



GRANT AGREEMENT FOR MEMBERS¹

NUMBER 874474 — PJ13 - W2 ERICA

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

on the one part,

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

and

on the other part,

1. 'the coordinator':

LEONARDO - SOCIETA PER AZIONI (LEONARDO), established in PIAZZA MONTE GRAPPA 4, ROMA 00195, Italy, VAT number: IT00881841001, represented for the purposes of signing the Agreement by Strategy, cinzia berteotti

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

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

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

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

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

6. **LUFTHARTSVERKET (LFV/COOPANS)**, established in HOSPITALSGATAN 30, NORRKOPING 602 27, Sweden, VAT number: SE202100079501,

7. **DASSAULT AVIATION (DAV)**, established in 9 ROND POINT CHAMPS-ELYSEES-MARCEL DASSAULT, PARIS 75008, France, VAT number: FR73712042456,

¹ '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.

8. **DIRECTION DES SERVICES DE LA NAVIGATION AERIENNE (DSNA)**, established in 50 RUE HENRY FARMAN, PARIS 75720, France, VAT number: FR29120064019,
9. **ENAIRES (ENAIRES)**, established in AVENIDA DE ARAGON S/N BLOQUE 330, PORTAL 2 PARQUE EMPRESARIAL LAS MERCEDES, MADRID 28022, Spain, VAT number: ESQ2822001J,
10. **ENAV SPA (ENAV)**, established in VIA SALARIA 716, ROMA 00138, Italy, VAT number: IT02152021008,
11. **EUROCONTROL - EUROPEAN ORGANISATION FOR THE SAFETY OF AIR NAVIGATION (EUROCONTROL)**, established in Rue de la Fusée 96, BRUXELLES 1130, Belgium, VAT number: not applicable, as 'beneficiary not receiving JU funding' (see Article 9),
12. **FREQUENTIS AG (FRQ (FSP))**, established in Innovationsstrasse 1, WIEN 1100, Austria, VAT number: ATU14715600,
13. **HUNGAROCNTRL MAGYAR LEGIFORGALMISZOLGALAT ZARTKORUEN MUKODO RESZVENYTARSASAG (HC (FSP))**, established in IGLO UTCA 33 35, BUDAPEST 1185, Hungary, VAT number: HU13851325,
14. **HONEYWELL AEROSPACE (Honeywell SAS)**, established in 4 AVENUE SAINT GRANIER, TOULOUSE 31300, France, VAT number: FR92340797919,
15. **INDRA SISTEMAS SA (INDRA)**, established in AVENIDA DE BRUSELAS 35, ALCOBENDAS MADRID 28108, Spain, VAT number: ESA28599033,
16. **SAAB AKTIEBOLAG (SAAB)**, established in ., LINKOPING 581 88, Sweden, VAT number: SE556036079301,
17. **NATS (EN ROUTE) PUBLIC LIMITED COMPANY (NATS)**, established in 4000 PARKWAY WHITELEY, FAREHAM PO15 7FL, United Kingdom, VAT number: GB440379456,
18. **THALES LAS FRANCE SAS (THALES AIR SYS)**, established in AVENUE GAY LUSSAC 2, ELANCOURT 78990, France, VAT number: FR15319159877,
19. **THALES AVS FRANCE SAS (THALES AVS)**, established in 75-77 AVENUE MARCEL DASSAULT, MERIGNAC 33700, France, VAT number: FR65612039495,
20. **DFS DEUTSCHE FLUGSICHERUNG GMBH (DFS)**, established in AM DFS CAMPUS 10, LANGEN 63225, Germany, VAT number: DE114110232, as 'beneficiary not receiving JU funding' (see Article 9),
21. **DEUTSCHES ZENTRUM FUER LUFT - UND RAUMFAHRT EV (DLR)**, established in Linder Hoehe, KOELN 51147, Germany, as 'beneficiary not receiving JU funding' (see Article 9),
22. **RIZENI LETOVEHO PROVOZU CESKE REPUBLIKY STATNI PODNIK (ANS CR (B4))**, established in JENEC NAVIGACNI 787, JENEC 252 61, Czechia, VAT number: CZ699004742, as 'beneficiary not receiving JU funding' (see Article 9),

23. **LETOVE PREVADZKOVE SLUZBY SLOVENSKEJ REPUBLIKY, STATNY PODNIK (LPS SR (B4))**, established in IVANSKA CESTA 93, BRATISLAVA 823 07, Slovakia, VAT number: SK2020244699, as ‘beneficiary not receiving JU funding’ (see Article 9),

24. **AUSTRO CONTROL OSTERREICHISCHE GESELLSCHAFT FUR ZIVILLUFTFAHRT MBH (ACG/COOPANS)**, established in WAGRAME STRASSE 19, WIEN 1220, Austria, VAT number: ATU37259408, as ‘beneficiary not receiving JU funding’ (see Article 9),

25. **CROATIA CONTROL, CROATIAN AIR NAVIGATION SERVICES LTD (CCL/COOPANS)**, established in RUDOLFA FIZIRA 2, VELIKA GORICA 10410, Croatia, VAT number: HR33052761319, as ‘beneficiary not receiving JU funding’ (see Article 9),

26. **UDARAS EITLIOCHTA NA HEIREANN THE IRISH AVIATION AUTHORITY (IAA/COOPANS)**, established in D'OLIER STREET 11-12 THE TIMES BUILDING, DUBLIN D02 T449, Ireland, VAT number: IE8211082B, as ‘beneficiary not receiving JU funding’ (see Article 9),

27. **NAVIAIR (Naviair/COOPANS)**, established in NAVIAIR ALLE 1, KASTRUP 2770, Denmark, VAT number: DK26059763, as ‘beneficiary not receiving JU funding’ (see Article 9),

28. **ATOS BELGIUM (ATOS (FSP))**, established in DA VINCILAAN 5, ZAVENTEM 1930, Belgium, VAT number: BE0401848135, as ‘beneficiary not receiving JU funding’ (see Article 9),

29. **AIRTEL ATN LIMITED (AIRTEL)**, established in 2 HARBOUR SQUARE CROFTON ROAD, DUN LOAGHAIRE DUBLIN A96D6R0, Ireland, VAT number: IE8287698U, as ‘beneficiary not receiving JU funding’ (see Article 9),

30. **SINTEF AS (SINTEF)**, established in STRINDVEGEN 4, TRONDHEIM 7034, Norway, VAT number: NO919303808MVA, as ‘beneficiary not receiving JU funding’ (see Article 9),

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

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

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

The Agreement is composed of:

Terms and Conditions

- | | |
|---------|---|
| Annex 1 | Description of the action |
| Annex 2 | Estimated budget for the action |
| | 2a Additional information on the estimated budget |
| Annex 3 | Accession Forms |
| | 3a Declaration on joint and several liability of linked third parties |
| Annex 4 | Model for the financial statements |
| Annex 5 | Model for the certificate on the financial statements |
| Annex 6 | Model for the certificate on the methodology |

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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 ‘**Enable RPAS Insertion in Controlled Airspace**’ — ‘**PJ13 - W2 ERICA**’ (**‘action’**), as described in Annex 1.

The grant is a ‘**complementary grant**’ to the grant agreement(s) under the call(s) for proposals H2020-SESAR-2019-1.

ARTICLE 3 — DURATION AND STARTING DATE OF THE ACTION

The duration of the action will be **37 months** as of 1 December 2019 (**‘starting date of the action’**).

ARTICLE 4 — ESTIMATED BUDGET AND BUDGET TRANSFERS

4.1 Estimated budget

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

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

4.2 Budget transfers

The estimated budget breakdown indicated in Annex 2 may be adjusted — without an amendment (see Article 55) — by transfers of amounts between beneficiaries, budget categories and/or forms of costs set out in Annex 2, if the action is implemented as described in Annex 1.

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

CHAPTER 3 GRANT

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

5.1 Maximum grant amount

The '**maximum grant amount**' is **EUR 8 486 176.57** (eight million four hundred and eighty six thousand one hundred and seventy six EURO and fifty seven 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 18 786 336.96** (eighteen million seven hundred and eighty six thousand three hundred and thirty six EURO and ninety six eurocents).

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

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

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

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

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

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

(d) for **other direct costs**:

- for costs of internally invoiced goods and services: on the basis of an amount per unit calculated by the beneficiary in accordance with its usual cost accounting practices ('**unit costs**');
- for all other costs: as actually incurred costs (**actual costs**);

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

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

5.3 Final grant amount — Calculation

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

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

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

Step 2 — Limit to the maximum grant amount

Step 3 — Reduction due to the no-profit rule

Step 4 — Reduction due to substantial errors, irregularities or fraud or serious breach of obligations

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

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

5.3.2 Step 2 — Limit to the maximum grant amount

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

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

The grant must not produce a profit.

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

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

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

The following are considered **receipts**:

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

The following are however not considered receipts:

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

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

5.3.4 Step 4 — Reduction due to substantial errors, irregularities or fraud or serious breach of obligations — Reduced grant amount — Calculation

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

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

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

5.4 Revised final grant amount — Calculation

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

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

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

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

ARTICLE 6 — ELIGIBLE AND INELIGIBLE COSTS

6.1 General conditions for costs to be eligible

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

(a) for **actual costs**:

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

in accordance with the accounting standards applicable in the country where the beneficiary is established and with the beneficiary's usual cost accounting practices;

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

(b) for unit costs:

- (i) they must be calculated as follows:

{amounts per unit set out in Annex 2a or calculated by the beneficiary in accordance with its usual cost accounting practices (see Article 6.2, Point A and Article 6.2.D.5)

multiplied by

the number of actual units};

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

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

(c) for flat-rate costs:

- (i) they must be calculated by applying the flat-rate set out in Annex 2, and
- (ii) the costs (actual costs or unit costs) to which the flat-rate is applied must comply with the conditions for eligibility set out in this Article.

6.2 Specific conditions for costs to be eligible

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

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

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

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

A. Direct personnel costs

Types of eligible personnel costs

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

Beneficiaries that are non-profit legal entities² may also declare as personnel costs **additional remuneration** for personnel assigned to the action (including payments on the basis of supplementary contracts regardless of their nature), if:

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

‘Additional remuneration’ means any part of the remuneration which exceeds what the person would be paid for time worked in projects funded by national schemes.

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

- (a) if the person works full time and exclusively on the action during the full year: up to EUR 8 000;
- (b) if the person works exclusively on the action but not full-time or not for the full year: up to the corresponding pro-rata amount of EUR 8 000, or
- (c) if the person does not work exclusively on the action: up to a pro-rata amount calculated as follows:

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

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

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

² For the definition, see Article 2.1(14) of the Rules for Participation Regulation No 1290/2013: ‘**non-profit legal entity**’ means a legal entity which by its legal form is non-profit-making or which has a legal or statutory obligation not to distribute profits to its shareholders or individual members.

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

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

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

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

Calculation

Personnel costs must be calculated by the beneficiaries as follows:

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

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

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

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

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

- (a) for personnel costs declared as **actual costs** (i.e. budget categories A.1, A.2, A.3): the hourly rate is calculated *per full financial year*, as follows:

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

using the personnel costs and the number of productive hours for each full financial year covered by the reporting period concerned. If a financial year is not closed at the end of the

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

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

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

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

plus

overtime worked

minus

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

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

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

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

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

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

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

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

divided by

{number of annual productive hours / 12}}}

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

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

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

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

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

(b) for personnel costs declared on the basis of **unit costs** (i.e. budget categories A.1, A.2, A.4, A.5): the hourly rate is one of the following:

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

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

and

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

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

C. Direct costs of providing financial support to third parties

Not applicable

D. Other direct costs

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

D.2 The depreciation costs of equipment, infrastructure or other assets (new or second-hand) as recorded in the beneficiary's accounts are eligible, if they were purchased in accordance with

Article 10.1.1 and written off in accordance with international accounting standards and the beneficiary's usual accounting practices.

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

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

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

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

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

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

D.4 Capitalised and operating costs of 'large research infrastructure'³: Not applicable

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

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

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

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

'Internally invoiced goods and services' means goods or services which are provided by the

³ **'Large research infrastructure'** means research infrastructure of a total value of at least EUR 20 million, for a beneficiary, calculated as the sum of historical asset values of each individual research infrastructure of that beneficiary, as they appear in its last closed balance sheet before the date of the signature of the Agreement or as determined on the basis of the rental and leasing costs of the research infrastructure.

beneficiary directly for the action and which the beneficiary values on the basis of its usual cost accounting practices.

E. Indirect costs

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

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

Beneficiaries receiving an operating grant⁵ financed by the EU or Euratom budget cannot declare indirect costs for the period covered by the operating grant, unless they can demonstrate that the operating grant does not cover any costs of the action.

F. Specific cost category(ies)

Not applicable

6.3 Conditions for costs of linked third parties to be eligible

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

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

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

6.5 Ineligible costs

'Ineligible costs' are:

- (a) costs that do not comply with the conditions set out above (Article 6.1 to 6.4), in particular:
 - (i) costs related to return on capital;
 - (ii) debt and debt service charges;

⁵ For the definition, see Article 121(1)(b) of Regulation (EU, Euratom) No 966/2012 of the European Parliament and of the Council of 25 October 2012 on the financial rules applicable to the general budget of the Union and repealing Council Regulation (EC, Euratom) No 1605/2002 ('**Financial Regulation No 966/2012**') (OJ L 218, 26.10.2012, p.1): '**operating grant**' means direct financial contribution, by way of donation, from the budget in order to finance the functioning of a body which pursues an aim of general EU interest or has an objective forming part of and supporting an EU policy.

- (iii) provisions for future losses or debts;
 - (iv) interest owed;
 - (v) doubtful debts;
 - (vi) currency exchange losses;
 - (vii) bank costs charged by the beneficiary's bank for transfers from the JU;
 - (viii) excessive or reckless expenditure;
 - (ix) deductible VAT;
 - (x) costs incurred during suspension of the implementation of the action (see Article 49);
- (b) costs declared under another JU, EU or Euratom grant (including other grants awarded by the JU, grants awarded by a Member State and financed by the EU or Euratom budget and grants awarded by bodies other than the JU for the purpose of implementing the EU or Euratom budget); in particular, indirect costs if the beneficiary is already receiving an operating grant financed by the EU or Euratom budget in the same period, unless it can demonstrate that the operating grant does not cover any costs of the action.

6.6 Consequences of declaration of ineligible costs

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

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

CHAPTER 4 RIGHTS AND OBLIGATIONS OF THE PARTIES

SECTION 1 RIGHTS AND OBLIGATIONS RELATED TO IMPLEMENTING THE ACTION

ARTICLE 7 — GENERAL OBLIGATION TO PROPERLY IMPLEMENT THE ACTION

7.1 General obligation to properly implement the action

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

7.2 Consequences of non-compliance

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

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

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

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

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

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

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

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

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

Beneficiaries that are not eligible for JU funding or request zero JU funding (**‘beneficiaries not receiving JU funding’**) must implement the action tasks attributed to them in Annex 1 in accordance with Article 7.1.

Their costs are estimated in Annex 2 but:

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

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

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

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

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

9.2 Consequences of non-compliance

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

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

ARTICLE 10 — PURCHASE OF GOODS, WORKS OR SERVICES

10.1 Rules for purchasing goods, works or services

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

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

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

10.1.2 Beneficiaries that are ‘contracting authorities’ within the meaning of Directive 2004/18/EC⁶ (or 2014/24/EU⁷) or ‘contracting entities’ within the meaning of Directive 2004/17/EC⁸ (or 2014/25/EU⁹) must comply with the applicable national law on public procurement.

10.2 Consequences of non-compliance

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

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

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

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

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

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

⁶ 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).

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

⁸ 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)

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

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

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

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

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

11.2 Consequences of non-compliance

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

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

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

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

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

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

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

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

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

12.2 Consequences of non-compliance

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

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

ARTICLE 13 — IMPLEMENTATION OF ACTION TASKS BY SUBCONTRACTORS

13.1 Rules for subcontracting action tasks

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

Subcontracting may cover only a limited part of the action.

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

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

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

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

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

Beneficiaries that are ‘contracting authorities’ within the meaning of Directive 2004/18/EC (or 2014/24/EU) or ‘contracting entities’ within the meaning of Directive 2004/17/EC (or 2014/25/EU) must comply with the applicable national law on public procurement.

13.2 Consequences of non-compliance

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

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

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

ARTICLE 14 — IMPLEMENTATION OF ACTION TASKS BY LINKED THIRD PARTIES

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

14.1.1 The following **affiliated entities**¹¹ and **third parties with a legal link to a beneficiary**¹² (**'linked third parties'**) may implement the action tasks attributed to them in Annex 1:

- TELESPAZIO SPA (TPZ), affiliated or linked to LEONARDO
- AIRBUS OPERATIONS SAS (AI OP SAS), affiliated or linked to AIRBUS SAS, if it has accepted joint and several liability with the beneficiary (see Annex 3a)
- AIRBUS DEFENCE AND SPACE GMBH (AI D&S GMBH), affiliated or linked to AIRBUS SAS, if it has accepted joint and several liability with the beneficiary (see Annex 3a)
- INSTYTUT CHEMII BIOORGANICZNEJ POLSKIEJ AKADEMII NAUK (PSNC), affiliated or linked to PANSA (B4), if it has accepted joint and several liability with the beneficiary (see Annex 3a)
- ECOLE NATIONALE DE L AVIATION CIVILE (ENAC), affiliated or linked to DSNA
- SAFRAN ELECTRONICS & DEFENSE (SAFRAN), affiliated or linked to DSNA, if it has accepted joint and several liability with the beneficiary (see Annex 3a)
- INGENIERIA DE SISTEMAS PARA LA DEFENSA DE ESPANA SA-SME MP (ISDEFE), affiliated or linked to ENAIRE, if it has accepted joint and several liability with the beneficiary (see Annex 3a)
- INGENIERIA Y ECONOMIA DEL TRANSPORTE SME MP SA (INECO), affiliated or linked to ENAIRE, if it has accepted joint and several liability with the beneficiary (see Annex 3a)
- CENTRO DE REFERENCIA INVESTIGACION DESARROLLO E INNOVACION ATM, A.I.E. (CRIDA), affiliated or linked to ENAIRE, if it has accepted joint and several liability with the beneficiary (see Annex 3a)
- IDS AIRNAV SRL (IDS AIRNAV), affiliated or linked to ENAV
- DEEP BLUE SRL (DEEP BLUE), affiliated or linked to ENAV

¹¹ For the definition see Article 2.1(2) Rules for Participation Regulation No 1290/2013: '**affiliated entity**' means any legal entity that is:

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

'Control' may take any of the following forms:

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

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

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

¹² '**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.

- CENTRO ITALIANO RICERCHE AEROSPAZIALI SCPA (CIRA), affiliated or linked to ENAV, if it has accepted joint and several liability with the beneficiary (see Annex 3a)
- TECHNO SKY S.R.L. (TECHNO SKY), affiliated or linked to ENAV, if it has accepted joint and several liability with the beneficiary (see Annex 3a)
- FREQUENTIS COMSOFT GMBH (FCO), affiliated or linked to FRQ (FSP)
- FREQUENTIS CZECH REPUBLIC SRO (FRQ CZ), affiliated or linked to FRQ (FSP), if it has accepted joint and several liability with the beneficiary (see Annex 3a)
- FREQUENTIS ROMANIA SRL (FRQ RO), affiliated or linked to FRQ (FSP)
- HONEYWELL INTERNATIONAL SRO (HIsro), affiliated or linked to Honeywell SAS, if it has accepted joint and several liability with the beneficiary (see Annex 3a)
- HONEYWELL INTERNATIONAL INC (HIinc), affiliated or linked to Honeywell SAS, if it has accepted joint and several liability with the beneficiary (see Annex 3a)
- THALES SIX GTS FRANCE SAS (THALES SIX), affiliated or linked to THALES AIR SYS, if it has accepted joint and several liability with the beneficiary (see Annex 3a)
- THALES ALENIA SPACE FRANCE SAS (TAS-FRANCE), affiliated or linked to THALES AIR SYS, if it has accepted joint and several liability with the beneficiary (see Annex 3a)
- THALES SIX GTS FRANCE SAS (THALES SIX), affiliated or linked to THALES AVS

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

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

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

14.2 Consequences of non-compliance

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

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

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

ARTICLE 14a — IMPLEMENTATION OF ACTION TASKS BY INTERNATIONAL PARTNERS

Not applicable

ARTICLE 15 — FINANCIAL SUPPORT TO THIRD PARTIES

15.1 Rules for providing financial support to third parties

Not applicable

15.2 Financial support in the form of prizes

Not applicable

15.3 Consequences of non-compliance

Not applicable

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

16.1 Rules for providing trans-national access to research infrastructure

Not applicable

16.2 Rules for providing virtual access to research infrastructure

Not applicable

16.3 Consequences of non-compliance

Not applicable

SECTION 2 RIGHTS AND OBLIGATIONS RELATED TO THE GRANT ADMINISTRATION

ARTICLE 17 — GENERAL OBLIGATION TO INFORM

17.1 General obligation to provide information upon request

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

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

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

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

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

- (i) changes in its legal, financial, technical, organisational or ownership situation or those of its linked third parties and
- (ii) changes in the name, address, legal form, organisation type of its linked third parties;
- (b) **circumstances** affecting:
 - (i) the decision to award the grant or
 - (ii) compliance with requirements under the Agreement.

