][IMI2] JU under the Horizon 2020 Research and Innovation Framework Programme

(To be printed on letterhead paper of the auditor)

To
[name of contact person(s)], [Position]
[[Beneficiary's] [Linked Third Party's] name]
[Address]
[dd Month yyyy]

Dear [Name of contact person(s)],

As agreed under the terms of reference dated [dd Month yyyy]

with *[OPTION 1: [insert name of the beneficiary] ('the Beneficiary')] [OPTION 2: [insert name of the linked third party] ('the Linked Third Party'), third party linked to the Beneficiary [insert name of the beneficiary] ('the Beneficiary')]*,

we

[name of the auditor] ('the Auditor'),

established at

[full address/city/state/province/country],

represented by

[name and function of an authorised representative],

have carried out the agreed-upon procedures ('the Procedures') and provide hereby our Independent Report of Factual Findings ('the Report'), concerning the *[Beneficiary's] [Linked Third Party's]* usual accounting practices for calculating and declaring direct personnel costs declared as unit costs ('the Methodology').

You requested certain procedures to be carried out in connection with the grant(s)

[title and number of the grant agreement(s)] ('the Agreement(s)').

The Report

Our engagement was carried out in accordance with the terms of reference ('the ToR') appended to this Report. The Report includes: the standard statements ('the Statements') made by the *[Beneficiary] [Linked Third Party]*, the agreed-upon procedures ('the Procedures') carried out and the standard factual findings ('the Findings') confirmed by us.

The engagement involved carrying out the Procedures and assessing the Findings and the documentation requested appended to this Report, the results of which the Commission uses to draw conclusions regarding the acceptability of the Methodology applied by the *[Beneficiary] [Linked Third Party]*.

The Report covers the methodology used from [dd Month yyyy]. In the event that the *[Beneficiary] [Linked Third Party]* changes this methodology, the Report will not be applicable to any Financial Statement[2] submitted thereafter.

The scope of the Procedures and the definition of the standard statements and findings were determined solely by the Commission. Therefore, the Auditor is not responsible for their suitability or pertinence.

Since the Procedures carried out constitute neither an audit nor a review made in accordance with International Standards on Auditing or International Standards on Review Engagements, we do not give a statement of assurance on the costs declared on the basis of the *[Beneficiary's] [Linked Third Party's]* Methodology. Had we carried out additional procedures or had we performed an audit or review in accordance with these standards, other matters might have come to its attention and would have been included in the Report.

Exceptions

Apart from the exceptions listed below, the *[Beneficiary] [Linked Third Party]* agreed with the standard Statements and provided the Auditor all the documentation and accounting information needed by the Auditor to carry out the requested Procedures and corroborate the standard Findings.

List here any exception and add any information on the cause and possible consequences of each exception, if known. If the exception is quantifiable, also indicate the corresponding amount.

…..

Explanation of possible exceptions in the form of examples (to be removed from the Report):

i. the [Beneficiary] [Linked Third Party] did not agree with the standard Statement number … because…;

ii. the Auditor could not carry out the procedure … established because …. (e.g. due to the inability to reconcile key information or the unavailability or inconsistency of data);

iii. the Auditor could not confirm or corroborate the standard Finding number … because ….

Remarks

We would like to add the following remarks relevant for the proper understanding of the Methodology applied by the [Beneficiary] [Linked Third Party] or the results reported:

Example (to be removed from the Report):

Regarding the methodology applied to calculate hourly rates …

Regarding standard Finding 15 it has to be noted that …

The [Beneficiary] [Linked Third Party] explained the deviation from the benchmark statement XXIV concerning time recording for personnel with no exclusive dedication to the action in the following manner: …

Annexes

Please provide the following documents to the auditor and annex them to the report when submitting this CoMUC to the JU:

1. Brief description of the methodology for calculating personnel costs, productive hours and hourly rates;

[2] Financial Statement in this context refers solely to Annex 4 of the Agreement by which the Beneficiary declares costs under the Agreement.