17.3 Consequences of non-compliance

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

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

ARTICLE 18 — KEEPING RECORDS — SUPPORTING DOCUMENTATION

18.1 Obligation to keep records and other supporting documentation

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

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

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

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

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

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

18.1.2 Records and other documentation to support the costs declared

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

- (a) for **actual costs**: adequate records and other supporting documentation to prove the costs declared, such as contracts, subcontracts, invoices and accounting records. In addition, the beneficiaries' usual cost accounting practices and internal control procedures must enable direct

reconciliation between the amounts declared, the amounts recorded in their accounts and the amounts stated in the supporting documentation;

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

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

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

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

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

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

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

18.2 Consequences of non-compliance

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

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

ARTICLE 19 — SUBMISSION OF DELIVERABLES

19.1 Obligation to submit deliverables

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

19.2 Consequences of non-compliance

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

ARTICLE 20 — REPORTING — PAYMENT REQUESTS

20.1 Obligation to submit reports

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

20.2 Reporting periods

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

- RP1: from month 1 to month 13
- RP2: from month 14 to month 25
- RP3: from month 26 to month 37

20.3 Periodic reports — Requests for interim payments

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

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

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

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

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

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

The report must indicate the communication activities;

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

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

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

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

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

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

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

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

- the information provided is full, reliable and true;
 - the costs declared are eligible (see Article 6);
 - the costs can be substantiated by adequate records and supporting documentation (see Article 18) that will be produced upon request (see Article 17) or in the context of checks, reviews, audits and investigations (see Article 22), and
 - for the last reporting period: that all the receipts have been declared (see Article 5.3.3);
- (ii) an **‘explanation of the use of resources’** and the information on subcontracting (see Article 13) and in-kind contributions provided by third parties (see Articles 11 and 12) from each beneficiary and from each linked third party, for the reporting period concerned;
- (iii) not applicable;
- (iv) a **‘periodic summary financial statement’**, created automatically by the electronic exchange system, consolidating the individual financial statements for the reporting period concerned and including — except for the last reporting period — the **request for interim payment**.

20.4 Final report — Request for payment of the balance

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

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

- (a) a **‘final technical report’** with a **summary** for publication containing:

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

20.5 Information on cumulative expenditure incurred

Not applicable

20.6 Currency for financial statements and conversion into euro

Financial statements must be drafted in euro.

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

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

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

20.7 Language of reports

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

20.8 Consequences of non-compliance

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

If the coordinator breaches its obligation to submit the reports and if it fails to comply with this obligation within 30 days following a written reminder, the JU may terminate the Agreement (see Article 50) or apply any of the other measures described in Chapter 6.

ARTICLE 21 — PAYMENTS AND PAYMENT ARRANGEMENTS

21.1 Payments to be made

The following payments will be made to the coordinator:

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

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

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

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

The amount of the pre-financing payment will be EUR **5 091 705.93** (five million ninety one thousand seven hundred and five EURO and ninety three eurocents).

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

An amount of EUR **424 308.83** (four hundred and twenty four thousand three hundred and eight EURO and eighty three eurocents), corresponding to 5% of the maximum grant amount (see Article 5.1), is retained by the JU from the pre-financing payment and transferred into the ‘**Guarantee Fund**’.

21.3 Interim payments — Amount — Calculation

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

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

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

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

Step 1 — Application of the reimbursement rates

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

21.3.1 Step 1 — Application of the reimbursement rates

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

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

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

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

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

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

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

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

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

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

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

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

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

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

21.5 Notification of amounts due

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

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

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

21.6 Currency for payments

The JU will make all payments in euro.

21.7 Payments to the coordinator — Distribution to the beneficiaries

Payments will be made to the coordinator.

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

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

Pre-financing may however be distributed only:

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

21.8 Bank account for payments

All payments will be made to the following bank account:

Name of bank: UNICREDIT SPA
Full name of the account holder: LEONARDO SPA
IBAN code: IT07Z0200805351000004640167

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 883/2013¹⁶ and No 2185/96¹⁷ (and in accordance with their provisions and procedures), and Article 110 of the JU Financial Rules¹⁸, the European Anti-Fraud Office (OLAF) may — at any moment during implementation of the action or afterwards — carry out investigations, including on-the-spot checks and inspections, to establish whether there has been fraud, corruption or any other illegal activity affecting the financial interests of the EU.

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

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

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

22.4 Checks, reviews, audits and investigations for international organisations

In conformity with its financial regulations, the European Union, including the European Anti-Fraud

¹⁶ 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).

¹⁷ 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).

¹⁸ The SESAR JU Financial Rules are made publicly available on the SESAR JU official website.

Office (OLAF) and the European Court of Auditors (ECA), may undertake, including on the spot, checks, reviews, audits and investigations.

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

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

22.5.1 Findings in this grant

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

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

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

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

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

22.5.2 Findings in other grants

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

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

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

22.5.3 Procedure

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

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

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



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

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

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

- the revised financial statements, if approved;
 - the proposed alternative correction method, if accepted
- or
- the initially notified correction rate for extrapolation, if it does not receive any observations or revised financial statements, does not accept the observations or the proposed alternative correction method or does not approve the revised financial statements.

22.5.3.2 If the findings concern **substantial errors, irregularities or fraud or serious breach of obligations**: the formal notification will include:

- (a) an invitation to submit observations on the list of grants affected by the findings and
- (b) the flat-rate the JU or the Commission intends to apply according to the principle of proportionality.

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

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

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

22.6 Consequences of non-compliance

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

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

ARTICLE 23 — EVALUATION OF THE IMPACT OF THE ACTION

23.1 Right to evaluate the impact of the action

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

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

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

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

23.2 Consequences of non-compliance

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

SECTION 3 RIGHTS AND OBLIGATIONS RELATED TO BACKGROUND AND RESULTS

SUBSECTION 1 GENERAL

ARTICLE 23a — MANAGEMENT OF INTELLECTUAL PROPERTY

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

Beneficiaries that are universities or other public research organisations must take measures to implement the principles set out in Points 1 and 2 of the Code of Practice annexed to the Commission Recommendation on the management of intellectual property in knowledge transfer activities¹⁹.

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

¹⁹ Commission Recommendation C(2008) 1329 of 10.4.2008 on the management of intellectual property in knowledge transfer activities and the Code of Practice for universities and other public research institutions attached to this recommendation.

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

SUBSECTION 2 RIGHTS AND OBLIGATIONS RELATED TO BACKGROUND

ARTICLE 24 — AGREEMENT ON BACKGROUND

24.1 Agreement on background

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

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

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

24.2 Consequences of non-compliance

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

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

ARTICLE 25 — ACCESS RIGHTS TO BACKGROUND

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

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

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

Waivers of access rights are not valid unless in writing.

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

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

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

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

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

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

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

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

25.4 Access rights for affiliated entities

Unless otherwise agreed in the consortium agreement, access to background must also be given — under fair and reasonable conditions (see above; Article 25.3) and unless it is subject to legal restrictions or limits, including those imposed by the rights of third parties (including personnel) — to affiliated entities²⁰ established in an EU Member State or ‘**associated country**’²¹, if this is needed to exploit the results generated by the beneficiaries to which they are affiliated.

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

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

25.5 Access rights for third parties

Not applicable

25.6 Consequences of non-compliance

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

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

SUBSECTION 3 RIGHTS AND OBLIGATIONS RELATED TO RESULTS

ARTICLE 26 — OWNERSHIP OF RESULTS

26.1 Ownership by the beneficiary that generates the results

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

²¹ 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.

Results are owned by the beneficiary that generates them.

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

26.2 Joint ownership by several beneficiaries

Two or more beneficiaries own results jointly if:

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

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

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

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

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

26.3 Rights of third parties (including personnel)

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

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

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

26.4 JU ownership, to protect results

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

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

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

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

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

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

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

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

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

26.5 Consequences of non-compliance

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

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

ARTICLE 27 — PROTECTION OF RESULTS — VISIBILITY OF JU FUNDING AND SUPPORT FROM JU MEMBERS

27.1 Obligation to protect the results

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

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

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

27.2 JU ownership, to protect the results

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

27.3 Information on JU funding and support from JU members

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

“The project leading to this application has received funding from the SESAR Joint Undertaking (JU) under grant agreement No 874474. The JU receives support from the European Union’s Horizon 2020 research and innovation programme and the SESAR JU members other than the Union”.

27.4 Consequences of non-compliance

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

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

ARTICLE 28 — EXPLOITATION OF RESULTS

28.1 Obligation to exploit the results

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

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

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

28.2 Results that could contribute to European or international standards — Information on JU funding and support from JU members

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

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

“Results incorporated in this standard received funding from the SESAR Joint Undertaking (JU) under grant agreement No 874474. The JU receives support from the European Union’s Horizon 2020 research and innovation programme and the SESAR JU members other than the Union”.

28.3 Consequences of non-compliance

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

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

ARTICLE 29 — DISSEMINATION OF RESULTS — OPEN ACCESS — VISIBILITY OF JU FUNDING AND SUPPORT FROM JU MEMBERS

29.1 Obligation to disseminate results

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

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

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

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

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

29.2 Open access to scientific publications

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

In particular, it must:

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

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

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

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

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

29.3 Open access to research data

Not applicable;

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

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

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

“This project has received funding from the SESAR Joint Undertaking (JU) under grant agreement No 874474. The JU receives support from the European Union’s Horizon 2020 research and innovation programme and the SESAR JU members other than the Union”.

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

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

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

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

29.5 Disclaimer excluding JU responsibility

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

29.6 Consequences of non-compliance

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

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

ARTICLE 30 — TRANSFER AND LICENSING OF RESULTS

30.1 Transfer of ownership

Each beneficiary may transfer ownership of its results.

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

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

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

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

30.2 Granting licenses

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

- (a) this does not impede the access rights under Article 31 and
- (b) not applicable.

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

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

30.3 JU right to object to transfers or exclusive licensing

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

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

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

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

The JU may request additional information.

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

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

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

30.4 Consequences of non-compliance

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

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

ARTICLE 31 — ACCESS RIGHTS TO RESULTS

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

The conditions set out in Article 25.1 apply.

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

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

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

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

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

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

31.4 Access rights of affiliated entities

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

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

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

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

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

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

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

31.6 Access rights for third parties

The beneficiaries must give — under the conditions set out in Article 31.2 — access to their results to complementary beneficiaries²² (see Article 2).

31.7 Consequences of non-compliance

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

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

SECTION 4 OTHER RIGHTS AND OBLIGATIONS

ARTICLE 32 — RECRUITMENT AND WORKING CONDITIONS FOR RESEARCHERS

²² ‘Complementary beneficiary’ means a beneficiary of a complementary grant agreement.

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

The beneficiaries must take all measures to implement the principles set out in the Commission Recommendation on the European Charter for Researchers and the Code of Conduct for the Recruitment of Researchers²³, in particular regarding:

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

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

32.2 Consequences of non-compliance

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

ARTICLE 33 — GENDER EQUALITY

33.1 Obligation to aim for gender equality

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

33.2 Consequences of non-compliance

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

ARTICLE 34 — ETHICS AND RESEARCH INTEGRITY

34.1 Obligation to comply with ethical and research integrity principles

The beneficiaries must carry out the action in compliance with:

- (a) ethical principles (including the highest standards of research integrity)
- and
- (b) applicable international, EU and national law.

Funding will not be granted for activities carried out outside the EU if they are prohibited in all Member States or for activities which destroy human embryos (for example, for obtaining stem cells).

²³ Commission Recommendation 2005/251/EC of 11 March 2005 on the European Charter for Researchers and on a Code of Conduct for the Recruitment of Researchers (OJ L 75, 22.3.2005, p. 67).

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

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

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

In addition, the beneficiaries must respect the fundamental principle of research integrity — as set out, for instance, in the European Code of Conduct for Research Integrity²⁴.

This implies compliance with the following fundamental principles:

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

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

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

34.2 Activities raising ethical issues

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

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

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

needed for implementing the action tasks in question.

²⁴ European Code of Conduct for Research Integrity of ALLEA (All European Academies)
http://ec.europa.eu/research/participants/data/ref/h2020/other/hi/h2020-ethics_code-of-conduct_en.pdf

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

34.3 Activities involving human embryos or human embryonic stem cells

Activities involving research on human embryos or human embryonic stem cells may be carried out, in addition to Article 34.1, only if:

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

34.4 Consequences of non-compliance

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

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

ARTICLE 35 — CONFLICT OF INTERESTS

35.1 Obligation to avoid a conflict of interests

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

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

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

35.2 Consequences of non-compliance

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

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

ARTICLE 36 — CONFIDENTIALITY

36.1 General obligation to maintain confidentiality

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

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

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

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

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

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

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

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

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

The confidentiality obligations no longer apply if:

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

36.2 Consequences of non-compliance

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

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

ARTICLE 37 — SECURITY-RELATED OBLIGATIONS

37.1 Results with a security recommendation

Not applicable

37.2 Classified information

Not applicable

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

Not applicable

37.4 Consequences of non-compliance

Not applicable

ARTICLE 38 — PROMOTING THE ACTION — VISIBILITY OF JU FUNDING AND SUPPORT FROM JU MEMBERS**38.1 Communication activities by beneficiaries****38.1.1 Obligation to promote the action and its results**

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

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

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

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

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

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

For communication activities:

“This project has received funding from the SESAR Joint Undertaking (JU) under grant agreement No 874474. The JU receives support from the European Union’s Horizon 2020 research and innovation programme and the SESAR JU members other than the Union”.

For infrastructure, equipment and major results:

“This *[infrastructure]**[equipment]**[insert type of result]* is part of a project that has received funding from the SESAR Joint Undertaking (JU) under grant agreement No 874474. The JU receives support from the European Union’s Horizon 2020 research and innovation programme and the SESAR JU members other than the Union”.

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

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

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

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

38.1.3 Disclaimer excluding JU responsibility

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

38.2 Communication activities by the JU

38.2.1 Right to use beneficiaries' materials, documents or information

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

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

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

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

- (a) **use for its own purposes** (in particular, making them available to persons working for the JU or any other EU institution, body, office or agency or body or institutions in EU Member States; and copying or reproducing them in whole or in part, in unlimited numbers);
- (b) **distribution to the public** (in particular, publication as hard copies and in electronic or digital format, publication on the internet, as a downloadable or non-downloadable file, broadcasting by any channel, public display or presentation, communicating through press information services, or inclusion in widely accessible databases or indexes);
- (c) **editing or redrafting** for communication and publicising activities (including shortening, summarising, inserting other elements (such as meta-data, legends, other graphic, visual, audio or text elements), extracting parts (e.g. audio or video files), dividing into parts, use in a compilation);
- (d) translation;

- (e) giving **access in response to individual requests** under Regulation No 1049/2001²⁷, without the right to reproduce or exploit;
- (f) **storage** in paper, electronic or other form;
- (g) **archiving**, in line with applicable document-management rules, and
- (h) the right to authorise **third parties** to act on its behalf or sub-license the modes of use set out in Points (b), (c), (d) and (f) to third parties if needed for the communication and publicising activities of the JU.

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

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

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

38.3 Consequences of non-compliance

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

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

ARTICLE 39 — PROCESSING OF PERSONAL DATA

39.1 Processing of personal data by the JU and the Commission

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

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

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

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

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.

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).

39.2 Processing of personal data by the beneficiaries

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

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

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

39.3 Consequences of non-compliance

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

ARTICLE 40 — ASSIGNMENTS OF CLAIMS FOR PAYMENT AGAINST THE JU

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

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

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

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

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

41.1 Roles and responsibility towards the JU

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

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

The **financial responsibility** of each beneficiary is governed by Article 44.

41.2 Internal division of roles and responsibilities

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

(a) Each **beneficiary** must:

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

(b) The **coordinator** must:

- (i) monitor that the action is implemented properly (see Article 7);
- (ii) act as the intermediary for all communications between the beneficiaries and the JU (in particular, providing the JU with the information described in Article 17), unless the Agreement specifies otherwise;
- (iii) request and review any documents or information required by the JU and verify their completeness and correctness before passing them on to the JU;
- (iv) submit the deliverables and reports to the JU (see Articles 19 and 20);
- (v) ensure that all payments are made to the other beneficiaries without unjustified delay (see Article 21);
- (vi) inform the JU of the amounts paid to each beneficiary, when required under the Agreement (see Articles 44 and 50) or requested by the JU.

The coordinator may not delegate or subcontract the above-mentioned tasks to any other beneficiary or third party (including linked third parties).

41.3 Internal arrangements between beneficiaries — Consortium agreement

Not applicable

41.4 Relationship with complementary beneficiaries — Collaboration agreement

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

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

- efficient decision making processes and
- settlement of disputes.

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

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

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

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

41.5 Relationship with partners of a joint action — Coordination agreement

Not applicable

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

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

ARTICLE 42 — REJECTION OF INELIGIBLE COSTS

42.1 Conditions

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

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

42.2 Ineligible costs to be rejected — Calculation — Procedure

Ineligible costs will be rejected in full.

If the rejection of costs does not lead to a recovery (see Article 44), the JU will formally notify the coordinator or beneficiary concerned of the rejection of costs, the amounts and the reasons why (if applicable, together with the notification of amounts due; see Article 21.5). The coordinator or

beneficiary concerned may — within 30 days of receiving notification — formally notify the JU of its disagreement and the reasons why.

If the rejection of costs leads to a recovery, the JU will follow the contradictory procedure with pre-information letter set out in Article 44.

42.3 Effects

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

If the JU rejects costs **after termination of the participation of a beneficiary**, it will deduct them from the costs declared by the beneficiary in the termination report and include the rejection in the calculation after termination (see Article 50.2 and 50.3).

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

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

ARTICLE 43 — REDUCTION OF THE GRANT

43.1 Conditions

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

- (a) a beneficiary (or a natural person who has the power to represent or take decisions on its behalf) has committed:
 - (i) substantial errors, irregularities or fraud or
 - (ii) serious breach of obligations under the Agreement or during the award procedure (including improper implementation of the action, submission of false information, failure to provide required information, breach of ethical principles) or
- (b) a beneficiary (or a natural person who has the power to represent or take decision on its behalf) has committed — in other EU or Euratom grants awarded to it under similar conditions — systemic or recurrent errors, irregularities, fraud or serious breach of obligations that have a material impact on this grant (**extension of findings from other grants to this grant**; see Article 22.5.2).

43.2 Amount to be reduced — Calculation — Procedure

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

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

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

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

43.3 Effects

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

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

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

ARTICLE 44 — RECOVERY OF UNDUE AMOUNTS

44.1 Amount to be recovered — Calculation — Procedure

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

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

44.1.1 Recovery after termination of a beneficiary’s participation

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

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

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

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

- (b) if a linked third party has accepted joint and several liability (see Article 14), by **holding the third party liable** up to the maximum JU contribution indicated, for the linked third party, in the estimated budget (see Annex 2) and/or
- (c) by **taking legal action** (see Article 57).

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

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

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

44.1.2 Recovery at payment of the balance

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

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

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

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

If the coordinator does not repay the JU by the date in the debit note and has not submitted the report

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).

on the distribution of payments: the JU will **recover** the amount set out in the debit note from the coordinator (see below).

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

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

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

plus

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

divided by

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

multiplied by

the final grant amount (see Article 5.3)},

minus

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

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

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

divided by

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

multiplied by

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

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

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

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

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

- (i) if a linked third party has accepted joint and several liability (see Article 14), by **holding the third party liable** up to the maximum JU contribution indicated, for the linked third party, in the estimated budget (see Annex 2) and/or
- (ii) by **taking legal action** (see Article 57).

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

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

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

44.1.3 Recovery of amounts after payment of the balance

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

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

$$\left\{ \left\{ \begin{array}{l} \text{beneficiary's costs declared in the final summary financial statement and approved by the JU multiplied by} \\ \text{the reimbursement rate set out in Article 5.2 for the beneficiary concerned} \end{array} \right\} \right. \\ \text{plus} \\ \left. \left\{ \begin{array}{l} \text{its linked third parties' costs declared in the final summary financial statement and approved by the JU} \\ \text{multiplied by the reimbursement rate set out in Article 5.2 for each linked third party concerned} \end{array} \right\} \right. \\ \text{divided by} \\ \left. \left\{ \begin{array}{l} \text{the JU contribution for the action calculated according to Article 5.3.1} \end{array} \right\} \right. \\ \text{multiplied by} \\ \left. \left\{ \begin{array}{l} \text{the final grant amount (see Article 5.3)} \end{array} \right\} \right\}.$$

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

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

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

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

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

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

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

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

- (i) if a linked third party has accepted joint and several liability (see Article 14), by **holding the third party liable** up to the maximum JU contribution indicated, for the linked third party, in the estimated budget (see Annex 2) and/or
- (ii) by **taking legal action** (see Article 57).

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

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

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

ARTICLE 45 — ADMINISTRATIVE SANCTIONS

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

SECTION 2 LIABILITY FOR DAMAGES

ARTICLE 46 — LIABILITY FOR DAMAGES

46.1 Liability of the JU

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

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

46.2 Liability of the beneficiaries

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

SECTION 3 SUSPENSION AND TERMINATION

ARTICLE 47 — SUSPENSION OF PAYMENT DEADLINE

47.1 Conditions

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

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

47.2 Procedure

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

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

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

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

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

ARTICLE 48 — SUSPENSION OF PAYMENTS

48.1 Conditions

The JU may — at any moment — suspend payments, in whole or in part and for one or more beneficiaries, if:

- (a) a beneficiary (or a natural person who has the power to represent or take decision on its behalf) has committed or is suspected of having committed:
 - (i) substantial errors, irregularities or fraud or
 - (ii) serious breach of obligations under the Agreement or during the award procedure (including improper implementation of the action, submission of false information, failure to provide required information, breach of ethical principles) or
- (b) a beneficiary (or a natural person who has the power to represent or take decision on its behalf) has committed — in other JU, EU or Euratom grants awarded to it under similar conditions — systemic or recurrent errors, irregularities, fraud or serious breach of obligations that have a material impact on this grant (**extension of findings from other grants to this grant**; see Article 22.5.2).

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

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

48.2 Procedure

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

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

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

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

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

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

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

ARTICLE 49 — SUSPENSION OF THE ACTION IMPLEMENTATION

49.1 Suspension of the action implementation, by the beneficiaries

49.1.1 Conditions

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

49.1.2 Procedure

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

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

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

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

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

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

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

49.2 Suspension of the action implementation, by the JU

49.2.1 Conditions

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

- (a) a beneficiary (or a natural person who has the power to represent or take decisions on its behalf) has committed or is suspected of having committed:
 - (i) substantial errors, irregularities or fraud or
 - (ii) serious breach of obligations under the Agreement or during the award procedure (including improper implementation of the action, submission of false information, failure to provide required information, breach of ethical principles);
- (b) a beneficiary (or a natural person who has the power to represent or take decisions on its behalf) has committed — in other JU, EU or Euratom grants awarded to it under similar conditions — systemic or recurrent errors, irregularities, fraud or serious breach of obligations that have a material impact on this grant (**extension of findings from other grants to this grant**; see Article 22.5.2), or
- (c) the action is suspected of having lost its scientific or technological relevance.

49.2.2 Procedure

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

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

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

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

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

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

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

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

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

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

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

50.1 Termination of the Agreement, by the beneficiaries

50.1.1 Conditions and procedure

The beneficiaries may terminate the Agreement.

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

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

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

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

50.1.2 Effects

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

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

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

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

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

After termination, the beneficiaries' obligations (in particular Articles 20, 22, 23, Section 3 of Chapter 4, 36, 37, 38, 40, 42, 43 and 44) continue to apply.

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

50.2.1 Conditions and procedure

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

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

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

The notification must include:

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

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

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

50.2.2 Effects

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

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

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

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

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

The JU will — on the basis of the periodic reports, the termination report and the report on the distribution of payments — **calculate** the amount which is due to the beneficiary and if the (pre-financing and interim) payments received by the beneficiary exceed this amount.

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

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

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

Only costs incurred by the beneficiary concerned until termination takes effect are eligible (see Article 6). Costs relating to contracts due for execution only after termination are not eligible.

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

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

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

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

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

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

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

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

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

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

After termination, the concerned beneficiary's obligations (in particular Articles 20, 22, 23, Section 3 of Chapter 4, 36, 37, 38, 40, 42, 43 and 44) continue to apply.

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

50.3.1 Conditions

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

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

- (h) the action has lost scientific or technological relevance;
- (i) not applicable;
- (j) not applicable;
- (k) a beneficiary (or a natural person who has the power to represent or take decisions on its behalf) has committed fraud, corruption, or is involved in a criminal organisation, money laundering or any other illegal activity;
- (l) a beneficiary (or a natural person who has the power to represent or take decisions on its behalf) has committed:
 - (i) substantial errors, irregularities or fraud or
 - (ii) serious breach of obligations under the Agreement or during the award procedure (including improper implementation of the action, submission of false information, failure to provide required information, breach of ethical principles);
- (m) a beneficiary (or a natural person who has the power to represent or take decisions on its behalf) has committed — in other JU, EU or Euratom grants awarded to it under similar conditions — systemic or recurrent errors, irregularities, fraud or serious breach of obligations that have a material impact on this grant (**extension of findings from other grants to this grant**; see Article 22.5.2);
- (n) despite a specific request by the JU, a beneficiary does not request — through the coordinator — an amendment to the Agreement to end the participation of one of its linked third parties or international partners that is in one of the situations under points (e), (f), (g), (k), (l) or (m) and to reallocate its tasks.

50.3.2 Procedure

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

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

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

The termination will **take effect**:

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

50.3.3 Effects

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

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

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

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

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

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

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

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

After termination, the beneficiaries' obligations (in particular Articles 20, 22, 23, Section 3 of Chapter 4, 36, 37, 38, 40, 42, 43 and 44) continue to apply.

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

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

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

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

If the request for amendment is rejected by the JU (because it calls into question the decision

awarding the grant or breaches the principle of equal treatment of applicants), the Agreement may be terminated according to Article 50.3.1(c).

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

The JU will — on the basis of the periodic reports, the termination report and the report on the distribution of payments — **calculate** the amount which is due to the beneficiary and if the (pre-financing and interim) payments received by the beneficiary exceed this amount.

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

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

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

Only costs incurred by the beneficiary concerned until termination takes effect are eligible (see Article 6). Costs relating to contracts due for execution only after termination are not eligible.

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

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

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

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

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

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

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

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

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

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

After termination, the concerned beneficiary's obligations (in particular Articles 20, 22, 23, Section 3 of Chapter 4, 36, 37, 38, 40, 42, 43 and 44) continue to apply.

SECTION 4 FORCE MAJEURE

ARTICLE 51 — FORCE MAJEURE

'Force majeure' means any situation or event that:

- prevents either party from fulfilling their obligations under the Agreement,
- was unforeseeable, exceptional situation and beyond the parties' control,
- was not due to error or negligence on their part (or on the part of third parties involved in the action), and
- proves to be inevitable in spite of exercising all due diligence.

The following cannot be invoked as force majeure:

- any default of a service, defect in equipment or material or delays in making them available, unless they stem directly from a relevant case of force majeure,
- labour disputes or strikes, or
- financial difficulties.

Any situation constituting force majeure must be formally notified to the other party without delay, stating the nature, likely duration and foreseeable effects.

The parties must immediately take all the necessary steps to limit any damage due to force majeure and do their best to resume implementation of the action as soon as possible.

The party prevented by force majeure from fulfilling its obligations under the Agreement cannot be considered in breach of them.

CHAPTER 7 FINAL PROVISIONS

ARTICLE 52 — COMMUNICATION BETWEEN THE PARTIES

52.1 Form and means of communication

Communication under the Agreement (information, requests, submissions, ‘formal notifications’, etc.) must:

- be made in writing and
- bear the number of the Agreement.

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

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

Communications in the electronic exchange system must be made by persons authorised according to the Participant Portal Terms & Conditions. For naming the authorised persons, each beneficiary must have designated — before the signature of this Agreement — a ‘legal entity appointed representative (LEAR)’. The role and tasks of the LEAR are stipulated in his/her appointment letter (see Participant Portal Terms & Conditions).

If the electronic exchange system is temporarily unavailable, instructions will be given on the JU and Commission websites.

52.2 Date of communication

Communications are considered to have been made when they are sent by the sending party (i.e. on the date and time they are sent through the electronic exchange system).

Formal notifications through the **electronic** exchange system are considered to have been made when they are received by the receiving party (i.e. on the date and time of acceptance by the receiving party, as indicated by the time stamp). A formal notification that has not been accepted within 10 days after sending is considered to have been accepted.

Formal notifications **on paper** sent by **registered post** with proof of delivery (only after the payment of the balance) are considered to have been made on either:

- the delivery date registered by the postal service or
- the deadline for collection at the post office.

If the electronic exchange system is temporarily unavailable, the sending party cannot be considered in breach of its obligation to send a communication within a specified deadline.

52.3 Addresses for communication

The **electronic** exchange system must be accessed via the following URL:

<https://ec.europa.eu/research/participants/portal/desktop/en/projects/>

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

Formal notifications on paper (only after the payment of the balance) addressed **to the JU** must be sent to the official mailing address indicated on the JU's website.

Formal notifications on paper (only after the payment of the balance) addressed **to the beneficiaries** must be sent to their legal address as specified in the Participant Portal Beneficiary Register.

ARTICLE 53 — INTERPRETATION OF THE AGREEMENT

53.1 Precedence of the Terms and Conditions over the Annexes

The provisions in the Terms and Conditions of the Agreement take precedence over its Annexes.

Annex 2 takes precedence over Annex 1.

53.2 Privileges and immunities

Nothing in the Agreement may be interpreted as a waiver of any privileges or immunities accorded to the *EUROCONTROL - EUROPEAN ORGANISATION FOR THE SAFETY OF AIR NAVIGATION* by its constituent documents or international law.

ARTICLE 54 — CALCULATION OF PERIODS, DATES AND DEADLINES

In accordance with Regulation No 1182/71³⁰, periods expressed in days, months or years are calculated from the moment the triggering event occurs.

The day during which that event occurs is not considered as falling within the period.

ARTICLE 55 — AMENDMENTS TO THE AGREEMENT

55.1 Conditions

The Agreement may be amended, unless the amendment entails changes to the Agreement which would call into question the decision awarding the grant or breach the principle of equal treatment of applicants.

Amendments may be requested by any of the parties.

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).

55.2 Procedure

The party requesting an amendment must submit a request for amendment signed in the electronic exchange system (see Article 52).

The coordinator submits and receives requests for amendment on behalf of the beneficiaries (see Annex 3).

If a change of coordinator is requested without its agreement, the submission must be done by another beneficiary (acting on behalf of the other beneficiaries).

The request for amendment must include:

- the reasons why;
- the appropriate supporting documents, and
- for a change of coordinator without its agreement: the opinion of the coordinator (or proof that this opinion has been requested in writing).

The JU may request additional information.

If the party receiving the request agrees, it must sign the amendment in the electronic exchange system within 45 days of receiving notification (or any additional information the JU has requested). If it does not agree, it must formally notify its disagreement within the same deadline. The deadline may be extended, if necessary for the assessment of the request. If no notification is received within the deadline, the request is considered to have been rejected

An amendment **enters into force** on the day of the signature of the receiving party.

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

ARTICLE 56 — ACCESSION TO THE AGREEMENT

56.1 Accession of the beneficiaries mentioned in the Preamble

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

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

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

56.2 Addition of new beneficiaries

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

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

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

ARTICLE 57 — APPLICABLE LAW AND SETTLEMENT OF DISPUTES

57.1 Applicable law

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

57.2 Dispute settlement

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

As an exception, if such a dispute is between the JU and SINTEF AS, the competent Belgian courts have sole jurisdiction.

As an exception, for the following beneficiaries:

- EUROCONTROL - EUROPEAN ORGANISATION FOR THE SAFETY OF AIR NAVIGATION

such disputes must — if they cannot be settled amicably — be referred to arbitration. Each party must formally notify to the other party its intention of resorting to arbitration and the identity of the arbitrator. The Permanent Court of Arbitration Optional Rules for Arbitration Involving International Organisations and States in force at the date of entry into force of the Agreement will apply. The appointing authority will be the Secretary-General of the Permanent Court of Arbitration following a written request submitted by either party. The arbitration proceedings must take place in Brussels and the language used in the arbitral proceedings will be English. The arbitral award will be binding on all parties and will not be subject to appeal.

If a dispute concerns administrative sanctions or offsetting, the beneficiaries must bring action before the General Court — or, on appeal, the Court of Justice of the European Union — under Article 263 TFEU.

ARTICLE 58 — ENTRY INTO FORCE OF THE AGREEMENT

The Agreement will enter into force on the day of signature by the JU or the coordinator, depending on which is later.

SIGNATURES

For the coordinator

For the JU



ANNEX 1 (part A)

Research and Innovation action

NUMBER — 874474 — PJ13 - W2 ERICA

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1.1. The project summary

Project Number ¹	874474	Project Acronym ²	PJ13 - W2 ERICA
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One form per project

General information

Project title ³	Enable RPAS Insertion in Controlled Airspace
Starting date ⁴	01/12/2019
Duration in months ⁵	37
Call (part) identifier ⁶	H2020-SESAR-2019-1
Topic	SESAR-IR-VLD-WAVE2-11-2019 PJ.13 W2 IFR RPAS
Fixed EC Keywords	
Free keywords	RPAS, unmanned aircraft, Air Traffic Insertion, Detect and Avoid, IFR, Air Traffic Management, accommodation, integration, controlled airspace, regulation, Collision Avoidance

Abstract ⁷

Remotely Piloted Aircraft Systems (RPAS) have positively impacted civil and military applications. RPAS access to non-segregated airspace is essential to exploit their full capabilities, offering new services to the community and enabling market opportunities with huge economy benefits. To make insertion of RPAS into the ATM system a success, key challenges have to be addressed: to design a harmonised way to operate in nominal and emergency conditions; that RPAS do not adversely impact operations of existing airspace users; to ensure interoperability with current safety nets; to develop common standards and procedures.

ERICA will assess operational and technical capabilities to allow RPAS to safely operate (in nominal and emergency conditions) in controlled airspace (class A to C) and will develop and validate solutions without negative impacts on air traffic. A Detect and Avoid system for the “collision avoidance” and “remain well clear” functions will be developed. A framework for inserting RPAS into the non-segregated airspace will be developed in two streams: “Accommodation”, with platforms, missions and applications to meet the initial demand, exploiting existing capabilities, and “Integration”, to reach the final objective.

The benefits expected from the project are: developing recognised European RPAS operations in non-segregated airspace; enabling civil and military RPAS, fixed and rotary wing aircraft, to operate mixed with the manned traffic under a single European sky; increasing RPAS access to the airspace and equity with conventional traffic; contributions to regulatory and standardisation bodies; assuring interoperability with ATM system within and outside Europe; Safety, Human Performance and Cyber Security KPAs will also be investigated.

The ERICA partnership, which consists of expert ANSPs, Industry and R&D stakeholders, brings the essential assets to deliver the RPAS integration with a common European view, the key for the success of the Project.

1.2. List of Beneficiaries

 Associated with document Ref. Ares(2019)7194021 - 21/11/2019

Project Number ¹	874474	Project Acronym ²	PJ13 - W2 ERICA
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List of Beneficiaries

No	Name	Short name	Country	Project entry month ⁸	Project exit month
1	LEONARDO - SOCIETA PER AZIONI	LEONARDO	Italy	1	37
2	AIRBUS	AIRBUS SAS	France	1	37
3	STICHTING NATIONAAL LUCHT- EN RUIMTEVAARTLABORATORIUM	NLR	Netherlands	1	37
4	VALSTYBES IMONE ORO NAVIGACIJA	ON (B4)	Lithuania	1	37
5	POLSKA AGENCJA ZEGLUGI POWIETRZNEJ	PANSA (B4)	Poland	1	37
6	LUFTFARTSVERKET	LFV/COOPANS	Sweden	1	37
7	DASSAULT AVIATION	DAV	France	1	37
8	DIRECTION DES SERVICES DE LA NAVIGATION AERIENNE	DSNA	France	1	37
9	ENAIRES	ENAIRES	Spain	1	37
10	ENAV SPA	ENAV	Italy	1	37
11	EUROCONTROL - EUROPEAN ORGANISATION FOR THE SAFETY OF AIR NAVIGATION	EUROCONTROL	Belgium	1	37
12	FREQUENTIS AG	FRQ (FSP)	Austria	1	37
13	HUNGAROCNTRNOL MAGYAR LEGIFORGALMISZOLGALAT ZARTKORUEN MUKODO RESZVENYTARSASAG	HC (FSP)	Hungary	1	37
14	HONEYWELL AEROSPACE	Honeywell SAS	France	1	37
15	INDRA SISTEMAS SA	INDRA	Spain	1	37
16	SAAB AKTIEBOLAG	SAAB	Sweden	1	37
17	NATS (EN ROUTE) PUBLIC LIMITED COMPANY	NATS	United Kingdom	1	37
18	THALES LAS FRANCE SAS	THALES AIR SYS	France	1	37
19	THALES AVS FRANCE SAS	THALES AVS	France	1	37
20	DFS DEUTSCHE FLUGSICHERUNG GMBH	DFS	Germany	1	37
21	DEUTSCHES ZENTRUM FUER LUFT - UND RAUMFAHRT EV	DLR	Germany	1	37
22	RIZENI LETOVEHO PROVOZU CESKE REPUBLIKY STATNI PODNIK	ANS CR (B4)	Czechia	1	37
23	LETOVE PREVADZKOVE SLUZBY SLOVENSKEJ REPUBLIKY, STATNY PODNIK	LPS SR (B4)	Slovakia	1	37

1.2. List of Beneficiaries

 Associated with document Ref. Ares(2019)7194021 - 21/11/2019

No	Name	Short name	Country	Project entry month ⁸	Project exit month
24	AUSTRO CONTROL OSTERREICHISCHE GESELLSCHAFT FUR ZIVILLUFTFAHRT MBH	ACG/COOPANS	Austria	1	37
25	CROATIA CONTROL, CROATIAN AIR NAVIGATION SERVICES LTD	CCL/COOPANS	Croatia	1	37
26	UDARAS EITLIOCHTA NA HEIREANN THE IRISH AVIATION AUTHORITY	IAA/COOPANS	Ireland	1	37
27	NAVIAIR	Naviair/COOPANS	Denmark	1	37
28	ATOS BELGIUM	ATOS (FSP)	Belgium	1	37
29	AIRTEL ATN LIMITED	AIRTEL	Ireland	1	37
30	SINTEF AS	SINTEF	Norway	1	37

1.3. Workplan Tables - Detailed implementation

Associated with document Ref. Ares(2019)7194021 - 21/11/2019

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	Management	1 - LEONARDO	36.00	1	37
WP2	Collision avoidance for IFR RPAS	11 - EUROCONTROL	869.08	2	37
WP3	IFR RPAS accommodation and integration in Airspace Class A to C	10 - ENAV	1,447.58	2	37
WP4	Ethics requirements	1 - LEONARDO	N/A	1	37
Total			2,352.66		

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 - LEONARDO	Report	Confidential, only for members of the consortium (including the Commission Services)	3
D1.2	Final Project Report	WP1	1 - LEONARDO	Report	Public	35
D1.3	Management Progress Report (Y1)	WP1	1 - LEONARDO	Report	Confidential, only for members of the consortium (including the Commission Services)	11
D1.4	Management Progress Report (Y2)	WP1	1 - LEONARDO	Report	Confidential, only for members of the consortium (including the Commission Services)	23
D2.1	Solution 111 - V3 Data Pack	WP2	11 - EUROCONTROL	Report	Public	34
D3.1	Solution 115 - V3 Data Pack	WP3	10 - ENAV	Report	Public	35
D3.2	Solution 117 - V2 Data Pack	WP3	10 - ENAV	Report	Public	35
D4.1	H - Requirement No. 1	WP4	1 - LEONARDO	Ethics	Confidential, only for members of the consortium (including the Commission Services)	3
D4.2	POPD - Requirement No. 2	WP4	1 - LEONARDO	Ethics	Confidential, only for members of the consortium (including the Commission Services)	3
D4.3	GEN - Requirement No. 3	WP4	1 - LEONARDO	Ethics	Confidential, only for members of the consortium (including the Commission Services)	3

1.3.3. WT3 Work package descriptions

Work package number ⁹	WP1	Lead beneficiary ¹⁰	1 - LEONARDO
Work package title	Management		
Start month	1	End month	37

Objectives

Coordination and monitoring of project's progress to accomplish the main objectives regarding time and resources. Coordinate with SESAR 2020 programme and fulfil the administrative requirements of the grant agreement.

Coordination of Dissemination and Exploitation plan preparation and further related activities. Risk management according to the current practices of the SESAR programme.

Description of work and role of partners

WP1 - Management [Months: 1-37]

LEONARDO

Project Management and Coordination (M1-M37). 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.

Project Quality Management and Standardisation (M1-M37). The coordinator will ensure the quality of the project. A project management handbook has been produced by SJU to define certain processes.

Reporting and Communication with the SJU (M1-M37). In cooperation with all involved partners, the POC for Communication Activities is responsible to provide the required periodic and final reports to the SJU/EC.

Technical and Scientific Coordination (M1-M37). 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).

Contribution to the SESAR2020 Program Management (M1-M37) The coordinator provides input to the Programme Committee and its sub-committees meetings and supports discussions through the participating Members of the committee.

Administration of the project according to the grant agreement.

Project Communication and dissemination (M1-M37): the outcomes provided by the Solution leaders will be used for communication and dissemination actions at project level.

Participation per Partner

Partner number and short name	WP1 effort
1 - LEONARDO	36.00
Total	36.00

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 - LEONARDO	Report	Confidential, only for members of the consortium (including the Commission Services)	3
D1.2	Final Project Report	1 - LEONARDO	Report	Public	35
D1.3	Management Progress Report (Y1)	1 - LEONARDO	Report	Confidential, only for members of the consortium (including the Commission Services)	11
D1.4	Management Progress Report (Y2)	1 - LEONARDO	Report	Confidential, only for members of the consortium (including the Commission Services)	23

Description of deliverables

Project Management Plan
 Final Project Report
 2 Management Progress Report

D1.1 : Project Management Plan [3]
 The Project Management Plan (PMP) complements what is already defined in the GA by elaborating in more detail how the project will be executed. It will explain how the programme management and content integration guidance published by the SJU will be put into practice for this specific project.

D1.2 : Final Project Report [35]
 The present report will provide the final explanation of the work carried out by the beneficiaries

D1.3 : Management Progress Report (Y1) [11]
 This report will contain an explanation of the work carried out by the beneficiaries and an overview of the progress.

D1.4 : Management Progress Report (Y2) [23]
 This report will contain an explanation of the work carried out by the beneficiaries and an overview of the progress.

Schedule of relevant Milestones

Milestone number ¹⁸	Milestone title	Lead beneficiary	Due Date (in months)	Means of verification
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Work package number ⁹	WP2	Lead beneficiary ¹⁰	11 - EUROCONTROL
Work package title	Collision avoidance for IFR RPAS		
Start month	2	End month	37

Objectives

Analyse, develop and validate the European DAA (RWC and CA) building on the EUROCAE WG-105 European standards (under development), MIDCAS, TRAWA.

Analyse, develop and validate the ACAS Xu (CA and RWC), building on EUROCAE WG-75/RTCA SC-147 standards (under development) and continuing the work from SESAR Wave 1 (PJ.11-A2).

Ensure that the specification for the CA and RWC functions for both European DAA and ACAS Xu match the operational requirements, by coordinating closely with WP3 (covering Solutions 115 & 117).

Ensure the interoperability of the both above systems with the existing and currently under development Collision Avoidance Systems.

Develop a European Encounter Modelling and Metrics techniques to apply to DAA/RWC enabling the achievement of the above objectives.

As far as Dissemination and Exploitation are concerned, the present WP will provide input to the Project Manager for the “Dissemination and Exploitation plan” and will perform the planned activities.

Description of work and role of partners

WP2 - Collision avoidance for IFR RPAS [Months: 2-37]

EUROCONTROL, LEONARDO, AIRBUS SAS, NLR, LFV/COOPANS, DSNA, Honeywell SAS, SAAB, NATS, THALES AIR SYS, THALES AVS

The global concept development and specifications

In order to achieve all its objectives the work will follow two threads:

- The European DAA (CA and RWC) building on the EUROCAE WG-105 European standards (under development), based on MIDCAS and TRAWA projects.
 - The ACAS Xu (CA and RWC), building on EUROCAE/RTCA WG-75/RTCA SC-147 standards (under development).
- These two threads will work in coordination and use a common baseline defined within the Solution, based on past and ongoing work (SESAR Wave 1, EUROCAE standards, EDA programs, FAA ACAS-Xu developments).