2. Brief description of the time recording system in place;
3. An example of the time records used by the [*Beneficiary] [Linked Third Party*];
4. Description of any budgeted or estimated elements applied, together with an explanation as to why they are relevant for calculating the personnel costs and how they are based on objective and verifiable information;
5. A summary sheet with the hourly rate for direct personnel declared by the [*Beneficiary*] [*Linked Third Party*] and recalculated by the Auditor for each staff member included in the sample (the names do not need to be reported);
6. A comparative table summarising for each person selected in the sample a) the time claimed by the [*Beneficiary*] [*Linked Third Party*] in the Financial Statement(s) and b) the time according to the time record verified by the Auditor;
7. A copy of the letter of representation provided to the Auditor.

Use of this Report

This Report has been drawn up solely for the purpose given under Point 1.1 Reasons for the engagement.

The Report:

- is confidential and is intended to be submitted to the JU by the [*Beneficiary*] [*Linked Third Party*] in connection with Article 18.1.2 of the Agreement;
- may not be used by the [*Beneficiary*] [*Linked Third Party*], by the JU or by the Commission for any other purpose, nor distributed to any other parties;
- may be disclosed by the JU or the Commission only to authorised parties, in particular the European Anti-Fraud Office (OLAF) and the European Court of Auditors.
- relates only to the usual cost accounting practices specified above and does not constitute a report on the Financial Statements of the [*Beneficiary*] [*Linked Third Party*].

No conflict of interest[3] exists between the Auditor and the Beneficiary *[and the Linked Third Party*] that could have a bearing on the Report. The total fee paid to the Auditor for producing the Report was EUR _____ (including EUR _____ of deductible VAT).

We look forward to discussing our Report with you and would be pleased to provide any further information or assistance which may be required.

Yours sincerely

[legal name of the Auditor]
[name and title of the authorised representative]
[dd Month yyyy]
Signature of the Auditor

[3] A conflict of interest arises when the Auditor's objectivity to establish the certificate is compromised in fact or in appearance when the Auditor for instance:
- was involved in the preparation of the Financial Statements;
- stands to benefit directly should the certificate be accepted;
- has a close relationship with any person representing the beneficiary;
- is a director, trustee or partner of the beneficiary; or
- is in any other situation that compromises his or her independence or ability to establish the certificate impartially.

Statements to be made by the Beneficiary/Linked Third Party ('the Statements') and Procedures to be carried out by the Auditor ('the Procedures') and standard factual findings ('the Findings') to be confirmed by the Auditor

The Commission reserves the right to provide the auditor with guidance regarding the Statements to be made, the Procedures to be carried out or the Findings to be ascertained and the way in which to present them. The Commission reserves the right to vary the Statements, Procedures or Findings by written notification to the Beneficiary/Linked Third Party to adapt the procedures to changes in the grant agreement(s) or to any other circumstances.

If this methodology certificate relates to the Linked Third Party's usual accounting practices for calculating and claiming direct personnel costs declared as unit costs any reference here below to 'the Beneficiary' is to be considered as a reference to 'the Linked Third Party'.

Please explain any discrepancies in the body of the Report.	
Statements to be made by Beneficiary	**Procedures to be carried out and Findings to be confirmed by the Auditor**
A. Use of the Methodology 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*]*.	**Procedure:** ✓ The Auditor checked these dates against the documentation the Beneficiary has provided. **Factual finding:** 1. The dates provided by the Beneficiary were consistent with the documentation.
B. Description of the Methodology III. The methodology to calculate unit costs is being used in a consistent manner and is reflected in the relevant procedures. *[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]* *[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:* - *...]*	**Procedure:** ✓ The Auditor reviewed the description, the relevant manuals and/or internal guidance documents describing the methodology. **Factual finding:** 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.
C. **Personnel costs** <u>General</u>	**Procedure:** *The Auditor draws a sample of employees to carry out the procedures indicated in*