Building as much as possible on this input/starting point, as well as operational input from Solutions 117 and 115, a common requirements baseline will be established (OSD, DAA and interoperability MASPSs) based on EUROCAE standards and draft ICAO SARPs. Validation metrics, common scenarios and encounter models will also be developed. The starting point of the work is the EUROCAE evolving standards, in particular, the EUROCAE WG-105 DAA OSD, MASPS and MOPS for airspace A-C. As explained above, the baseline work of Solution 111 will use this input together with the results of SESAR wave 1 (10.05 in particular), operational input from Solutions 117 and 115 and other relevant work (ICAO draft SARPs, JARUS etc.) in order to form a baseline for the DAA validation. Validation results will be actively fed back to the standardisation process by direct participating to the standardisation bodies working groups of relevance. In particular, participation to the EUROCAE WG-105 DAA working group will be ensured throughout the work and when possible information will be brought also to other groups of relevance, e.g. ICAO RPAS Panel, JARUS DAA working group and EASA.

Interoperability is a major focus with respect to current and future CA Solutions (e.g. TCAS/ACAS and ACAS X). The starting point here is the WG-75/SC-147 INTEROP MASPS. Interoperability with respect to RWC and compatibility with ATC and other airspace users will also be considered.

As outlined in the Methodology section, Solution 111 implements DAA specific validation exercises including both Real-Time man-in-the-loop (remote pilots and ATCOs) simulations (RTS) and Fast-Time simulations (FTS) running a large number of scenarios for statistical assessment of performances (risk ratios).

The specific work in relation to the objective “Analyse, develop and validate the European DAA (RWC and CA) building on the EUROCAE WG-105 European standards (under development), MIDCAS, TRAWA” will be addressed.

The ACAS Xu work in ERICA will build directly on the outcomes of SESAR Wave 1 PJ.11-A2 Solution, in particular, on the European operational acceptability criteria and preliminary V3 validation plan, both drafted at the final stage of

Wave 1; as well as on V2 validation results. ACAS Xu MOPS development is expected to be in early pre-FRAC (Final Review And Comment) phase when SESAR Wave 2 will start.

Fast refinement of the European acceptability criteria based on the results of initial PJ.13 validations, outcomes of the latest EUROCAE DAA standardization work, and using early outcomes of WP3 will allow to directly influence ACAS Xu MOPS finalization process. Outcomes of the later validation activities using MOPS version of ACAS Xu will be important input for ETSO development and system deployment.

Specific European activities will be performed in continuation of support to the ACAS Xu development work driven primarily standardization groups EUROCAE WG-75 and RTCA SC-147. Final version of European operational acceptability criteria will be developed using available outcomes of WP3 and EUROCAE WG-105 and shared with standardization groups to support ACAS Xu MOPS finalization and ETSO development process. Models and Metrics will be developed in line with ACAS Xu design strategy via tuning runs and a final European Validation Exercise on the MOPS version of ACAS Xu Strong interaction with EUROCAE WG-105 will be important to maximize worldwide interoperability of various DAA systems.

The Validations exercises will be detailed in the Validation Plan (VALP), but they can be conceptually summarized as follows.

- The simulation platforms will be developed/adapted as well as the required models (sensors, RPAS performance, safety and operational encounter models etc.) An important step at this stage will be a development of the agreed preliminary encounter model emulating the foreseen RPAS operations. ANSP and operational expertise in the project will ensure that this is truly representative and that potential issues are identified and described.
- Two iterations of validations will be performed with initial set of FTS and RTS followed in a second iteration by a final set of FTS and RTS. Results from iteration 1 will be used to refine the validation plan and if required, update to the simulation environments and when suitable provided to standardisation and PJ13 developments (OSD etc) as intermediate input. Final results will be captured in the update of the OSD and technical specifications together with external inputs from standardisation groups.
- The FTS campaigns focus on statistical assessment of safety and performance given a multitude of pertinent scenarios, related to the expected operation of the RPAS equipped with the DAA system including, CA and, RWC functions. The contribution of the DAA system will be evaluated in relation to the requirements the system needs to fulfil to reach the overall ATM safety number (maximum number of midair collisions per flight hour). The SPR as well as existing material from e.g. ICAO and EUROCAE is expected to identify the required performance of the system capabilities (in the form of risk ratios) given the effectiveness of other barriers like the environment, strategic conflict management, tactical conflict management, involved manned pilot and providence to comply with the maximum number of midair collisions per flight hour.
- The RTS focus instead on the operational aspect and the users' needs, mainly related to ATCO and remote pilot. Workload (WL) and situation awareness (SA) will be observed and the capability of the system to support the pilot in ensuring seamless integration with ATCOs, will be evaluated. One objective is to gain acceptance from ATCOs that the remote pilot, supported by the system, can be considered an acceptable airspace user. Another objective is to gain acceptance from the remote pilot that the system sufficiently supports him in preventing midair collision, maintaining separation and adequate traffic awareness, interacting with the ATCO.
- All validations are performed in closest possible coordination (as described elsewhere) in order to ensure a coherent approach, re-use or work & assets, avoid duplication of work, use common scenarios and encounter models etc. This includes performing joint validations with 117.
- A second round of simulations will be performed covering overall system performance evaluation. All results will be consolidated in the validation report, and the outcomes will be communicated to the standardization groups.
- Based on the results of the V3 validation the SESAR technical specifications document will be developed, and the PJ13 Solution 111 OSD will be updated.

In addition to the above, the work will consider and coordinate with also other (than mentioned above) developments relating to DAA when possible, such as within the military domain (e.g. within European Defense Fund/EDF/EDIDP). In the following are showed the main specificities for the two streams in terms of planned validation exercises and expected partners contributions and involvement.

European DAA

Validation exercises

EXE_111_001 First FTS SAAB

Initial DAA Safety and Performance Assessment on SAAB FTS Platform. Will use the SAAB FTS platform with DAA (CA and RWC) for cooperative and non-cooperative intruders. Validation scenario/objectives: the exercise will run a large number of encounters to allow statistical evaluation of the safety level achieved by the DAA system for different scenarios. Standard encounter models representing manned traffic in airspace class A-C as well as evolved

models representing operations with unmanned traffic will be used for simulations with some different RPA types. The simulations will make use of pilot models to represent remote pilot response to alerts generated by the DAA system. Expected Achievements: evaluate the safety performance achieved by the CA and RWC functions as part of the DAA system. The safety performance will be assessed against safety requirements and findings will be used to modify and enhance the functions as needed. The results will support EXE_111_02 with scenarios for Real Time Simulations with RPAS in a simulated ATM-system.

EXE_111_002 First RTS LFV/COOPANS-SAAB

Initial DAA and Remote pilot Workload & Situational Awareness connected to NARSIM as ATM-system for ATCO workload & Situation Awareness. Will use LFV/COOPANS RTS platform with RPAS models connected to SAAB RPAS-sim as remote pilot station integrated. Validation scenario/objectives: the RTS1 exercise will explore lost separation and collision scenarios by the use of DAA system on the RPAS to provide the remote pilot with situation awareness and collision avoidance functions. Both cooperative and non-cooperative sensors will be integrated in the DAA system. Additionally the RWC function will be explored in scenarios where the remote pilot is responsible to remain well clear of other traffic and thus needs to interact with ATC to receive amended clearance. ATCOs personnel and RPAS pilots will take part in the simulations, working in a realistic operational environment that will include nominal and non-nominal scenarios. Specific assessments will be done for Acceptability and Human performance. Expected Achievements: gather experience and data as feedback to further develop and mature the DAA system and its operational use.

EXE_111_003 Second FTS SAAB

Full DAA Safety and Performance validation. Interoperability validation on SAAB FTS Platform. SAAB FTS platform with DAA (CA and RWC) for cooperative and non-cooperative intruders. Validation scenario/objectives: FTS2 exercise will validate the updated DAA system (from findings in previous FTS and RTS exercises) in a similar statistical manner as in FTS1. The exercise will include C2 link latency and link loss scenarios, in which case automated CA will be engaged to ensure safety. A special set of scenarios will be used to demonstrate technical interoperability with other collision avoidance systems on manned and unmanned aircraft. Expected Achievements: Validated safety performance of the CA and RWC functions for cooperative as well as non-cooperative intruders.

EXE_111_004 Second RTS LFV/COOPANS-SAAB

Exercise on LFV/COOPANS RTS Platform, joint with validation on Solution 117. ATCO and Remote pilot operational acceptability. Will use LFV/COOPANS RTS platform with RPAS and remote pilot station integrated. Validation scenario/objectives: RTS2 exercise will evaluate the updated DAA system (from findings in previous FTS and RTS exercises) and will further include C2 link latency and link loss in which case automated CA will be engaged to ensure safety. A strong focus will also be to demonstrate interoperability with other collision avoidance systems on manned and unmanned traffic. Expected Achievements: Validated CA and RWC functions that are found to have acceptable operational behaviour when evaluated from an ATCO perspective and from a remote pilot perspective as well as for other airspace users.

In addition, a Flight Demonstration campaign is planned using DAA Solution integrated on VTOL RPAS in scenarios with intruder encounters, in order to Demonstrate DAA capabilities in real world environment.

Partner's Contributions

SAAB will contribute with a major focus on the European DAA thread as well as the common work and interoperability. This will include work with

requirements (OSD/SPR/INTEROP etc.), development (DAA models, FTS platform adaptation, integration into RTS platforms, adaptation and integration on VTOL RPAS), standardisation and validation. For the standardisation, will actively contribute to the DAA standards in EUROCAE WG-105 (where Saab is chairman of the DAA working group) and other relevant bodies (e.g. ICAO RPAS Panel, JARUS). Will support and conduct the related FTS and RTS Validation Activities as well as perform a demonstration of the DAA capabilities in a real world environment.

EUROCONTROL will develop, via their modelling toolset, encounter models and toolset which are to be used for the iterative validation of ACAS Xu and extend this work to include encounters which meet the requirements for DAA/RWC/CA validation. This will include the development of new metrics and acceptability criteria for RWC and horizontal manoeuvring

AI D&S GMBH will contribute to the generation of the OSD, technical specifications. AI D&S GMBH will review V3 validations of the overall system performance.

Leonardo will contribute to the definition of OSD and SPR/INTEROP on the basis of previous work conducted in EUROCAE WG-105 and will contribute to their reviews and updates. Leonardo will participate to DAA/RWC validation activities contributing to the definition of the validation metrics, procedures and reports.

NLR will contribute with a model for minimum sensor performance for DAA and will contribute to all Solution documents and support to evaluations

NATS will support representative encounter development, support the development of real-world performance metrics, evaluate operational compatibility and measures of safety and will contribute to all Solution documents. LFV/COOPANS will participate to the European DAA tasks. This includes support to SAAB FTS validation exercises and execution of the RTS validations (joint with Solution 117).

ACAS Xu

Validation exercises

EXE_111_005 Pre-MOPS ACAS Xu Fast Time Simulation Honeywell SAS

- Based on the pre-final review (pre-FRAC) version of ACAS Xu;
- Testing against European operational acceptability criteria from PJ.11-A2 (Wave 1);
- Extensive surveillance, RPA performance and pilot's reaction impact testing;

EXE_111_006 MOPS-based ACAS Xu Fast Time Simulation Honeywell SAS

- Using the MOPS version of ACAS Xu;
- Requirements provided by WP3 (Solutions 115 and 117) included in final European operational acceptability criteria and used within the validation;
- Evolution of the system with respect to criteria used in previous validations tested.

EXE_111_007 - Real Time Hardware in the loop Evaluation Honeywell SAS

- MOPS version of ACAS Xu ported on experimental hardware platform;
- C2 communication hardware platform integrated as well;
- Overall system performance assessment as a preparation step for flight demo.

EXE_111_008 - Flight demo of ACAS Xu Honeywell SAS

- Demonstration of ACAS Xu behaviour in real environment;
- Use of manned aircraft planned at this stage.

EXE_111_009 – First ACAS-Xu assessment - Fast Time Simulation Thales AIR SYS

- Pre-FRAC ACAS-Xu revision integration in the Fast Time Simulator;
- Performance and safety assessment of ACAS-X algorithm based on EUROCONTROL Encounter Model.
- ACAS-Xu will be assessed with sensors like ATAR, optronic and bearing fewer antennas, and with C2-link model.

EXE_111_010 – Second ACAS-Xu assessment - Fast Time Simulation Thales AIR SYS

- Final ACAS-Xu revision integration in the Fast Time Simulator;
- Performance and safety assessment of ACAS-X algorithm based on EUROCONTROL Encounter Model.
- ACAS-Xu will be assessed with sensors like ATAR, optronic and bearing fewer antennas and with C2-link model.

EXE_111_011 - Human factor assessment thanks to Human-In-the-Loop Simulation Thales AIR SYS

- Latest ACAS-X revision integration in the Human In the Loop;
- Performance and safety assessment of ACAS-X algorithm taken into account;
- Human factor and communication link based on specific flight scenarios.
- It will be evaluated if this Real Time Simulation will be a joint validation with Solution 117 activity (EXE_117_006).

EXE_111_012 - ACAS-Xu Prototype for Flight Demo Thales AIR SYS

- Latest ACAS-Xu revision integration in the Thales AIR SYS prototype;
- Prototype integration in an RPAS for a flight demo.
- It will be evaluated if this this flight demo can be hold jointly with Solution 115 validation (EXE_115_001, with the patroller platform).

EXE_111_013 First Xu Fast Time Simulation DSNA

- Effect of RWC and avoidance manoeuvres in mid-size airport with real register traffic.

EXE_111_014 Second Xu FTS DSNA (3 aircraft)

- Performance of ACAS Xu CA in three-aircraft encounters.
- Operational impact of ACAS Xu RWC and CA in day-to-day encounters
- Performance of ACAS Xu when confronted with GA aircraft equipped with Mode S.

Partner's Contributions

Honeywell SAS will focus on progressive validation of ACAS Xu releases (Runs) along the MOPS finalization phase using Honeywell SAS simulation and experimental hardware platforms and at a later stage will also use a system prototype to target the validation/demonstration in a real environment. Beyond these activities Honeywell SAS will contribute to the operational and technical requirements definition (OSD, technical specifications, operational

performance and safety requirements) as well as benefits evaluation. Honeywell SAS will also continue to contribute strongly to the standardization of ACAS Xu and DAA as well as will support future development of ETSO.

Thales AVS and its third parties will contribute by bringing its expertise and knowledge in Support to ACAS-Xu OSED; Support to ACAS Xu technical specifications and interface requirements (including additional surveillance sources and sensors, in particular radar sensor); Implementation/integration and validation of the ACAS Xu Run X (both surveillance & logic) with a surveillance input representative for a selected combination of surveillance sensors.

Thales AIR SYS will provide the platform for Fast Time Simulation with the objective to evaluate a final MOPS version of ACAS Xu (as implementation of DAA) in the environment of a mid-size airport. Thales AIR SYS will provide ACAS-Xu model for Real Time Simulation, and provide ACAS-Xu prototype for RPAS platform.

EUROCONTROL will further develop the V2 Encounter Models from Wave 2 to become V3 models representative of European A-C Airspace.

Airbus will contribute to the generation of the OSED, technical specifications. Airbus will review V3 validations of the overall system performance.

NATS will support representative encounter development, support the development of real-world performance metrics, evaluate operational compatibility and measures of safety and will contribute to all Solution documents.

DSNA will contribute to ACAS Xu validation through two Fast Time Simulations. RPAS considered will be of different categories: Patroller (SAFRAN), VTOLs and MALE turboprop, in addition to EUROCONTROL Database. Different sensors (OMNI and OPTRONIC) detecting both cooperative and non-cooperative aircraft will be considered. The platform and encounter sets for EXE_111_014 will be developed jointly by DSNA with a subcontractor and Egis Avia.

Participation per Partner

Partner number and short name	WP2 effort
1 - LEONARDO	21.00
2 - AIRBUS SAS	6.00
AI OP SAS	18.00
AI D&S GMBH	12.00
3 - NLR	3.90
6 - LFV/COOPANS	2.93
8 - DSNA	22.40
SAFRAN	18.40
11 - EUROCONTROL	198.00
14 - Honeywell SAS	7.00
HIsrc	175.00
HIinc	24.00
16 - SAAB	110.00
17 - NATS	13.40
18 - THALES AIR SYS	1.00
THALES SIX	176.00
TAS-FRANCE	4.75
19 - THALES AVS	8.30
THALES SIX	47.00
Total	869.08

List of deliverables

Deliverable Number¹⁴	Deliverable Title	Lead beneficiary	Type¹⁵	Dissemination level¹⁶	Due Date (in months)¹⁷
D2.1	Solution 111 - V3 Data Pack	11 - EUROCONTROL	Report	Public	34

Description of deliverables

V3 Data Pack (OSED/SPR/INTEROP, TS/IRS, CBA)

D2.1 : Solution 111 - V3 Data Pack [34]

Refined and extended documentation of RPAS Xu V2 phase including OSED updated based on V3 validations results and results available from DAA/RWC and CA Exercises (RPAS IFR operations); Operational, performance and interoperability requirements; Technical and Interface Requirements Specifications and benefits evaluation.

Schedule of relevant Milestones

Milestone number¹⁸	Milestone title	Lead beneficiary	Due Date (in months)	Means of verification
MS1	V3 Gate for solution PJ13-111	11 - EUROCONTROL	35	The V3 gate for solution 111 is successfully passed.

Work package number ⁹	WP3	Lead beneficiary ¹⁰	10 - ENAV
Work package title	IFR RPAS accommodation and integration in Airspace Class A to C		
Start month	2	End month	37

Objectives

Aim of this workpackage is to develop and validate, in a stepped approach, a framework for the insertion of RPAS into the non-segregated airspace of category A-C, allowing their routinely access and operations; two main streams of activities are foreseen as follows:

- “Accommodation” of civil and military IFR RPAS, in accordance to the typology of platform and mission/application that are characterising the initial demand, trying to exploit as much as possible mature capabilities and systems existing at the target accommodation date. The validation will be performed at V3 maturity level (ref. Solution PJ13-W2-115);
- “Integration” of military and civil IFR RPAS, enabling from the operational and technical point of views, their deployment in a cooperative environment, in full integration with the manned aviation. The validation will be performed at V2 maturity level (ref. Solution PJ13-W2-117).

Accommodation and integration, developed in parallel, will refer to two different temporal horizons.

As far as Dissemination and Exploitation are concerned, the present WP will provide input to the Project Manager for Dissemination and Exploitation plan and will perform the planned activities.

Accommodation - WP03.01 - Solution 115

The general objective of Solution 115 is to enable IFR RPAS operations in controlled airspace classes A-C considering only “accommodation” measures. In this Solution, the operational and performance requirements that are needed to achieve accommodation will be identified, as well as the working methods. The V3 validation of these requirements will be performed through an integrated RTS platform comprising flight planning, ATC and RPAS components. It will be based on technologies or researches mature at the target accommodation timeframe.

As far as Dissemination and Exploitation are concerned, the present WP will provide input to the Project Manager for Dissemination and Exploitation plan and will perform the planned activities.

Integration - WP03.02 - Solution 117

The general objective of Solution 117 is to enable IFR RPAS operations in controlled airspace classes A-C only considering “integration” measures. In this Solution, the operational and performance requirements that are needed to achieve the full integration will be identified, as well as the working methods.

As far as Dissemination and Exploitation are concerned, the present WP will provide input to the Project Manager for Dissemination and Exploitation plan and will perform the planned activities.

Description of work and role of partners

WP3 - IFR RPAS accommodation and integration in Airspace Class A to C [Months: 2-37]

ENAV, LEONARDO, AIRBUS SAS, NLR, ON (B4), PANSA (B4), LFV/COOPANS, DAV, DSNA, ENAIRE, EUROCONTROL, FRQ (FSP), HC (FSP), INDRA, SAAB, THALES AIR SYS, THALES AVS, DFS

The present workpackage is composed of two sub-workpackages WP03.01 and WP03.02 that are respectively coincident with Solution 115 and Solution 117.

The activity peculiar workpackage WP03 is the strict coordination between Solution 115 and 117 (“accommodation” and “integration”) that is necessary in order to reach the final project objectives. This is considered necessary by the partners because the two topics deal with the same subject on two different temporal horizons that must be managed together.

WP03.01 - SOLUTION 115

Objectives:

The general objective of Solution 115 is to enable IFR RPAS operations in controlled airspace classes A-C considering only “accommodation” measures. In this Solution, the operational and performance requirements that are needed to achieve accommodation will be identified, as well as the working methods. The V3 validation of these requirements will be performed through an integrated RTS platform comprising flight planning, ATC and RPAS components. It will be based on technologies or researches mature at the target accommodation timeframe.

As far as Dissemination and Exploitation are concerned, the present WP will provide input to the Project Manager for Dissemination and Exploitation plan and will perform the planned activities.

Description of work

ENAV as WP Leader of WP03 will monitor the solution 115 developments and review the outputs to ensure alignment with solution 117 given the strong synergies between the two solutions.

Thales AVS will lead the technical activities of solution 115 by ensuring the execution of technical development and the deliveries of the relevant deliverables.

Concept development

At concept level, this WP will be undertaken in a common stream of work between WP 3.01 and 3.02 which will have 2 sets of requirements output because accommodation is an incremental and a scalable step with a concept that is a subset of the full integration with manned aviation. This ensures long-term continuity to the next step.

WP03.01 will rely on one hand on the consolidation and refinement of relevant inputs to establish the Solution needs, concept and operational scope and, on the other hand, on associated mature technical enablers. This encompasses RPAS flight planning (OAT and GAT) and operational IFR RPAS traffic accommodation in non-segregated controlled European airspace classes A-C, in targeted operational environments associated with the initial short-term RPAS demand (e.g. medium density/complexity airspace with limited daily peaks).

It will encompass:

- Accommodation needs: Flight planning (in coordination with PJ07 Solution 40) and RPAS characteristic fixed wing MALE considered for the accommodation stream in relation to initial demand and long-endurance specifics (e.g. re-plan during flight, en-route holding etc.). RPAS specificities compared to manned aviation and their impact on Air Traffic Management (Flight domain, Remote piloting, sector hand-overs, contingencies)
- Characteristics and constraints of the operational environment (IFR controlled European airspace classes A-C, low and high-level En-Route, medium density/complexity terminal airspace with RPAS crossing to specific airfields, limited daily peaks), accessibility / sharing of airspace and flexibility for RPAS operators to access the shared airspace. Airspace design / structure, separation standards, operating methods and procedures, in particular procedures for RPAS contingency handling. CNS Performances needed in the environments on RPAS avionics capabilities.
- Definition of accommodation use cases for validation.
- Associated with the above, the operational, safety and performance requirements will be established and a security risk analysis will be performed. The separation standards will be coordinated with Solution 111.

The concept development will be performed :

- In coordination among WP03.01 partners (ongoing participants), considering the short-term demand for RPAS accommodation (inter alia, ICAO, EDA-ERA, EASA, EUROCONTROL, previous SESAR results and previous trials conclusions). This will allow the WP to identify main issues, and consolidate and refine mature concept and high level requirements orientations.
- By means of an initial high-level trade-off between the concept orientations and the ATM and IFR controlled environments constraints (e.g. safety, workload, capacity, etc.). This will consider the initial short-term demand (circa 2021-25): it is expected that the concept will imply no or minimal changes to the aviation IFR operations conduct and their reliance on systems in that period.

The Concept and the associated high-level requirements will be documented and delivered in the accommodation section of the overall OSED/SPR (Operational Service Environment Description/Safety & Performance Requirements).

Operational and technical specification

In order to validate the accommodation concept and its requirements related to initial RPAS demand the following operational and technical elements will be developed, in certain cases modified from existing assets to adapt a high-fidelity integrated RTS validation platform.

- Representative ATM route planning tools; it is expected for GAT accommodation that the ICAO FPL 2012 format will be the basis.
- Representative ATC environment, including en-route and terminal area with transit to specific RPAS airfields.
- Air traffic representative on the targeted operational environment with traffic scenarios derived from real traffic conditions.
- ATC systems/control stations with all relevant capabilities (Radar traffic, Flight Plan and predicted route information, conflict detection) and representative of the airspace structure (En-Route, TMA) per FIR.
- ATC Controllers employing the control procedures defined in the OSED/SPR (providing control / separation instructions / clearances to remote pilot and monitoring the RPA progression).
- RPAS platform comprising fixed-wing MALE RPA models (for initial accommodation demand). It will run on the airborne RTS platform with the associated navigation positioning and autopilot capability, whereas the associated RPS

will run on a separate remote ground piloting station. The RPAS platform encompasses its C2 link run over a specific network with a module for performance simulation degradation and avionics capabilities for the targeted environment.

- Links between ATC system and RPA/RPS per the OSED/SPR for surveillance, predictions (simulated over the RTS network).

Prototyping development, integration and testing

Before of the execution of the Validation Exercises, some activities of development/adaptation/modification of the V3 RTS IBP components to the specifications established above will be performed, on existing assets.

Validation exercises

The validation methodology in this WP is a Real Time Simulation to perform both technical and operational validations to achieve V3 maturity level. Solution 115 will conduct a single integrated validation exercise: EXE_115_001 RTS INTEGRATED V3 VALIDATION.

The operational validation will include remote RPA pilots and ATC controllers :

- It will evaluate: human factors, performance/workload, safety, and other KPA impacts, inter alia, accessibility, capacity, etc.
- The scenario will encompass nominal, abnormal and emergency operational procedures including those related to degradations/loss of diverse components in the RPAS / ATM system (communications, C2 link, Navigation accuracy/integrity, RPAS related emergencies)

In the following the main elements of the exercise are described.

Flight Planning / ATM Network

Planning tool for FOC/WOC, associated aeronautical data; Flight plan processing will be addressed through a relationship with Solution 40 to cover specific RPAS flight planning; Delivery of flight plan to operator.

The pre-flight preparation tool provided by FRQ (FSP) will be customised to support RPAS pilots in validating the planned flight against the AIXM store. The study will address the RPAS flight planning and flight plan updates during a mission. The changes between manned and unmanned IFR flight planning will be analyzed and validated.

The FMS provided by Thales AVS will be upgraded so as to upload the accepted flight plans to the RPAS avionics.

ATC environment

ATC systems/control stations representative of en-route and terminal area with transit to specific RPAS airfields, and traffic representative on the targeted operational environment. ATCOs personnel will use this environment in the validation exercise for standard and especially in failure scenarios related to link losses and RPAS failures leading to contingency procedures.

The ATC environment for validation of TMA and En-route will be provided by DSNA and it will allow the validation of RTS RPAS platforms (e.g. Thales AVS and DSNA's LTP) in order to evaluate En-route, TMA and the possible tower environment. It also will support the validation of Real Flights, performed in collaboration with military, as well as a demonstration campaign is proposed with state RPAS and with DSNA's LTP SAFRA patroller equipped with ACAS Xu Prototype. Several scenarios will be considered in order to assess the accommodation procedures.

The RPAS platforms will be technically and operationally integrated into this ATC environment.

RPAS platform

RPAS platform model (i.e. an RPS and a Long Endurance Fixed Wing RPA) and remote pilot with avionics capabilities (provided by Thales AVS and DSNA's LTP (Safran Patroller)). The RPAS platforms will be integrated with the ATC platform network, so that the RPA will be part of the mixed traffic in the ATC traffic scenario. The RPAS platform encompasses :

- RPA performance model and its autopilot.
- A Remote Pilot Station (RPS).
- The RPA/RPS avionics : Flight Management System (FMS) + associated navigation data, ADS-C EPP for trajectory downlink to ATC, FMS / Auto-pilot coupling, Navigation capabilities in FMS managed navigation mode or Autopilot selected modes;
- Failures simulation (on links and at RPA level)

V3 Validation

The RPAS accommodation V3 validation will be run on the RTS validation environment setup as described above to assess:

- Operational performances when the RPAS is managed by ATC in mixed traffic, in nominal conditions and during contingency procedures automated or controlled by remote pilot (controller workload, sector capacity, efficiency, complexity, safety levels, mitigations means).
- Technical capabilities and performances, specific to RPAS operations.

The V3 validation will provide conclusions on the impact of RPAS accommodation as GAT in non-segregated airspace. The impacts (e.g. workload, capacity, accessibility, etc.) will be assessed qualitatively and quantitatively when possible.

Guidance/recommendations will be given on the management of impact in order to attain airspace capacity, efficiency, limit workload, and have standard accommodation procedures (taking into account abnormal situations and contingency procedures).

An Impact and Cost-Benefit assessment of the accommodation Solutions will be associated with these conclusions in a common stream of work between WP 3.01 and 3.02 which will have 2 sets of Impact assessment and CBA outputs to ensure long-term continuity to the next step.

Partner's Contributions

The summary of the partners' contributions is as following:

AI D&S GMBH OSED/SPR, VALP, TS
 Dassault Aviation OSED/SPR, VALP, VALR
 DSN A OSED/SPR, VALP, TS, AN, VALR, CBA
 ENAIRE OSED/SPR, VALP
 EUROCONTROL OSED/SPR, CBA
 FRQ (FSP) OSED/SPR, VALP, AN, VALR
 HC (FSP) OSED/SPR
 INDRA OSED/SPR, TS
 Leonardo OSED/SPR
 SAAB OSED/SPR, VALP
 Thales AVS OSED/SPR, VALP, TS, AN, VALR, CBA

Partners agreed the following lead responsibilities for Solution 115:

Validation Plan (VALP) V3: DSN A
 Availability Notes: Thales AVS
 Validation Report (VALR) V3: DSN A (ATC), Thales AVS (RPAS)
 Technical Specification (TS/IRS) V3: Indra
 Safety, Performance and Operational Requirements (SPR-INTEROP/OSED) V3 and CBA V3: Thales AVS.

WP03.02 - SOLUTION 117

Description of work:

Concept development

The SESAR Solution includes the development and validation of the operational concept and technical enablers for the integration of IFR RPAS in European airspace in airspace classes A-C:

- Development of operational requirements and technological solutions for communication between ATC and IFR RPAS (R/T and CPDLC, both direct from ground-stations and via satellite communications relay, and/or ground-ground link between controller and RPAS pilot), with the consideration of the performance of each of the options;
- Research for characterizing, quantifying and assessing the impact of the communications performance of satellite-based relays when complying with ATC instructions (this includes the combination of the latency of the communication from ATC to the RPAS pilot, the time for the RPAS pilot to introduce the command in the RPS and the communication from the RPS to the RPAS for implementation);
- Development of IFR RPAS RLP for operating airspace classes A to C. The concept may consider the creation of airspace sub-classes with different performance requirements (e.g. less stringent latency requirements in low density airspace, but potentially with higher separation minima between IFR RPAS, and between manned aircraft and IFR RPAS);
- Investigation of the potential need for modified separation minima between IFR RPAS and between manned aircraft and IFR RPAS, including both wake and radar separation minima. Where necessary, new criteria should be developed and validated by this Solution. The research on the definition of new separation minima must be coordinated with Solution 54 "Digital evolution of separation minima in en-route and TMA";
- Assessment of navigation performance requirements for RPAS, including assessment of the ability of an RPAS to execute existing published procedures, and development of new procedures if necessary;
- Development of contingency procedures and supporting technology, considering in particular the lost-link contingency, including in particular determination of the time milestones after a failure to communicate in which the link is to be considered lost, and addressing in particular the intermittent lost-link contingency;
- Development or adaptation of ATCO procedures and support tools for handling IFR RPAS. This may require the adaptation of current CD&R tools in order to account for the specificities of IFR RPAS (e.g. different performance models, adaptation of the TP, etc.);

- Assessment of the impact on ATC of the increased variety of performance envelopes and RPAS characteristics, and assessment of the impact on the complexity metrics used to support demand and capacity balancing;
- Adaptation of the network manager function (procedures and systems) to integrate IFR RPAS traffic. This should take into account IFR RPAS specificities such e.g. long persistence of IFR RPAS flights in the same area, etc.;
- Development of Flight Operation Centre procedures and systems (FOC/WOC) for IFR RPAS including flight planning, consideration of contingency procedures in the flight planning phase and coordination with the network. For long-endurance missions, the Solution shall allow making modifications to flight plans after the mission has started, with processes that may be different depending on the look-ahead time. In particular, the Solution shall investigate the possibility that changes to the flight plan during the flight execution that are submitted sufficiently in advance are processed between NM and the FOC/WOC without the involvement of ATC;
- The development of a system performing the RWC function is being carried out by Solution 111, and this Solution must cooperate closely with them. The RWC function is designed to provide the remote pilot with greater situational awareness, allowing him to comply with the ICAO Annex II section 3.2 requirements for taking responsibility for the safety of the aircraft and maintaining vigilance, without the use of an out-the-window view. It should be noted that the RWC function in airspace classes A-C does not provide an alternative means of providing separation, which is the job of ATC, and nor does it exist to compensate for systematic weaknesses in the RPAS system design, such as data-link latency or frequent lost-link; in order to be able to operate IFR, the RPAS must be able to perform to a sufficient degree so as to enable ATC to be the separator. This Solution must develop the operational requirements and procedures to cover RWC to support integration, especially regarding the complex subtleties of the execution of RWC manoeuvres in airspace classes A-C.

The Solution will address IFR rotary wing RPAS as well as fixed wing, considering also HALE class of RPAS that may operate long portions of their flights in uncontrolled airspace (above class A airspace), in particular it is expected that as the density of IFR RPAS operating in this area increases, may become necessary for ATC to provide separation between IFR RPAS operating above manned aircraft. Even though this SESAR Solution only concerns airspace classes A-C, it will develop criteria to determine when a separation provision service between HALE RPAS flying at high altitude is necessary (e.g. above a certain density of HALE flights), and will provide recommendations for either extending class A airspace above its current limits or propose the creation of a new class of airspace to cover this specific service provision.

Operational and technical specification

Specific objective of integration will be the development and validation of RPAS technical capabilities, ATM planning tools, ATC tools and procedural means to allow both IFR RPAS to comply with ATC instructions and ATC to handle IFR RPAS in a cooperative environment in full integration with manned aviation. In order to achieve this objective, the automation of IFR RPAS operations will be investigated taking into account the impact on ATC workload, operational safety, capacity, efficiency, complexity and other key performance parameters.

The present Solution will address RPAS category capable to fly in controlled airspace, in detail the “Certified” category identified by EASA where requirements are comparable to those for manned aviation. Oversight by NAA (issue of licenses and approval of maintenance, operations, training, ATM/ANS and aerodromes organizations) and by EASA (design and approval of foreign organisations) will be required according to a process similar to manned aviation. Going more in detail Solution will address RPAS belonging to Class VI defined in the EUROCONTROL RPAS CONOPS that are capable of carry out is IFR operations, including Network, TMA and Airport operations with capability of flying SIDs and STARs as designed for manned operations taking into account RPAS such as MALE/HALE with fixed wing and rotary aircraft as well.

Prototyping development

Before of the execution of the Validation Exercises, some activities of development/adaptation of the IBP to the validation scope will be performed.

Validation exercises

The validation methodology to achieve the target maturity in Wave 2 consists of a number of different methods, techniques and tools, which are all in line with the E-OVCM and the current maturity level. Within Solution 117 validation activities planned for the accommodation step and for the full integration with manned aviation will refer to:

- Fast Time Simulations and modelling techniques, useful for gather quantitative results for some specific KPAs (e.g. Safety, Capacity, Efficiency) mainly for the full integration validations
- Real-time simulation techniques are important in providing human-in-the-loop experience of a proposed concept in a relatively controlled and repeatable environment. This will allow assessing some specific KPAs like Human Performance and Safety.

In the following, the list of Validation exercises:

EXE_117_001 ENAV/LEONARDO RTS

This V2 validation exercise will explore the possibility of integrating RPA class VI aircraft (certified RPA able to fly IFR according to EUROCONTROL CONOPS for RPAS) in a non-segregated Italian Terminal Manoeuvring Area (TMA). The operations will be carried out in a mixed mode considering both RPA and “manned” traffic. RP will fly SID and STAR procedures.

ENAV ATCOs personnel and remote pilots (RPs) will join to the real time simulations, working in a realistic operational environment. Nominal and non-nominal scenarios will be executed. Special emphasis will be put on: 1) the assessment of delegated separation benefits in TMA during automatic approach or climb; 2) the impact of latency in SATCOM used to relay C2 and ATC data (BRLOS operations); 3) the assessment of dedicated contingency management means (procedures or technical means) designed for RPAS in case of (C2 and ATC) link loss or degradation of CNS performance.

Simulation runs will investigate the RPAS ability to fly SID/STAR routes and respond to ATCO’s vectoring. Specific assessments will be performed for Safety and Human performance KPIs involving dedicated operational staff.

The activities will be executed by using a federated simulation framework that will comprise a Leonardo RPAS (RPA + RPS) full simulator, a Leonardo ATC platform, two other simulation facilities that allow to control both unmanned systems (1 fixed wing and 1 rotorcraft provided by ENAV LTP) with real pilots and manned aircraft with dedicated pseudo pilots. THALES AVS Flight Management System with datalink capabilities will be integrated into this federated simulation.

At least a RPAS will be able to exchange CPDLC messages with ATC and at least a RPAS will be equipped with CA functions in order to allow considerations on their interoperability with the separation means.

EXE_117_002 LEONARDO FTS

This validation exercise will explore the possibility to adapt Airborne Separation Assistance applications for manned aircraft to RPAS platforms in order to make IFR RPAS operations (e.g. interval management during approach) transparent with respect to ATC separation instructions, also in case of C2 Link Loss or other contingencies.

The operations will be carried out in a mixed mode considering both RPAS and “manned” traffic. RPA will fly En-route, SID and STAR procedures.

Nominal and non-nominal scenarios will be executed. In particular the following assessments will be performed: 1) performance assessment of the separation assistance functions in En-route and TMA; 2) safety benefits of delegated separation in TMA during automatic approach or climb; 3) interoperability with the ATOL capability (e.g. automatic approach while managing inter-aircraft spacing); 4) benefits of automatic contingency management means designed for RPAS in case of (C2 and ATC) link loss or degradation of CNS performance. I will be evaluated the possibility to use the THALES AVS FMS in the contingency procedures assessment. The activities will be executed by using the FTS simulation framework of Leonardo in Turin.

EXE_117_003 EUROCONTROL simulation FTS/RTS

The validation exercise will explore the integration of RPAS class VI aircraft (certified RPAS able to fly IFR according to EUROCONTROL Conops for RPAS) in a generic, non-segregated airspace (classes A to C). The aim of the activity will be to further refine the work conducted in SESAR H2020 Wave 1, investigating additional elements not considered in previous studies. This could include aspects such as: 1) Quantitative evaluation of the impact on ATC, measuring the effects in term of sector capacity, controller workload and other relevant KPI; 2) Investigation of possible use of supplementary means of communication for exchanging messages between remote pilots and ATCOs, aiming at mitigating the already observed impact of C2 Latency and Contingency procedures; 3) Evaluation of the impact of D&A functions (emulated) on controller tasks. The validation will consider the RPAS operations, both nominal and non-nominal, in En-route and APP environments. Cooperation with ENAV is expected, with the provision of expertise and air traffic controllers to support the real time simulation. The activities will be executed in the EUROCONTROL Experimental Centre in Bretigny S/O, France.

EXE_117_004 PANSA (B4)/PSNC RTS/FTS

The exercise will validate how capacity, speed, reliability and latency of the data link between RPAS and the pilot (C2C) and ATC and the RPAS pilot will effect on capacity management within controlled airspace.

The study will also evaluate how scalability, error rates, delay in communication, network protocols statistics, user application performance and safety aspects will affect traffic distribution at En-Route sectors. The validations will be carried in RPAS environment (FTS) and, later, in mixed mode, considering both RPAS and manned traffic through the RTS performed on PANSA’s ATM system test platform.

EXE_117_005 ENAIRE FTS

The validation exercise will be focused on conventional (reference scenario) and specific (solution scenario) ATC procedures for related with RPAS, aiming at separation minima and navigation performance. The scenarios will be designed to manage conflict detection and resolution based in general and specified ATC commands instructions, clearances and tools complaining with separation minima and operational procedures; they will be modelled using

different existing certified on-board navigation and communication equipment. In addition, Also proposed detect and avoid procedures and systems will be evaluated assuming remote pilot actions or autonomous responses, including also addressing contingency situations provoked after pilot or autonomous reactions. Operationally, performance areas as capacity and safety will be assessed taking into account traffic forecast, ATC workload, and conflict detection and resolution.

EXE_117_006 DSNA RTS

DSNA will contribute to Solution 117 through RTS. The DSNA RTS ATC simulation platform EASY will integrate:

- A Thales AVS RPS and FMS simulator,
- A Patroller RPS provided by Safran.

This simulation set-up will allow assessing aircraft cockpits featuring new functionalities in a representative traffic and evaluate operational working methods for normal and abnormal situations in particular for RWC assessment. In particular, we will evaluate the impact of RWC alarms.

RPAS considered will be of different categories: Patroller (SAFRAN), VTOLs and MALE turboprop.

Real register traffic will be used in En-route and TMA. Qualified ATC will participate.

The idea is to validate RPAS procedures and RPAS technical capabilities with regards to performance, safety and ATC workload KPA's:

- Within En-Route and TMA airspace including evaluation of the impact of C2 latency and ATC Comms;
- Within co-operative traffic (airspace classes A-D);
- Nominal, abnormal and emergency operational procedures including those related with Satcom C2 Link Loss and Satnav Underperformances.
- Cooperation with Thales AIR SYSLAS, Safran (DSNA third party) and ENAC (DSNA third party) is foreseen.

EXE_117_007 HC (FSP)/FRQ (FSP) RTS/FTS

This V2 validation exercise will allow for example ANSPs to provide a pre-flight preparation tool to RPAS pilots to help RPAS pilots validating the planned flight against AIXM data stored and (via Digital NOTAM temporally modified) in the AIXM store. FSP's solution may therefore act as backend to provide other partner systems information in AIXM and information on RPAS flight information available in the pre-flight phase (flight planning) using a B2B connection. The study will address the workflow of RPAS flight planning and flight plan updates during a mission including validation against an AIXM datastore (e.g. Digital NOTAM). The changes between manned and unmanned IFR flight planning will be analysed and validated.

EXE_117_008 INDRA RTS/FTS

This V2 validation will study the integration of RPAS in en-route airspace.

The aim of the validation activity will be to introduce RPAS flight in a controlled airspace in order to investigate the following items:

- Flight preparation in a manner compatible with the ATM system.
- Impact in the separation provision due to latency and a different flight awareness of the crew.
- Impact of RPAS communications due to drone might stay on station in a given area that can be across several airspaces boundaries for a very long time.
- Weather conditions changes require specific coordination ATC and RPAS for reactive manoeuvres, level changes and rerouting.
- ATC will need awareness of RPAS activities in their AOR (Areas of Responsibility) the FP needs to indicate this flight is a RPAS.
- ATCO and RPAS needs to take in account contingency procedures in case of loss of Command & Control.

EXE_117_009 First RTS LFV/COOPANS-SAAB (NATMIG) - joint with EXE_111_002

This exercise will be joint with Solution 111 (as listed in WP2) and will evaluate ATCO and Remote pilot operational acceptability during IFR flight in airspace class C with a relevant mix of traffic considering both cooperative and non-cooperative (including equipment failures and infringements), specifically evaluating DAA aspects. Validation scenario/objectives: The exercise will evaluate both the operational aspects of the remote pilot reacting to DAA system alerts and guidance as well as general IFR operations including situations with C2 link latency and link loss. Focus will be to demonstrate airspace integration and interaction with ATC. Expected Achievements: Evaluation of RPAS IFR flight in class C airspace including human interaction (ATCO and Remote pilot) and more specifically on DAA aspects, identifying potential areas in need of improvements.

EXE_117_010 Second RTS LFV/COOPANS-SAAB (NATMIG) – joint with EXE_111_004

This exercise will be joint with Solution 111 (as listed in WP2) and will validate ATCO and Remote pilot operational acceptability during IFR flight in airspace class C, taking into account any technical and operational findings from the previous RTS exercise. The exercise will be done with a relevant mix of traffic considering both cooperative and

non-cooperative (including equipment failures and infringements), specifically validating DAA operational aspects. Validation scenario/objectives: The exercise will validate both the operational aspects of the remote pilot reacting to DAA system alerts and guidance as well as general IFR operations including situations with C2 link latency and link loss. Focus will be to demonstrate airspace integration and interaction with ATC. Expected Achievements: RPAS IFR flight in class C airspace validated, including human interaction (ATCO and Remote pilot) and more specifically on DAA aspects.