Please explain any discrepancies in the body of the Report.	
Statements to be made by Beneficiary	**Procedures to be carried out and Findings to be confirmed by the Auditor**
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; 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. *[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]*. 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 budget). <u>If additional remuneration as referred to in the grant agreement(s) is paid</u>	*this section C and the following sections D to F.* *[The Auditor has drawn a random sample of 10 full-time equivalents made up of employees assigned to the action(s). If fewer than 10 full-time equivalents are assigned to the action(s), the Auditor has selected a sample of 10 full-time equivalents consisting of all employees assigned to the action(s), complemented by other employees irrespective of their assignments.]*. For this sample: ✓ the Auditor reviewed all documents relating to personnel costs such as employment contracts, payslips, payroll policy (e.g. salary policy, overtime policy, variable pay policy), accounting and payroll records, applicable national tax , labour and social security law and any other documents corroborating the personnel costs claimed; ✓ in particular, the Auditor reviewed the employment contracts of the employees in the sample to verify that: i. they were employed directly by the Beneficiary in accordance with applicable national legislation; ii. they were working under the sole technical supervision and responsibility of the latter; iii. they were remunerated in accordance with the Beneficiary's usual practices; iv. they were allocated to the correct group/category/cost centre for the purposes of calculating the unit cost in line with the Beneficiary's usual cost accounting practices; ✓ the Auditor verified that any ineligible items or any costs claimed under other costs categories or costs covered by other types of grant or by other grants financed from the European Union budget have not been taken into account when calculating the personnel costs; ✓ the Auditor numerically reconciled the total amount of personnel costs used to calculate the unit cost with the total amount of personnel costs recorded in the statutory accounts and the payroll system. ✓ to the extent that actual personnel costs were adjusted on the basis of budgeted or estimated elements, the Auditor carefully examined those elements and checked the information source to confirm that they correspond to objective and verifiable information;

Please explain any discrepancies in the body of the Report.	
Statements to be made by Beneficiary	**Procedures to be carried out and Findings to be confirmed by the Auditor**
XII. The Beneficiary is a non-profit legal entity; XIII. The additional remuneration is part of the beneficiary's usual remuneration practices and paid consistently whenever the relevant work or expertise is required; XIV. The criteria used to calculate the additional remuneration are objective and generally applied regardless of the source of funding; 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). *[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:* *- ...]*	✓ 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). ✓ the Auditor recalculated the personnel costs for the employees in the sample. **Factual finding:** 4. All the components of the remuneration that have been claimed as personnel costs are supported by underlying documentation. 5. The employees in the sample were employed directly by the Beneficiary in accordance with applicable national law and were working under its sole supervision and responsibility. 6. Their employment contracts were in line with the Beneficiary's usual policy; 7. Personnel costs were duly documented and consisted solely of salaries, social security contributions (pension contributions, health insurance, unemployment fund contributions, etc.), taxes and other statutory costs included in the remuneration (holiday pay, thirteenth month's pay, etc.); 8. The totals used to calculate the personnel unit costs are consistent with those registered in the payroll and accounting records; 9. To the extent that actual personnel costs were adjusted on the basis of budgeted or estimated elements, those elements were relevant for calculating the personnel costs and correspond to objective and verifiable information. The budgeted or estimated elements used are: — (indicate the elements and their values). 10. Personnel costs contained no ineligible elements; 11. Specific conditions for eligibility were fulfilled when additional remuneration was paid: a) the Beneficiary is registered in the grant agreements as a non-profit legal entity; b) it was paid according to objective criteria generally applied regardless of the source of funding used and c) remuneration was capped at EUR 8 000 per full-time equivalent (or up to up to the equivalent pro-rata amount if the person did not work on the