Partner's Contributions

To this Solution different beneficiaries will participate and contribute to reach the targets.

In particular is important to underline that beneficiaries involved comes from different company and areas like as: industry, ANSP, research and development centre, and this will guarantee that the contributions will feed the Solution from different perspective. Main activities in the frame of Solution are related to the development of the concept for RPAS integration, included operational/safety/performance and technical requirements production, development of dedicated use cases, update and development of working methods, analysis of operational environments, validation activities and related assessment in terms of the main KPA to be addressed. All these activities have been summarized in the following deliverables

According to the deliverables and validations that will be developed by the Solution in W2 in order to reach the target maturity level, the following activities have been planned:

- OSED/SPR (Operational Service Environment Description) that will collect in particular the Operational Environment and procedures description, the use cases and system/operation safety/performance requirements that are critical for developing a plan for the integration of RPAS from in current segregated operations to non-segregated operations in, including both CA and RWC functions. The Solution will consolidate needs, concept and operational scope using PJ13 ongoing partners' activity / participation from SESAR Wave 1, coordination (EDA-EASA, EUROCONTROL, ICAO etc.) and trials already performed. Through this, the Solution will consolidate the requirements for RPAS flight planning (OAT and GAT) and accommodation of initial RPAS demand as GAT traffic in targeted operational environments (e.g. dense, high traffic airspace vs. medium density/complexity airspace which has a few daily peaks). To the OSED task the following beneficiary will participate: ENAV, Leonardo, Airbus, NLR, ON (B4), LFV/COOPANS, Dassault Aviation, DFS, ENAIRE, EUROCONTROL, FRQ (FSP), HC (FSP), Honeywell SAS, INDRA, Thales AIR SYS, Thales AVS, DSN, SAAB, PANSA (B4) supported by PCSN (LTP).
- Validation Plan and Validation Report: To the validation planning and reporting tasks the following partners will participate: ENAV, Leonardo, ENAIRE, EUROCONTROL, FRQ (FSP), HC (FSP), DSN, Airbus, INDRA, SAAB, NLR, Thales AVS, PANSA (B4) supported by PCSN (LTP).
- Availability note: The Availability note will contain information about validation platform used during the exercises. The following partners will participate to this task: ENAV, Leonardo, EUROCONTROL, FRQ (FSP), DSN, Thales AVS, INDRA, PANSA (B4) supported by PCSN (LTP).
- Technical Specification: The Technical Specification contains the requirements that describe functional and capabilities specifications, covering performance, physical characteristics, environmental and facility conditions under which the functional block(s) enabling a SESAR Solution has to perform, requirements to interfaces (in case they are included in this document) and data definitions, security specifications, design constraints. The following beneficiaries will participate to this task: Leonardo, INDRA, Honeywell SAS, Airbus, Thales AVS, FRQ (FSP), SAAB, PANSA (B4) supported by PCSN (LTP).
- CBA: this document will contain the cost and benefit analysis taking into account the KPA and KPI impacted by Solution. The following beneficiaries will participate to this task: ENAV, Leonardo, Airbus, ON (B4), LFV/COOPANS, DFS, EUROCONTROL, Thales AIR SYS, Thales AVS,
- VALP Roadmap for Next Phase: a document that contain information about the planning for SESAR W3. The following partners will participate to this task: ENAV, Leonardo, ENAIRE, EUROCONTROL, Honeywell SAS, DSN, Thales AVS, Airbus, FRQ (FSP), SAAB, PANSA (B4) supported by PCSN (LTP).

Partners agreed the following responsibilities for the PMP deliverables of Solution 117:

Safety, Performance and Operational Requirements (SPR-INTEROP/OSED) V2: ENAV

Subcomponents of the previous document: HPAR: ENAV / PAR: ENAV / SAR: PANSA

Validation Plan (VALP) V2: Eurocontrol

Availability Notes: ENAV

Validation Report (VALR) V2: ENAIRE

CBA V2: FRQ (FSP)

Technical Specification (TS/IRS) V2: Leonardo

Initial Validation Plan (VALP) V3 defining the validation roadmap for phase V3: Eurocontrol

Participation per Partner	
Partner number and short name	WP3 effort
1 - LEONARDO	444.67
TPZ	14.33
2 - AIRBUS SAS	0.00
AI D&S GMBH	23.00
3 - NLR	3.90
4 - ON (B4)	19.46
5 - PANSAS (B4)	35.87
PSNC	27.48
6 - LFV/COOPANS	8.33
7 - DAV	14.30
8 - DSNA	26.90
ENAC	21.70
SAFRAN	34.20
9 - ENAIRE	10.15
ISDEFE	16.64
INECO	13.34
CRIDA	23.86
10 - ENAV	12.21
IDS AIRNAV	7.90
DEEP BLUE	4.11
CIRA	20.99
TECHNO SKY	13.96
11 - EUROCONTROL	135.00
12 - FRQ (FSP)	22.27
FCO	8.13
FRQ CZ	74.73
FRQ RO	7.63
13 - HC (FSP)	21.00
15 - INDRA	174.76
16 - SAAB	37.00
18 - THALES AIR SYS	0.00
TAS-FRANCE	14.25
19 - THALES AVS	152.51
20 - DFS	3.00
Total	1,447.58

List of deliverables

Deliverable Number¹⁴	Deliverable Title	Lead beneficiary	Type¹⁵	Dissemination level¹⁶	Due Date (in months)¹⁷
D3.1	Solution 115 - V3 Data Pack	10 - ENAV	Report	Public	35
D3.2	Solution 117 - V2 Data Pack	10 - ENAV	Report	Public	35

Description of deliverables

Solution 115 V3 Data Pack

Solution 117 V2 Data Pack

D3.1 : Solution 115 - V3 Data Pack [35]

The Solution data pack is provided at the end of the activities related to the V3 maturity phase to document its achievement.

D3.2 : Solution 117 - V2 Data Pack [35]

The Solution data pack is provided at the end of the activities related to the V2 maturity phase to document its achievement.

Schedule of relevant Milestones

Milestone number¹⁸	Milestone title	Lead beneficiary	Due Date (in months)	Means of verification
MS2	V3 Gate for solution PJ13-115	10 - ENAV	35	The V3 gate for solution 115 is successfully passed.
MS3	V2 Gate for solution PJ13-117	10 - ENAV	35	The V2 gate for solution 117 is successfully passed.

Work package number ⁹	WP4	Lead beneficiary ¹⁰	1 - LEONARDO
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]

LEONARDO

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 - LEONARDO	Ethics	Confidential, only for members of the consortium (including the Commission Services)	3
D4.2	POPD - Requirement No. 2	1 - LEONARDO	Ethics	Confidential, only for members of the consortium (including the Commission Services)	3
D4.3	GEN - Requirement No. 3	1 - LEONARDO	Ethics	Confidential, only for members of the consortium (including the Commission Services)	3

Description of deliverables

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

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

2.1. The procedures and criteria that will be used to identify/recruit research participants must be submitted as a deliverable. 2.2. The informed consent procedures that will be implemented for the participation of humans must be submitted as a deliverable. 2.3. Templates of the informed consent/assent forms and information sheets (in language and terms intelligible to the participants) must be submitted as a deliverable.

D4.2 : POPD - Requirement No. 2 [3]

4.1 The beneficiary must confirm compliance with GDPR and with respective national legal framework(s). 4.2 The beneficiary must confirm that it has appointed a Data Protection Officer (DPO) and the contact details of the DPO are made available to all data subjects involved in the research. 4.4 The beneficiary must explain how all of the data they intend to process is relevant and limited to the purposes of the research project (in accordance with the 'data minimisation' principle). This must be submitted as a deliverable. 4.6 A description of the technical and organisational measures that will be implemented to safeguard the rights and freedoms of the data subjects/research participants must be submitted as a deliverable.

D4.3 : GEN - Requirement No. 3 [3]

12.2. A thorough analysis of the ethics issues raised by this project and the measures that will be taken to ensure compliance with the ethics standards of H2020 must be included in the grant agreement before signature. 12.6. Other. The applicants must explicitly confirm the exclusive focus on civil applications.

Schedule of relevant Milestones

Milestone number ¹⁸	Milestone title	Lead beneficiary	Due Date (in months)	Means of verification
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1.3.4. WT4 List of milestones

Milestone number¹⁸	Milestone title	WP number⁹	Lead beneficiary	Due Date (in months)¹⁷	Means of verification
MS1	V3 Gate for solution PJ13-111	WP2	11 - EUROCONTROL	35	The V3 gate for solution 111 is succesfully passed.
MS2	V3 Gate for solution PJ13-115	WP3	10 - ENAV	35	The V3 gate for solution 115 is succesfully passed.
MS3	V2 Gate for solution PJ13-117	WP3	10 - ENAV	35	The V2 gate for solution 117 is succesfully passed.

1.3.5. WT5 Critical Implementation risks and mitigation actions

Risk number	Description of risk	WP Number	Proposed risk-mitigation measures
1	Divergence from content within current Standards. Decisions in international forums are made by those that participate supported by evidence (Low)	WP2	Active participation and involvement in the tasks of WG-105 and WG-75 (and their partner Special Committees in the RTCA) by Project Partners
2	Limited experimentation in DAA/RWC manoeuvres on Validation Platforms (Medium)	WP2	To be included in Wave 3 (Wave 2 where possible)

1.3.6. WT6 Summary of project effort in person-months

	WP1	WP2	WP3	WP4	Total Person/Months per Participant
1 - LEONARDO	36	21	444.67	✓	501.67
· TPZ	0	0	14.33		14.33
2 - AIRBUS SAS	0	6	0		6
· AI OP SAS	0	18	0		18
· AI D&S GMBH	0	12	23		35
3 - NLR	0	3.90	3.90		7.80
4 - ON (B4)	0	0	19.46		19.46
5 - PANSAS (B4)	0	0	35.87		35.87
· PSNC	0	0	27.48		27.48
6 - LFV/COOPANS	0	2.93	8.33		11.26
7 - DAV	0	0	14.30		14.30
8 - DSNA	0	22.40	26.90		49.30
· ENAC	0	0	21.70		21.70
· SAFRAN	0	18.40	34.20		52.60
9 - ENAIRE	0	0	10.15		10.15
· ISDEFE	0	0	16.64		16.64
· INECO	0	0	13.34		13.34
· CRIDA	0	0	23.86		23.86
10 - ENAV	0	0	12.21		12.21
· IDS AIRNAV	0	0	7.90		7.90
· DEEP BLUE	0	0	4.11		4.11
· CIRA	0	0	20.99		20.99
· TECHNO SKY	0	0	13.96		13.96
11 - EUROCONTROL	0	198	135		333

	WP1	WP2	WP3	WP4	Total Person/Months per Participant
12 - FRQ (FSP)	0	0	22.27		22.27
· FCO	0	0	8.13		8.13
· FRQ CZ	0	0	74.73		74.73
· FRQ RO	0	0	7.63		7.63
13 - HC (FSP)	0	0	21		21
14 - Honeywell SAS	0	7	0		7
· Hlsro	0	175	0		175
· Hlinc	0	24	0		24
15 - INDRA	0	0	174.76		174.76
16 - SAAB	0	110	37		147
17 - NATS	0	13.40	0		13.40
18 - THALES AIR SYS	0	1	0		1
· THALES SIX	0	176	0		176
· TAS-FRANCE	0	4.75	14.25		19
19 - THALES AVS	0	8.30	152.51		160.81
· THALES SIX	0	47	0		47
20 - DFS	0	0	3		3
21 - DLR	0	0	0		0
22 - ANS CR (B4)	0	0	0		0
23 - LPS SR (B4)	0	0	0		0
24 - ACG/COOPANS	0	0	0		0
25 - CCL/COOPANS	0	0	0		0
26 - IAA/COOPANS	0	0	0		0
27 - Naviair/COOPANS	0	0	0		0
28 - ATOS (FSP)	0	0	0		0
29 - AIRTEL	0	0	0		0

	WP1	WP2	WP3	WP4	Total Person/Months per Participant
30 - SINTEF	0	0	0		0
Total Person/Months	36	869.08	1447.58		2352.66

1.3.7. WT7 Tentative schedule of project reviews

Review number ¹⁹	Tentative timing	Planned venue of review	Comments, if any
RV1	15	SJU premises	Review linked to the 1st period
RV2	27	SJU premises	Review linked to the 2nd period

1. Project number

The project number has been assigned by the Commission as the unique identifier for your project. It cannot be changed. The project number **should appear on each page of the grant agreement preparation documents (part A and part B)** to prevent errors during its handling.

2. Project acronym

Use the project acronym as given in the submitted proposal. It can generally not be changed. The same acronym **should appear on each page of the grant agreement preparation documents (part A and part B)** to prevent errors during its handling.

3. Project title

Use the title (preferably no longer than 200 characters) as indicated in the submitted proposal. Minor corrections are possible if agreed during the preparation of the grant agreement.

4. Starting date

Unless a specific (fixed) starting date is duly justified and agreed upon during the preparation of the Grant Agreement, the project will start on the first day of the month following the entry into force of the Grant Agreement (NB : entry into force = signature by the JU). Please note that if a fixed starting date is used, you will be required to provide a written justification.

5. Duration

Insert the duration of the project in full months.

6. Call (part) identifier

The Call (part) identifier is the reference number given in the call or part of the call you were addressing, as indicated in the publication of the call in the Official Journal of the European Union. You have to use the identifier given by the Commission in the letter inviting to prepare the grant agreement.

7. Abstract

8. Project Entry Month

The month at which the participant joined the consortium, month 1 marking the start date of the project, and all other start dates being relative to this start date.

9. Work Package number

Work package number: WP1, WP2, WP3, ..., WPn

10. Lead beneficiary

This must be one of the beneficiaries in the grant (not a third party) - Number of the beneficiary leading the work in this work package

11. Person-months per work package

The total number of person-months allocated to each work package.

12. Start month

Relative start date for the work in the specific work packages, month 1 marking the start date of the project, and all other start dates being relative to this start date.

13. End month

Relative end date, month 1 marking the start date of the project, and all end dates being relative to this start date.

14. Deliverable number

Deliverable numbers: D1 - Dn

15. Type

Please indicate the type of the deliverable using one of the following codes:

R	Document, report
DEM	Demonstrator, pilot, prototype
DEC	Websites, patent filings, videos, etc.
OTHER	
ETHICS	Ethics requirement
ORDP	Open Research Data Pilot
DATA	data sets, microdata, etc.

16. Dissemination level

Please indicate the dissemination level using one of the following codes:

- PU Public
- CO Confidential, only for members of the consortium (including the Commission Services)
- EU-RES Classified Information: RESTREINT UE (Commission Decision 2005/444/EC)
- EU-CON Classified Information: CONFIDENTIEL UE (Commission Decision 2005/444/EC)
- EU-SEC Classified Information: SECRET UE (Commission Decision 2005/444/EC)

17. Delivery date for Deliverable

Month in which the deliverables will be available, month 1 marking the start date of the project, and all delivery dates being relative to this start date.

18. Milestone number

Milestone number: MS1, MS2, ..., MSn

19. Review number

Review number: RV1, RV2, ..., RVn

20. Installation Number

Number progressively the installations of a same infrastructure. An installation is a part of an infrastructure that could be used independently from the rest.

21. Installation country

Code of the country where the installation is located or IO if the access provider (the beneficiary or linked third party) is an international organization, an ERIC or a similar legal entity.

22. Type of access

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

23. Access costs

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

History of Changes

Page/section	Nature of change and reason (if applicable)
Part A	
1.2	Changed Dassault Aviation short name to “DAV”. Dassault’s request.
1.3.2	Deliverable list changed: inserted one “data pack” for each solution. The single documents that are composing the data packs were deleted (they will be left in the excel file). SJU request.
1.3.2	The dissemination level of the “Final report” was set to PU. SJU request. SJU request.
1.3.2	The dissemination level of the three datapacks was set to PU. SJU request. SJU request.
WP3	Text of subworkpackages WP03.1 and WP03.2 was pasted to the description of WP03. The reason for this is that the SYGMA portal does not allow a structure in subworkpackages.
WP3	The table of partner’s contribution for sol115 was rewritten in a form of list as the SYGMA portal does not allow to insert tables in the WP description.
1.3.4	The list of milestone was rewritten so as to have a milestone for each datapack delivery. Three milestones were left: one for each solution.
	Project duration changed to 37 months instead of 36. Deadlines of deliverables and milestones were updated accordingly.
WP3	The WP3 description contained two mentions of NATS as participant to solution 117. This mentions were introduced by mistake during the proposal phase and were deleted after an appropriate verification with the partner, with the Solution Leader and with the Grant Manager.
WP3 description	Description of EXE_117_003 changed to “FTS/RTS” at the request of Eurocontrol to correct an inaccuracy.
WP3 description (solution 117)	Added text to define the partners responsible for each PMP subdeliverable of the datapack. At the request of ENAV. The list was agreed among the partners.
WP3	<p>The following sentence was removed from the GA at the request of INDRA:</p> <p><i>A second ATC environment for flight preparation will be provided by INDRA, and it will be compatible with the following ATM system and en-route airspace impacts /validations:</i></p> <ul style="list-style-type: none"> • <i>Flight planning and ATC awareness.</i> • <i>Separation provision due to latency and a different flight awareness of the crew.</i> • <i>Communications with RPAS crossing several airspaces boundaries.</i> • <i>Weather conditions changes that require a specific coordination between ATC and RPAS.</i> • <i>RPAS contingency procedures in case of loss of C2 link.</i> <p>The sentence is in fact a leftover of the validation that Indra intended to address in the project. It was included at an early stage under Solution 115 but the exercise was finally retained in Solution 117 and inadvertently was it never deleted from the Solution 115 section. Indra never consider in fact to participate to the joint exercise in Solution 115, as reflected in the partners’ contribution table</p>
WP3	Due to the absence of a second ATC system, Solution 115 will not be able to perform cross-border validation. As a consequence of this, in WP3 description (part A), where the accommodation needs are described, the sentence “RPAS specificities compared to manned aviation and their impact on Air Traffic Management (Flight domain, Remote piloting, sector and cross border hand-overs, contingencies)” was changed to “RPAS specificities compared to manned aviation and their impact on Air Traffic Management (Flight domain, Remote piloting, sector hand-overs, contingencies)”.
WP3	<p>The table of partner’s contribution for sol115 was changed for the FRQ (FSP) contribution: added the participation to VALP and VALR and removed the participation to TS.</p> <p>In fact it was clarified within the solution 115 working group that FRQ (FSP) will provide a pre-flight component to the validation platform, hence no activities are necessary for the TS.</p>
WP3	<p>The table of partner’s contribution for sol115 was changed for the SAAB contribution: deleted the participation to TS, AN and VALR.</p> <p>In fact it was clarified within the solution 115 working group that SAAB will not provide components to the validation platform, hence no activities are necessary for TS, AN and VALR definition. (SAAB will concentrate their activities on OSED/SPR and VALP)</p>
WP3	<p>The sentence “It will be evaluated the opportunity to use the THALES AVS FMS in the contingency procedures assessment” was deleted from the description of EXE_117_003 EUROCONTROL.</p> <p>The reason is that such an evaluation has already been performed and the outcome was that it would not</p>

	be possible for THALES AVS to integrate the FMS in a further additional environment to the two ones it will be used in.
WP3	The description of solution 115 was modified to add the partners leading each document (OSD/TS/...).
Part B	
1.1 / 1.3.2	Inserted text to address a shortcoming relevant to “inconsistency between solutions 111 and 115/117” (refer to 8.a in the “GUIDANCE DOCUMENT FOR COORDINATORS INVITED TO GRANT AGREEMENT PREPARATION CALL H2020-SESAR-2019-1”)
All along the document	Short names changed so as to be compliant to the list contained into the SYGMA portal (refer to 12 of the guidance document)
4.1.1.5	Added the role of the PANSA’s LTP. PANSA’s request.
4.1.1.10	Changed the description of ENAV LTPs. ENAV’s request.
4.1.2	CV of WP03 solution leader changed. ENAV’s request.
4.2.1	Section relevant to Leonardo’s subcontractors deleted. Answer changed to “NO”. Leonardo’s request.
4.2.5	Text added to explain PSNC’s (PANSA’s LTP) role in the project. PANSA’s request.
4.2.8	Text added to explain the activities of DSN’s LTPs in the project. DSN’s request.
4.2.10	ENAV’s LTP changed. Removed “IDS INGEGNERIA DEI SISTEMI”, inserted “IDS AIRNAV SRL”. ENAV’s request.
4.2.14	Removed “Honeywell EMS Satcom UK Ltd” from Honeywell’s LTPs. Honeywell’s request. The reasons for the change resulted from a deeper review of the resources and expertise needed to perform the research tasks presented in the proposal. The expertise originally assumed to be provided by Honeywell EMS Satcom UK will be fully covered by another Honeywell’s LTP (Linked Third Party): Honeywell International sro . The scientists and engineers employed at Honeywell International sro possess all the required education, knowledge and expertise to perform the tasks required by the Project 13 ERICA. The LTP Honeywell International sro sites are also technically equipped including several state-of-art laboratories and simulators to perform all tasks planned within PJ13 proposal. The change does not modify the general terms of the proposal.
1.3.2	Inserted text to address the shortcoming relevant to the “methodology” (refer to 8.a).
3.4	Inserted text to manage the “Max Grant Amount” and the list of deliverables and activities that will be performed on the basis of the available Grant Amount.
3.1.1	The gantt chart was updated to address the shortcomings and inconsistencies. (refer to 8.a in the “GUIDANCE DOCUMENT FOR COORDINATORS INVITED TO GRANT AGREEMENT PREPARATION CALL H2020-SESAR-2019-1”)
4.2.8	Text modified to improve the description of the subcontracted activities for DSN. At request of the Grant Manager.
4.2.19	Text modified to improve the description of the subcontracted activities for Thales AVS. At request of the Grant Manager.
3.1.1	Description of EXE_117_003 changed to “FTS/RTS” at the request of Eurocontrol to correct an inaccuracy in the gantt chart.
4.2.11	Text modified to improve the description of the subcontracted activities for Eurocontrol. At request of the Grant Manager.
3.4b tables	The description tables of the “other direct costs” of all the partners were modified at the request of the Grant Manager.
4.3	Section removed according to the request of the Grant Manager on 18/9/19.
5 Ethics	Chapter 5 was modified to answer to the remarks of the “Ethics Summary Report”. Three modifications were added: <ul style="list-style-type: none"> paragraph 5.1.1 – to assure that post-grant requirements about humans will be addressed paragraph 5.2.2 - to assure that post-grant requirements about protection of personal data will be addressed paragraph 5.1.5 “Remarks on the “Exclusive Use on Civil Applications”” was added to address the concerns about the exclusive focus on civil applications.
1.3.2	Due to the absence of a second ATC system, Solution 115 will not be able to perform cross-border validation. As a consequence of this, the sentence “Airspace structure for the accommodation concept, including cross border operations and multi-FIR (Flight Information Region) environment.” was changed to “Airspace structure for the accommodation concept, including multi-FIR (Flight Information Region) environment.”
4.1.1.11	The description of Eurocontrol was modified in the “contribution” section to state that they will also

	participate to solution 115 activities.
3.4b tables	SAAB's, LFV/COOPANS' and Leonardo's descriptions of "other direct cost" were modified at the request of the Grant Manager.
3.4 Resources to be committed	At the request of the Grant Manager it was deleted the following text: "List of documents compounding the contractual Data Packs to be completed with the funds of the First SJU contribution: [omissis] List of deliverables and activities to be partially executed with the funds of the First SJU contribution: [omissis]".

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ACRONYM LIST

ACAS	Airborne Collision Avoidance Systems
ADS-B	Automatic Dependent Surveillance - Broadcast
ANS	Air Navigation Service
ANSP	Air Navigation Service Provider
ASA	Airborne Separation Assistance
ASBU	Aviation Systems Block Upgrades
ASD	AeroSpace and Defence Industries Association of Europe
ATC	Air Traffic Control
ATCO	Air Traffic Controllers
ATM	Air Traffic Management
BRLOS	Beyond radio Line of Sight
C2	Communication and Control
CA	Collision Avoidance
CAA	Civil Aviation Authority
CANSO	Civil Air Navigation Services Organization
CNS	Communication Navigation Surveillance
CONOPS	Concept of Operations
CPDLC	Controller Pilot Data Link Communications
DAA	Detect And Avoid
DASC	Digital Avionics Systems Conference
DESIRE	Demonstration of Satellites enabling the Insertion of RPAS in Europe
EASA	European Aviation Safety Agency
EDA	European Defence Agency
ERA	Enhanced RPAS Automation
ERICA	Enable RPAS Insertion in Controlled Airspace
EUROCAE	European Organization for Civil Aviation Equipment
FAA	Federal Aviation Administration
FTS	Fast Time Simulation
GAT	General Air Traffic
GNSS	Global Navigation Satellite System
GSA	European GNSS Agency
HALE	High Altitude Long Endurance
HMI	Human Machine Interface
ICAO	International Civil Aviation Organisation
ICAS	International Council of the Aeronautical Sciences Congress
ICRA	International Conference on Research in Air Transportation
IFR	Instrument Flight Rules
INTEROP	Interoperability Standard
JARUS	Joint Authorities for Rulemaking on Unmanned Systems
JU	Joint Undertaking
KPA	Key Performance Assessment
MALE	Medium Altitude Long Endurance
MASPS	Minimum Aviation System Performance Standards
MIDCAS	Mid Collision Avoidance System
MOPS	Minimum Operational Performance Standards
NAA	National Aviation Authority
OAT	Operational Air Traffic
OI	Operational Improvement
OSD	Operational Service and Environment Description
PJ	Project
RA	Resolution Advisory

RP	Remote Pilot
RPAS	Remotely Piloted Aircraft Systems
RPS	Remote Pilot Station
RTCA	Radio Technical Commission for Aeronautics
RTS	Real Time Simulation
RWC	Remain Well Clear
SARPS	Standards And Recommended Practices
SES	Single European Sky
SESAR	Single European Sky ATM Research
SID	Standard Instrument Departure
SPR	Operational, Safety and Performance Requirements Standard
STAR	Standard Terminal Arrival Route
TCAS	Traffic Collision Avoidance System
TMA	Terminal Manoeuvring Area
TRAWA	Traffic Awareness
TSA	Temporary Segregated Area
V&V	Verification & Validation
WG	Working Group
WOC	Wing Operations Centre

1. Excellence

This project is part of the SESAR JU Single Programming Document 2019-2021 [1]. It is part of the Industrial Research & Validation phase, developed under the SJU Private Public Partnership. The present proposal addresses PJ13 W2 “IFR RPAS” (Instrument Flight Rules, Remotely Piloted Aircraft Systems) which is composed of the following Solutions:

- Solution PJ.13-W2-111 “Collision avoidance for IFR RPAS”
- Solution PJ.13-W2-115 “IFR RPAS accommodation in Airspace Class A to C”
- Solution PJ.13-W2-117 “IFR RPAS integration in Airspace Class A to C”.

Today, RPAS and drones are limited to fly in segregated airspaces and they cannot operate with other manned or unmanned aircraft systems in IFR traffic. Their coexistence with the manned aviation, and their operation within the same airspace and under a common air traffic control, is requiring to face a certain number of challenges (operational, technical, regulatory), strictly relevant to their nature of being distributed systems, a nature that today is preventing and limiting their operations outside segregated airspaces.

Introducing a new actor like an RPAS into the air transport system will only be possible if some gaps are bridged: RPA flies at a considerable distance from the remote pilot, who manages the air vehicle but who perceives all the information relevant to the flight only by means of the data transmitted from air to ground, sometimes with some delay. No possibility to look out of the window and to see the space surrounding, no possibility to directly perceive the real situation inside and outside the aircraft (“situation awareness”).

Moreover, with respect to manned aircraft, additional technical capabilities have to be considered: reliable and safe communications, management of contingencies in case of loss of communications or remote control, performance of command and control as well as the capability to promptly react to some potentially dangerous external situations (e.g. air proximity) and without the intervention of the pilot, both for collaborative and non-collaborative air traffic.

For such aircraft categories, recognised operational procedures are missing today and have to be defined in order for them to operate in non-segregated airspace both in nominal and contingency/emergency conditions, taking into account the peculiarity of RPAS of being controlled remotely. Moreover, it must be noted that in recent years a significant proliferation of similar activities has been launched in the military field without reaching a common and recognised regulation.

The need for RPAS to fly out of segregated airspaces is a must as stated by market analyses and surveys developed by different stakeholders in the international community. RPAS traffic growth is set to significantly expand and will support the user community in different sectors enabling a wide range of applications and services (both civil and military) that need a routine access to the non-segregated airspace as a prerequisite.

The above can be feasible only if a common way to operate and safely control the RPAS is defined at European level, adopted and supported by valid proven solutions in respect of the ICAO rules of air (as today and future evolutions) and without any negative impact on the existing ATM.

The successful integration of RPAS with the Commercial Aviation is a key challenge for the Single European Sky (SES) that, if not properly addressed, can negatively impact the global performance and safety of the future European Transport System.

Exploiting as much as possible the results available from different European and worldwide related activities, **the high level objective of the project is to provide tangible and validated results to the Regulation and Standardisation Authorities, to accelerate the establishment of a common European basis on which, in the near future, industries will develop recognised and accepted solutions while operators and service providers will be able to operationally use the solutions.** The ERICA project is a means to demonstrate validity and limits of the possible solutions, while providing a solid contribution to the regulatory and standardisation authorities.

In the framework of the routine access of RPAS into non-segregate airspace, the ERICA project will significantly contribute to the:

- establishment of a valid and recognised European operational and technical performance base;
- consolidation of a common regulatory and standardisation base within and outside Europe, both for Industry and Air Navigation Service Providers; ERICA will provide outputs and results for the production of standards and regulations. EASA, EUROCAE, JARUS, ICAO and other regulators will benefit from elements provided from ERICA like as: Operational and technical requirements, use cases and results/assessment of validation exercises.
- increase of the SESAR Key-Performance Indicator in terms of **Access to the airspace, Equity, Efficiency and Safety**, enabling civil and military RPAS, both fixed and rotary wing, to safely operate in Europe in accordance to the needs expressed by the community while meeting the established regulation and standards;
- exploitation of existing ATM infrastructures, with limited modifications and compatibility with the future ATM environment and infrastructures;
- enhancement of the **networking capacity** of ATC, that will manage RPAS without impacts on the manned traffic and will possess the capability to accommodate further traffic demands and different operational and airspace classes (“scalability” of the solution);
- export of the relevant technologies to other sectors with positive effects on the economy.

The project will build upon results from previous research, including SESAR 1 projects and SESAR2020 Wave 1 projects as well as mature results coming from the other RPAS framework as more detailed in the next chapters.

1.1 Objectives

The ERICA project is aimed at providing the basis for defining, developing and validating the key operational and technological enablers that are necessary to assure the proper insertion of RPAS into non-segregated airspace in terms of:

- “Collision avoidance for IFR RPAS” by developing and operationally validating a Detect And Avoid (DAA) system for IFR RPAS operating in airspace A to C that will allow the Remote Pilot (RP) to contribute to safety by preventing collisions in case the normal separation provisions fail.
- “IFR RPAS accommodation and integration in airspace Class A to C” by developing a framework for the insertion of RPAS into the non-segregated airspace, allowing their routine access and operations.

These aims will be achieved through the development and validation (at different maturity levels) of the three Solutions included in PJ13 W2 “IFR RPAS”.

In more detail, the objectives of the project are the following:

1. to develop and validate a DAA system to support the Remote Pilot during his/her operations, within the airspace categories A-C, in compliance with the ATC instructions. DAA is composed of a “collision avoidance” and a “remain well clear” function that will be both taken care of, for the air and the ground segments (including the interaction with the ATM system). The integration of Collision Avoidance (CA) and Remain Well Clear (RWC) with the avionics will be considered and the RP human performance will be assessed in human-in-the-loop simulations. The potential impact of DAA on controllers’ human performance will be evaluated as well as the dynamic of responsibility allocation between RWC and separation provision. RPAS on-ground operative phases are excluded from this proposal. The validation will be performed at V3 maturity level (ref. Solution PJ13-W2-111);
2. to develop and validate, in a stepped approach, a framework for the insertion of RPAS into the non-segregated airspace of category A-C, allowing their routinely access and operations; for such a scope, two main streams of activities are foreseen as follows:
 - “Accommodation” of civil and military IFR RPAS, in accordance to the typology of platform and mission/application that are characterising the initial demand, trying to exploit

as much as possible mature capabilities and systems existing at the target accommodation date. The validation will be performed at V3 maturity level (ref. Solution PJ13-W2-115);

- “Integration” of military and civil IFR RPAS, enabling from the operational and technical point of views, their deployment in a cooperative environment, in full integration with the manned aviation. The validation will be performed at V2 maturity level (ref. Solution PJ13-W2-117).

Starting from the above high level objectives, in the following the detailed objectives that will be addressed in the different project Solutions are further elaborated.

With respect to the Technical Specification of the call [2], the ERICA proposal is addressing the objectives of all the three Solutions, but in order to have a tighter coordination between Solution 115 and Solution 117, ERICA addresses both the topics of “accommodation” and “integration” into a single level 1 workpackage. This choice has been considered appropriate because Solution 115 is a step towards to Solution 117 and that both the two topics deal with subjects with large commonalities that must be managed together. In spite of this choice, “accommodation” and “integration” have their own separate streams of activities, in order to guarantee the traceability of objectives and results.

Solution 111 “Collision avoidance for IFR RPAS”

The objective of Solution 111 is to develop and operationally validate at V3 level a Detect and Avoid (DAA) system for IFR RPAS operating in airspace class A-C.

This Solution will consider both the CA and RWC functions and it will address both the European DAA and the joint USA/European ACAS-Xu concepts, currently in development, with a specific set of Validation Exercises. This work will be supported by further development of the Modelling and Metrics activities started in SESAR2020 Wave 1 developing European Encounter Models for RPAS now extended to DAA time-horizons and further development of European Acceptability Criteria.

Collision avoidance systems are operational globally. They are mandated for certain categories of aircraft and provide substantial safety benefits in airspaces throughout the world, possibly having saved many lives. The development of collision avoidance systems for new classes of airspace user must interoperate with existing systems and vice versa.

The following main objectives are associated to this overall goal:

1. Analyse, develop and validate the European DAA (CA and RWC) building on the EUROCAE WG-105 European standards (under development), MIDCAS, TRAWA.
2. Ensure that the specification for the CA and RWC functions match the operational requirements, by coordinating closely with Solution 117. Such a coordination will be possible because most of the operational requirements are independent on the final maturity level (that is different for the two solutions) as they are related to the “RPAS insertion” concept in general and they can be considered as fundamental statements.
3. Analyse, develop and validate the ACAS Xu (CA and RWC), building on EUROCAE/RTCA WG-75/RTCA SC-147 standards (under development). Continuing the work from SESAR Wave 1, a specific focus will be devoted to ACAS-Xu with the aim to understand and assess its compatibility within the European context (similar to the work performed for ACAS Xa for EASA).
4. Develop the European Encounter Modelling and Metrics techniques to apply to DAA/RWC.
5. Ensure the interoperability of the solution with the existing and currently under development Collision Avoidance Systems. Ensure that the DAA Solution is compatible with other avoidance technology (e.g. ACAS) or procedures (e.g. ATC separation standards) which are in place for manned aviation.
6. Assess the impact on avionics, controllers and remote pilots so as not to adversely affect human performance and to guarantee responsibility allocation between RWC on board function and on ground separation provision management (e.g. it is needed to clarify the ATCo responsibility and the

RWC behaviour with regard to CA when the RPA is in class A-C airspace, the C2 link is lost and the airborne intruder is not cooperative).

7. Ensure that the work conducted in SESAR2020 Wave 1 by PJ.11-A2 on ACAS Xu and PJ.10-05 on DAA and CA, will be taken as a baseline.
8. Ensure the coordination with the relevant work conducted outside SESAR (e.g. EDA research projects TRAWA and MIDCAS) with a focus on the accessible outcomes only.
9. Coordinate with both EUROCAE WG-75 and WG-105.
10. Ensure that both civilian and military airspace users are considered.

Solution 115 “IFR RPAS Accommodation in Airspace Class A to C” and Solution 117 “IFR RPAS Integration in Airspace Class A to C”

The general objective of the two solutions is to enable IFR RPAS operations in controlled airspace classes A-C considering both “accommodation” and “integration” measures. The operational and performance requirements that are needed to achieve accommodation and full integration will be identified, as well as the working methods. It is important to remind here that the term “accommodation” refers to a set of measures that will be adopted to assure the operational capability of RPAS in non-segregated classes A-C controlled airspace in the short term and mainly by making use of mature technologies at the target accommodation timeframe (2021-2025). The aim is to reach a first insertion, related to initial RPAS demand into the General Air Traffic (GAT) in the short term, most likely with some limitations and minimizing the impact on the existing ATM framework. On the other side, the term “integration” refers to a set of measures that will be adopted in the long term and that will likely use advanced concepts and new technical enablers, with the aim to reach the full insertion of RPAS in the GAT without the above limitations. Accommodation and integration refer therefore to two different temporal horizons.

Accommodation objectives will be reached by means of existing certified navigation solutions and civil regulation compliance coming from commercial aviation, and derived for remote piloting to allow safe navigation in controlled airspace classes A to C. The objective, in the accommodation solution, is to manage insertion with the minimum possible evolution, relying on mature capabilities to reach the V3 maturity level.

The scope in the accommodation solution will be the basis for the next step to the full RPAS integration, consistently with the DAA concept developed in Solution 111 when considering A-C classes of airspace.

This approach for insertion of RPAS in GAT will optimize the development and deployment costs and will minimize the risks. Moreover, the use of assets from commercial aviation will naturally minimize the impact on ATM procedures and will secure a short-term ATM accommodation phase deployment roadmap.

Specific objectives of accommodation and integration will be the development and validation of:

- Concept of operations (CONOPS) both for accommodation and integration;
- RPAS technical capabilities;
- ATM planning tools;
- ATC tools;
- ATC procedural means,

to allow IFR RPAS to comply with ATC instructions and to allow ATC to handle IFR RPAS in a cooperative environment in a first accommodation step further leading to full integration with manned aviation.

The automation of IFR RPAS operations will also be investigated taking into account the impact on ATC workload, operational safety, impact on capacity, efficiency and other key performance parameters.

The present Solutions will address the RPAS category capable to fly in controlled airspace, in detail the “Certified” category identified by EASA where requirements are comparable to those for manned aviation. It will be required an oversight by NAA (issue of licenses and approval of maintenance, operations, training,

ATM/ANS and aerodromes organizations) and by EASA (design and approval of foreign organisations) according to a process similar to manned aviation.

Going in a more detail, the Solution will address RPAS belonging to Class VI defined in the EUROCONTROL RPAS CONOPS that are capable of carry out IFR operations (Network included), TMA operations with capability of flying SIDs and STARs as designed for manned operations, taking into account RPAS such as MALE/HALE with fixed wing and rotary aircraft as well.

With reference to the RPAS category targeted by ERICA, validation activities planned in the frame of accommodation and integration solutions will include BRLOS operations in controlled airspace with both fixed wing and rotary wing. Rotorcrafts as example can perform some special operations different from the fixed wing and this will be useful to gather results and recommendations for a complete RPAS insertion considering the future market and main users.

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

The ERICA proposal addresses all the three Solutions of PJ.13 reported in List 1 of the SESAR Wave 2 Working Programme [2]:

- Solution PJ.13-W2-111 “Collision avoidance for IFR RPAS”
- Solution PJ.13-W2-115 “IFR RPAS accommodation in Airspace Class A to C”
- Solution PJ.13-W2-117 “IFR RPAS integration in Airspace Class A to C”

While the objectives relevant to DAA will be addressed within Solution 111, the accommodation and integration of RPAS into airspace class A-C will be addressed in one single work package that contains two Solutions, as already stated at paragraph 1.1.

1.2.1 Problem Statement

In line with the PJ13 contents, the ERICA proposal will contribute to address the **Problem Statement and R&D Needs** as defined in [2]:

The number of remotely piloted aircraft systems (RPAS) is continuously increasing and this will imply higher interactions with the wider ATM system. IFR RPAS operation characteristics e.g. speed, manoeuvrability, etc., together with their avionic system equipage may differ substantially from conventional aircraft.

One basic principle underpinning the integration of IFR RPAS in ATM, in alignment with ICAO principles, is that RPAS have to be treated in a similar manner to manned aircraft while duly considering the specific character of remotely-manned operations. IFR RPAS must be transparent (alike) to ATC and other airspace users.

Considering that RPAS and drones are today limited to fly in segregated airspaces and they cannot operate with other manned or unmanned aircraft systems in IFR traffic, there is a strong need to enable their operations in line with the community expectations. As far as the “**geographical spread**” and “**time scale**” are concerned, at European level this problem affects **all the existing airports at any time** (night and day).

1.2.2 Challenges and scope

In terms of expected performances, the ERICA proposal will work with the aim to improve:

- **Safety**, thanks to the development of a Detect And Avoid system for preventing collisions with other traffic;
- **Efficiency**, with the definition of procedures and systems that will enable the introduction of IFR RPAS in a controlled environment;

- **Access and Equity**, enabling new users to access the airspace.

In line with the PJ13 objectives stated in the call, the ERICA proposal will:

- develop and operationally validate at V3 level a **DAA system** (both for the CA and RWC functions), for collaborative and non-collaborative air traffic (e.g. intruders that are violating the own RPAS aerospace volume), supporting IFR RPAS when operating in airspace class A-C;
- develop and validate the **framework for accommodation and integration** of IFR RPAS operating in airspace class A-C, respectively at V3 and V2 level, taking into account the initial and long term demand for civil and military users (scalability from the initial to the long term demand);
- consider IFR RPAS operating both in **nominal and contingency/emergency conditions**, taking into account the capability of the existing (for accommodation) and future (for full integration) ATM infrastructures (SESAR compatibility);
- use as a basis what is currently available in terms of concepts, regulations, standards and technologies to develop the PJ.13 objectives;
- establish the necessary coordination with other SESAR 2020 projects, and with Regulatory and Standardization Bodies, EDA, EASA, EUROCAE, ICAO outside it, with the aim to manage the relevant **interdependencies**;
- assure the **scalability** of the solution: the **networking capacity** of the ATC will allow managing RPAS without impacts on the manned traffic and will allow accommodating further traffic demands and different operational and airspace environments.

The ERICA proposal addresses the activities designed by the SJU to cover the full spectrum of the research topics contained in the SESAR 2020 Work Programme [2]. In particular it relates to the following topics:

- *Advanced air traffic services*, with special focus on enhanced air safety nets (treated by Solution 111), separation and contingency management in En-Route and TMA (treated by Solutions 115 and 117). It should be noted that the investigation of the topic “Advanced air traffic services” applied to RPAS is already started in Solutions PJ.10.05 (“IFR RPAS Integration”) and PJ.11-A2 (“A2: Airborne Collision Avoidance for Remotely Piloted Aircraft Systems – ACAS Xu”) of SESAR2020 wave 1, this means that ERICA will use also the outcomes of those Solutions as baseline material.
- *Enabling aviation infrastructure*, with special focus on Communications, Navigation and Surveillance (CNS). The CNS topic applied to RPAS is new in SESAR2020 and will be treated partially in PJ13 (e.g. ATC COM performance, C2 link performance) and partially in PJ14, this means that a coordination should be created between the two projects.

With reference to *separation and contingency management in En-Route and TMA*, Solutions will fully address this topic by investigating separation hazards that can occur not only while flying in en-route but also in TMA, during approach or climb. Solutions 115 and 117 will incrementally address separation hazards and contingencies in two streams:

- Assessment and adaptation of current separation standards and associated procedures for RPAS accommodation in both nominal situations and unplanned situations¹;
- Investigation of automatic management of separation for RPAS full integration with manned aviation in compliance with ATC instructions as well as the interoperability of these automatic functions with other RPAS capabilities such as the Automatic Take-Off and Landing standardized by EUROCAE. The technical solutions will be researched in order to close the gap EC 1.2 (in particular: conflict management and traffic avoidance), EC 2.1 (*C2 specifications in case of degraded modes: contingency plans, alternate modes, reacquisition strategies*), EC 3.2 (*ATM*

¹ Contingency procedures to handle, inter alia, C2 temporary or complete link loss, ATC communications loss, Navigation RNP degradation, transponder loss. Contingencies may rely on standard or specific technical capabilities.

interfaces in SESAR context) and EC 5.3 (*On-board real-time smart processing*) identified in [3] - [4].