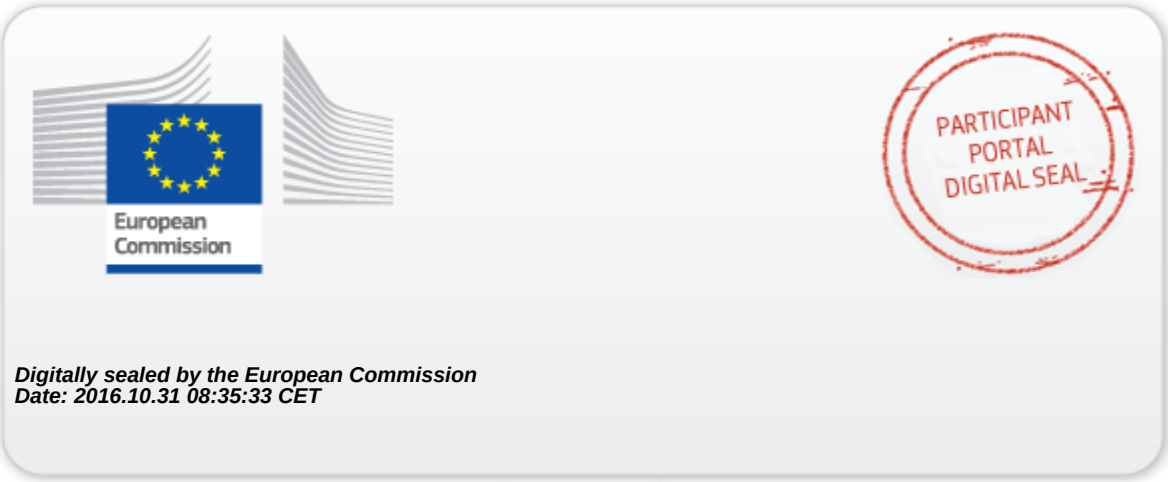
Please explain any discrepancies in the body of the Report.	
Statements to be made by Beneficiary	**Procedures to be carried out and Findings to be confirmed by the Auditor**
	action full-time during the year or did not work exclusively on the action).
D. Productive hours XVI. The number of productive hours per full-time employee applied is *[delete as appropriate]*: A. 1720 productive hours per year for a person working full-time (corresponding pro-rata for persons not working full time). B. the total number of hours worked in the year by a person for the Beneficiary 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. <u>If method B is applied</u> 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). 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. XIX. The contract (applicable collective labour agreement or national working time legislation) do specify the working time enabling to calculate the annual workable hours. <u>If method C is applied</u> XX. The standard number of productive hours per year is that of a full-time equivalent; for employees not assigned exclusively to the action(s) this number is reduced proportionately. 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.	**Procedure (same sample basis as for Section C: Personnel costs):** ✓ The Auditor verified that the number of productive hours applied is in accordance with method A, B or C. ✓ The Auditor checked that the number of productive hours per full-time employee is correct and that it is reduced proportionately for employees not exclusively assigned to the action(s). ✓ If method B is applied the Auditor verified i) the manner in which the total number of hours worked was done and ii) that the contract specified the annual workable hours by inspecting all the relevant documents, national legislation, labour agreements and contracts. ✓ If method C is applied the Auditor reviewed the manner in which the standard number of working hours per year has been calculated by inspecting all the relevant documents, national legislation, labour agreements and contracts and verified that the number of productive hours per year used for these calculations was at least 90 % of the standard number of working hours per year. **Factual finding:** <u>General</u> 12. The Beneficiary applied a number of productive hours consistent with method A, B or C detailed in the left-hand column. 13. The number of productive hours per year per full-time employee was accurate and was proportionately reduced for employees not working full-time or exclusively for the action. <u>If method B is applied</u> 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. 15. The contract specified the working time enabling to calculate the annual workable hours.

Please explain any discrepancies in the body of the Report.	
Statements to be made by Beneficiary	**Procedures to be carried out and Findings to be confirmed by the Auditor**
XXII. Standard workable (working) hours are hours during which personnel are at the Beneficiary's disposal preforming 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. *[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:* - *...]*	If method C is applied 16. The calculation of the number of productive hours per year corresponded to the usual costs accounting practice of the Beneficiary. 17. The calculation of the standard number of workable (working) hours per year was corroborated by the documents presented by the Beneficiary. 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.
E. Hourly rates The hourly rates are correct because: 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. *[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:* - *...]*	**Procedure** ✓ The Auditor has obtained a list of all personnel rates calculated by the Beneficiary in accordance with the methodology used. ✓ The Auditor has obtained a list of all the relevant employees, based on which the personnel rate(s) are calculated. For 10 full-time equivalent employees selected at random (same sample basis as Section C: Personnel costs): ✓ The Auditor recalculated the hourly rates. ✓ The Auditor verified that the methodology applied corresponds to the usual accounting practices of the organisation and is applied consistently for all activities of the organisation on the basis of objective criteria irrespective of the source of funding. **Factual finding:** 19. No differences arose from the recalculation of the hourly rate for the employees included in the sample.
F. Time recording XXIV. Time recording is in place for all persons with no exclusive dedication to one Horizon 2020 action. At least all hours worked in connection with the grant agreement(s) are registered on a **daily/weekly/monthly** basis *[delete as appropriate]* using a **paper/computer-based system** *[delete as appropriate]*; XXV. For persons exclusively assigned to one Horizon 2020 activity the Beneficiary has either signed a declaration to that effect or has put arrangements in place	**Procedure** ✓ The Auditor reviewed the brief description, all relevant manuals and/or internal guidance describing the methodology used to record time. The Auditor reviewed the time records of the random sample of 10 full-time equivalents referred to under Section C: Personnel costs, and verified in particular:

Please explain any discrepancies in the body of the Report.	
Statements to be made by Beneficiary	**Procedures to be carried out and Findings to be confirmed by the Auditor**
to record their working time; 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; XXVII. Measures are in place to prevent staff from: i. recording the same hours twice, ii. recording working hours during absence periods (e.g. holidays, sick leave), iii. recording more than the number of productive hours per year used to calculate the hourly rates, and iv. recording hours worked outside the action period. XXVIII. No working time was recorded outside the action period; XXIX. No more hours were claimed than the productive hours used to calculate the hourly personnel rates. *[Please provide a brief description of the time recording system in place together with the measures applied to ensure its reliability to the Auditor and annex it to the present certificate[4]].* *[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:* *- ...]*	✓ that time records were available for all persons with not exclusive assignment to the action; ✓ that time records were available for persons working exclusively for a Horizon 2020 action, or, alternatively, that a declaration signed by the Beneficiary was available for them certifying that they were working exclusively for a Horizon 2020 action; ✓ that time records were signed and approved in due time and that all minimum requirements were fulfilled; ✓ that the persons worked for the action in the periods claimed; ✓ that no more hours were claimed than the productive hours used to calculate the hourly personnel rates; ✓ that internal controls were in place to prevent that time is recorded twice, during absences for holidays or sick leave; that more hours are claimed per person per year for Horizon 2020 actions than the number of productive hours per year used to calculate the hourly rates; that working time is recorded outside the action period; ✓ the Auditor cross-checked the information with human-resources records to verify consistency and to ensure that the internal controls have been effective. In addition, the Auditor has verified that no more hours were charged to Horizon 2020 actions per person per year than the number of productive hours per year used to calculate the hourly rates, and verified that no time worked outside the action period was charged to the action. **Factual finding:** 20. The brief description, manuals and/or internal guidance on time recording provided by the Beneficiary were consistent with management

[4] The description of the time recording system must state among others information on the content of the time records, its coverage (full or action time-recording, for all personnel or only for personnel involved in H2020 actions), its degree of detail (whether there is a reference to the particular tasks accomplished), its form, periodicity of the time registration and authorisation (paper or a computer-based system; on a daily, weekly or monthly basis; signed and countersigned by whom), controls applied to prevent double-charging of time or ensure consistency with HR-records such as absences and travels as well as it information flow up to its use for the preparation of the Financial Statements.

Please explain any discrepancies in the body of the Report.	
Statements to be made by Beneficiary	**Procedures to be carried out and Findings to be confirmed by the Auditor**
	reports/records and other documents reviewed and were generally applied by the Beneficiary to produce the financial statements. 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; 22. For the random sample the time records were signed by the employee and the action manager/line manager, at least monthly. 23. Working time claimed for the action occurred in the periods claimed; 24. No more hours were claimed than the number productive hours used to calculate the hourly personnel rates; 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. 26. Working time claimed is consistent with that on record at the human-resources department.
[official name of the** [Beneficiary] [Linked Third Party]**]	***[official name of the Auditor]***
[name and title of authorised representative]	***[name and title of authorised representative]***
[dd Month yyyy]	***[dd Month yyyy]***
<***Signature of the** [Beneficiary] [Linked Third Party]*>	<***Signature** of the Auditor*>



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