With reference to *Enabling aviation infrastructure*, Solutions will address this topic by investigating the CNS performance that are required to guarantee the separation in spite the remote control of the operations. The technical Solutions will be researched in order to close the gap EC.1.2 (in particular: ATC data-link communication, GNSS navigation, ADS-B surveillance), EC 2.1 (*minimum RLP for C2*), EC 2.2 (*LOS/BLOS SATCOM infrastructure and data link*) and EC 3.2 (*ATM interfaces in SESAR context*) identified in [3]. Technical Solutions will be researched, inter alia, for communications between ATC and Remote Pilot by exploring, pros and cons of using SATCOM and datalink with ATC to manage separation issues.

Solution 111 will address RPAS Remain Well Clear and Collision Avoidance guidance and manoeuvres. These underpin the integration and accommodation goals in the other PJ13 Solutions. A variety of surveillance means will be investigated and insertion on a non-interference basis with current systems will be assessed.

1.3 Concept and methodology

1.3.1 Concept

The starting point

In the past years, several activities on RPAS Air Traffic Insertion have been developed and several are in the pipeline at national, European and worldwide level. Whereas on one side such a proliferation indicates the high level of attention to the topic of RPAS integration in non-segregated airspace, on the other one there is the risks to disperse the limited resources available.

The integration of RPAS, with routine access to non-segregated airspace, is a complex task that requires a holistic and multidisciplinary approach where all the competent and responsible stakeholders are committed to collaborate.

In the scope of the SESAR2020 programme, the **ERICA proposal constitutes a valid framework since it encompasses all the competencies, experience and partnership for addressing the necessary operational and technical aspects in one common European view.**

In fact, on the basis of the experience gathered by the ERICA partners, it will be possible to avoid to start from scratch and to exploit as much as possible the existing results, to verify their validity, to change and to adapt them when necessary. Moreover, it will be possible to demonstrate in a realistic environment the validity and limits of the approach and to constitute a solid base in terms of outcomes and recommendation to the Regulatory and Standardization Bodies.

For this purpose, it will be essential to take into consideration the main free access outcomes of at least the following national and international researches and innovation activities:

- SESAR 1 outcomes: in particular WP 4.7.6 and WP 9.06 for airborne separation assistance concept and applications;
- SESAR2020 wave 1 outcomes: in particular Solution PJ.10.05 data pack; Solution PJ.11-A2 data pack; RPAS Demos results;
- EDA accommodation study;
- EDA project ERA (Enhanced RPAS Automation), in particular for contingency and emergency recovery;
- EDA project MIDCAS and MIDCAS SSP;
- EDA project DESIRE;
- Ongoing EASA-EDA activity: “Guidelines for the accommodation of military IFR RPAS under GAT – Airspace classes A-C”;
- ICAO RPAS Panel studies;
- JARUS studies;

- GSA Projects;
- EUROCONTROL RPAS Operational Concept;
- EUROCAE RPAS Standards (from WG75 and WG105).

The concept approach

Following the project objectives and taking into account the available results up to date, the ERICA proposal will approach the RPAS insertion into non-segregated airspace in accordance to the:

- establishment of the new concept of operation;
- identification of which RPAS categories have to be considered;
- necessary performances that have to be satisfied with special attention to the mandatory safety measure;
- operational and technical solution that can satisfy the expected performances;
- validation of the identified solutions.

To progressively achieve access to all classes of airspace, RPAS must fulfil necessary requirements to ensure a sufficient high level of safety without degrading the total safety and performances of the existing aviation system. The necessary performances for RPAS to get access to unsegregated airspace have to be defined both for accommodation and integration considering the risk of Mid-Air Collision (MAC) and losses of separation.

The ERICA project will address RPAS capable to fly in controlled airspace that in terms of expected performance can be considered within the “Certified” category as identified by EASA and for which their requirements are comparable to those for manned aviation. For that category, similar process valid for manned aviation will be considered, leading to the oversight by National Aviation Authority, from issue of licences and approval of maintenance, operations, training, ATM/ANS and aerodromes organisations, and by EASA for design and approval of foreign organisations.

RPAS belonging to the certified category will be considered with capability of carry out the IFR operations, including Network, Terminal Maneuver Area and Airport operations and able of flying Standard Instrument Departure and Terminal Arrival Route as designed for manned operations. RPAS category will include different typologies such as MALE/HALE both for fixed and rotary wing.

It is worth to remind that “accommodation” and “integration” refer to two different time horizons: accommodation in the short term will allow managing the initial RPAS demand (minimizing the impact on the ATM framework), whereas integration refers to measures to be adopted in the long term with the aim the reach the full deployment of RPAS in the GAT.

Integration objectives will be reached through the development of operational and technological requirements specific for RPAS certified class, considering peculiarities of RPAS related to the absence of pilot on board (e.g. command and control link, satellite communication link).

In addition a deep analysis of current operating TMA/En Route environment (controlled A-C airspace) will be performed in order to identify the possibilities of RPAS of flying SID/STAR and Network designed for manned aviation. It will also be evaluated the option to use higher separation minima for IFR operations and the possibility of new flight procedures designs dedicated to RPAS according to their navigation performances. Special emphasis will be placed on the contingency management and analysis of current working method of ATCOs and Remote Pilots with possibility of adding/modifying some tasks considering the aspects related to IFR RPAS integration in controlled airspace.

The rules of the air detailed in ICAO Annex 2, and other Standards And Recommended Practices (SARPS), assume that in many situations the pilot flying an aircraft will be able to make use of information gained from visual observation of the situation outside the cockpit. The pilot’s removal from the cockpit of the aircraft, such as for the RPAS, has the consequence that the remote pilot’s real time perception is reduced. Detect and Avoid (DAA) system (both for CA and RWC functions) will be essential to assist and provide information to the remote pilot as ultimately responsible for avoiding collisions.

Moreover, the RWC function will be designed to provide the remote pilot with greater situational awareness, allowing him/her to comply with the ICAO Annex II section 3.2 requirements for taking responsibility for the safety of the aircraft and maintaining vigilance, without the use of an out-the-window view.

All the aforementioned objectives will also take into account the development of procedures and requirement for the generation, submission and management of RPAS flight plans, considering the possibilities that they can change during the flight execution taking into consideration the processing aspect at the level of Network Manager and Flight Operations Centre/Wing Operations Center.

The accommodation and integration Solutions are strictly interconnected considering that:

- **Accommodation** describes the condition when an RPAS can operate along with some level of adaptation or support that compensates for its inability to comply within existing operational constructs. This may be necessary during normal operations, abnormal or problematic scenarios, and when emergency situations arise. Accommodation allows for early RPA flights on a temporary and transitional basis and in limited numbers before the required technology, standards, and regulations are in place. The accommodation of RPAS in the aviation has been already addressed in many Nations.
- **Integration** refers to a future when RPA may be expected to enter the airspace system routinely without requiring special provisions. Integration will require the implementation of harmonized Standards and Recommended Practices (SARPs) and procedures (PANS).

For the Solution 111 the foreseen maturity level will be V3 while for Solutions 115 and 117 it will be V3 and V2, respectively.

The global concept of ERICA Project is summarized in Figure 1, while in the following paragraphs, more details will be provided on the concept for each Solution.

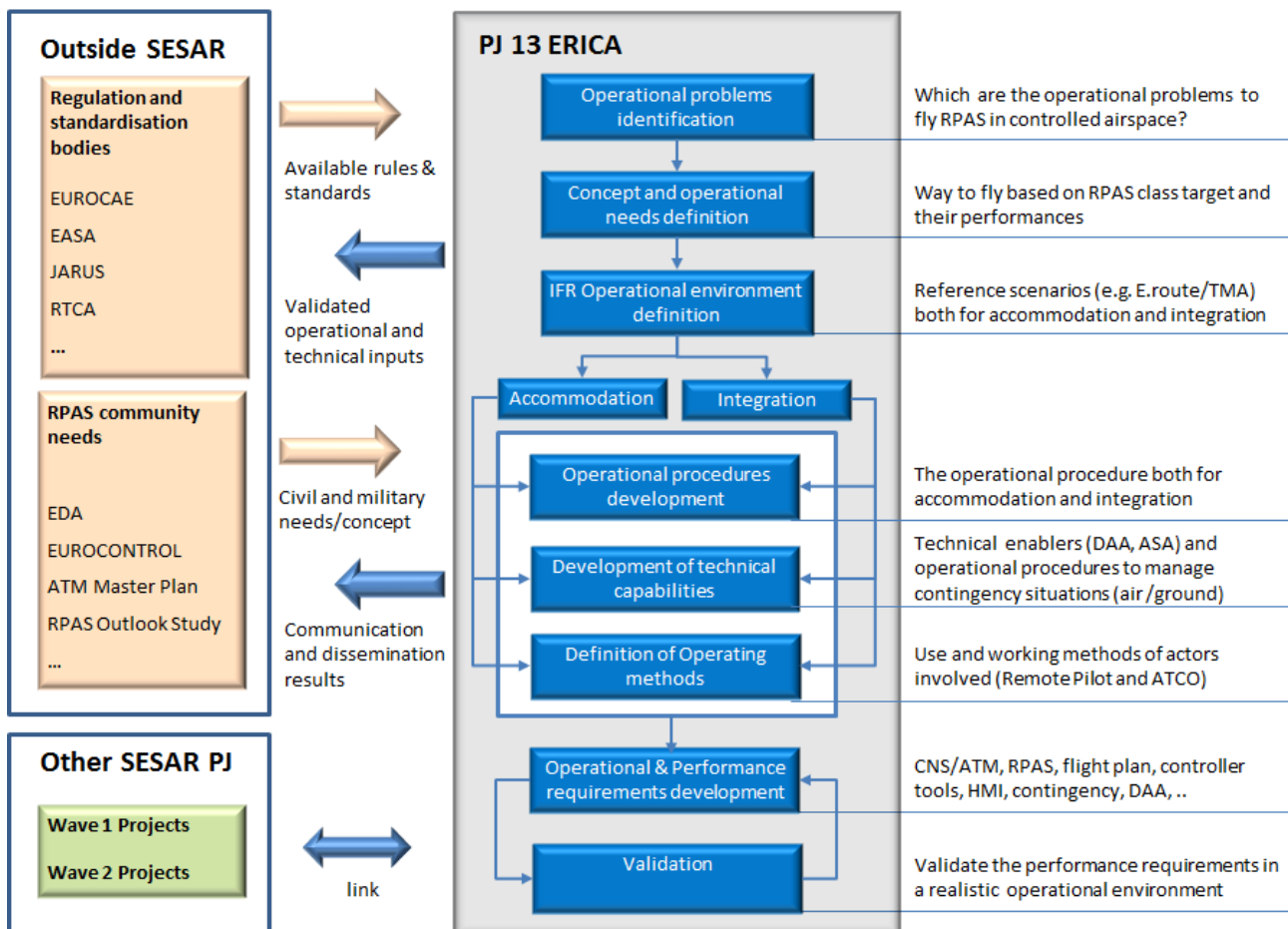


Figure 1 – The ERICA concept

In the following paragraphs, more details are provided on the concept for each Solution.

Solution 111 “Collision avoidance for IFR RPAS”

Solution 111 will address the RPAS DAA to support RPAS integration into the European A-C airspace under IFR flight rules, in line with the phase 1 (RPAS1) of the “European Roadmap for the safe integration of drones into all classes of airspace”, with the addition that non-cooperative targets are addressed to cover the event of a malfunctioning transponder or of a non-cooperative unauthorised intruder.

The absence of pilots on-board entails that some technological and procedural enablers have to be put in place to allow RPAS to operate like any other airspace user. A key enabler is the DAA capability, to provide the remote pilot with the CA and RWC (including situation awareness) capabilities.

Due to the fact that the pilot is not located on board the aircraft but remotely control the RPA via the C2 link, his/her ability to correctly judge the situation is impacted whereas he has to comply with ATC instructions. The ability is furthermore affected in the case of lost link conditions.

The RPAS must be capable of detecting and avoiding cooperative and non-cooperative traffic and performing avoidance manoeuvres while not creating another dangerous situation with other aircraft, i.e. solving primary conflicts and without inducing secondary ones. Avoidance manoeuvres can either be CA and RWC.

In general, CA is always the responsibility of the pilot/RPAS, while RWC only needs to be done when it is not provided by ATC (airspace dependent). The manoeuvres have to comply with the existing rules and regulations for manned aircraft. The DAA system for RPAS must issue instructions and/or take actions which makes it interoperable with present ACAS/TCAS. DAA systems and ACAS-X developments are required to be interoperable.

In airspace classes A-C, ATC is responsible for separation provision for IFR aircraft. According to the Rules of the Air, and in common with manned aviation, the remote pilot is required to comply with ATC instructions at all times unless an emergency situation arises. It is important, therefore, to ensure that any capability provided by the DAA system does not interfere or counteract the normal execution of ATC, including responsibility for separation provision.

The DAA system contributes to the overall Safety Barrier Model for ATM as depicted in Figure 2 below:

- Remain Well Clear is the second layer of conflict management and is the tactical process of keeping aircraft away from hazards (other airborne traffic), when separation is the responsibility of the remote pilot. This function also provides the remote pilot with situational awareness information on the surrounding air traffic to allow him/her a perception of the situation;
- Collision Avoidance is the third and last layer of conflict management and must protect the aircraft from collision when separation is lost. In all airspace and conditions, mid-air collision avoidance is the responsibility of the pilot.

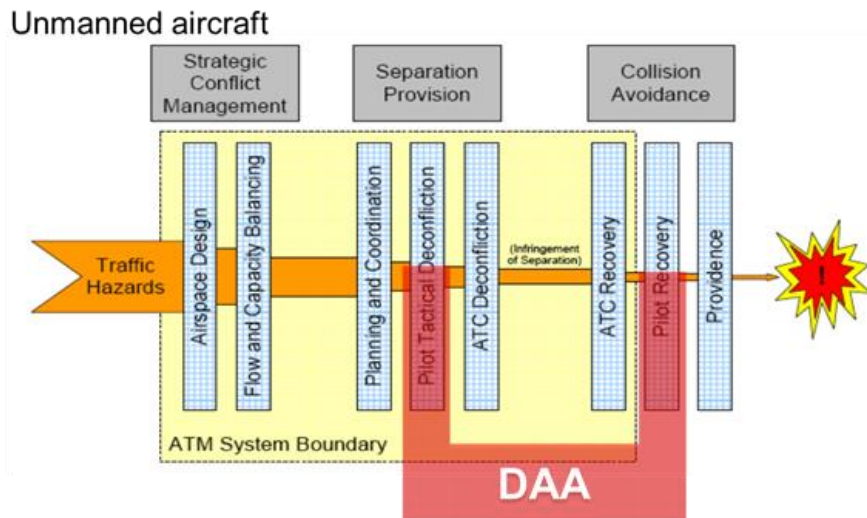


Figure 2 - ATM Safety Layers with DAA mapping

In airspace A-C, all targets should be cooperative. However, this Solution includes non-cooperative targets in order for the DAA system to cover the event of a malfunctioning transponder (notwithstanding the ATC warning and separation from the aircraft concerned) or a non-cooperative unauthorised intruder.

Within this context a full systems study of comprehensive sample of rare Near Mid Air Collision (NMAC) events will be conducted. The remote pilot's human performance will be assessed in human-in-the-loop simulations identifying specific situations from this comprehensive sample of conflict events. Multiple equipage scenarios in Equipped vs Equipped encounters will be analysed as well as unequipped vs equipped. The use of different sensors and systems will be explored with the aim to understand the most promising for the DAA both for cooperative and non-cooperative air traffic; e.g. EO, IR, ADS-B, TCAS, radar.

The validation activities in Solution 111 will lead to full V3 maturity via the integration and common approach to validation of the CA and RWC systems. DAA/RWC now provides the provenance, i.e. the operating environment in which encounters are generated and resolved.

The OI that covers this is CM-0808-u — Collision Avoidance for Remotely Piloted Aircraft but the Solution will require additional Operational Improvements steps (OIs) for DS18b.

Solution 115 “IFR RPAS Accommodation in Airspace Class A to C” and Solution 117 “IFR RPAS Integration in Airspace Class A to C”

The approach applied in these two Solutions is incremental and based on [3], where RPAS accommodation and integration are two modules defined as follows:

- accommodation module (B1-RPAS): implementation of basic operational and contingencies procedures, confirming performance associated with operational environments for operating RPA in non-segregated airspace.
- integration module (B2-RPAS): continuing to improve the RPA access to non-segregated airspace in terms of operational procedures, communication performance requirements, contingency procedures, DAA and ASA technologies.

The starting point for the initial accommodation of RPA in non-segregated airspace will be as in module B1-RPAS, where the stream is a subset of the full integration stream. The accommodation stream (Solution 115) will be validated at V3 maturity level, while the integration stream (Solution 117) will be validated at V2 maturity level.

Solution 117 will identify all the Operational Improvements (Integration target OIs) while Solution 115 will select a consistent OI subset. This subset shall be capable of reaching V3 maturity and shall allow short-term

RPAS insertion as GAT mixed with manned traffic. It shall be focused on EASA certified fixed wing RPA in the MALE category (Medium Altitude Long Endurance).

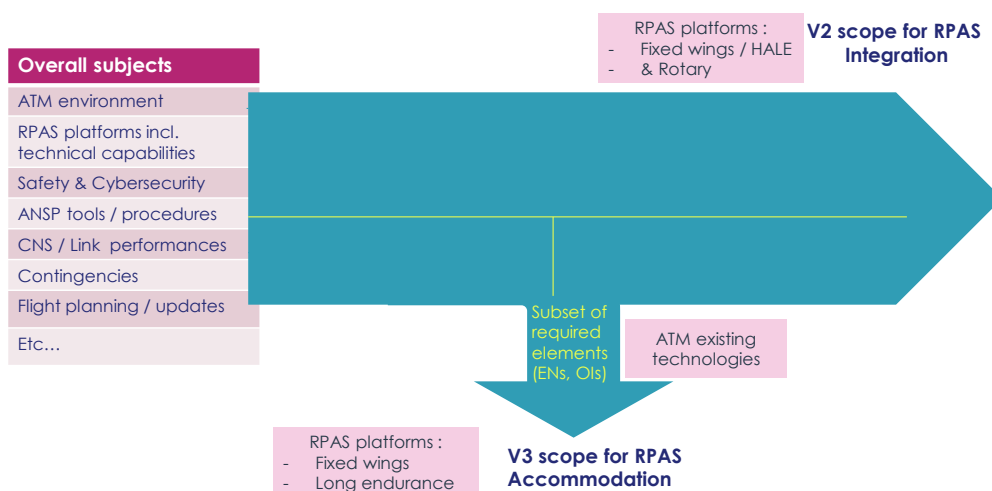


Figure 3 – Overall structure of Solutions 115 and 117

The integration Solution will benefit from previous RPAS Air Traffic Insertion studies, in particular results from SESAR Wave 1 project PJ10.05 (“IFR RPAS Integration”), and results from the European Defence Agency ERA project. On the other side the accommodation Solution will be scoped taking into account the Guidelines for the accommodation of military IFR RPAS under GAT in airspace classes A to C (currently being elaborated by EDA and EASA).

Airspace where IFR services are provided can be extremely complex, and there are many challenges on the integration or accommodation of RPAS into these environments. Research is needed to investigate the ways in which RPAS will use technical capabilities and procedural means to be safely integrated or accommodated into the ATM, including compliance with ATC instructions.

Such investigations include key enablers such as Command & Control (C2), contingency measures, RPAS CNS performances (to be addressed in cooperation with project 14) and detect and avoid (DAA) systems interoperable with ACAS (to be addressed in close cooperation with Solution 111).

Presuming that RPAS may not be able to comply with all existing manned operations rules, specific research will be needed to determine the impact of RPAS integration and accommodation in some areas, especially in case of command and control (C2) data-link loss or communication loss between RPAS and ATC.

This Solution will be based on the results of Solution PJ10-05 “IFR RPAS integration” (SESAR 2020 Wave 1), and it will take into account the free access outcomes of several projects and bodies outside SESAR like:

- EDA project DESIRE II;
- EDA project ERA (Enhanced RPAS Automation);
- EDA projects MIDCAS and MIDCAS SSP;
- EDA accommodation study;
- Ongoing EASA-EDA activity: “Guidelines for the accommodation of military IFR RPAS under GAT – Airspace classes A-C”;
- ICAO RPAS Panel;
- JARUS;
- GSA Projects;
- EUROCONTROL RPAS Operational Concept;
- EUROCAE WG105 (UAS) and WG75 (ACAS-X).

Accommodation and integration Solutions will be addressed in parallel:

- **accommodation** is related to a limited numbers of RPAS (initial demand) with minimum changes to operations and systems (analysing which dedicated airspace techniques will be necessary such as use of Temporary Segregated Area (TSA), use of corridors and/or partial segregation and in which operational environment). Moreover, accommodation results will be reached by using as much as possible mature technologies, for instance, voice communications for clearances and instructions, navigation with Flight Management Systems (FMS) derived from the commercial aviation for managing a wide variety of in-flight tasks, managing contingencies with capability to execute automated planned trajectories, and trajectory downlink to ATC to provide the active or contingency trajectory in case of C2 link failure.
- **integration** aims at providing the technical capabilities and procedural means to allow IFR RPAS to comply with ATC instructions and the development of new procedures and tools to allow ATC to handle IFR RPAS in a cooperative environment in full integration with manned aviation. Integrated surface operations are out of the scope of this Solution. The Solution includes the development and validation of the operational concept and technical enablers for the integration of IFR RPAS in European airspace in airspace classes A-C.

Both Solutions will take in consideration the following four principles:

- The insertion of RPAS shall imply a negligible impact on the current users of the airspace;
- RPAS shall comply with existing and future regulations and procedures as far as possible;
- RPAS shall not negatively impact existing aviation safety levels and avoid increasing risk;
- RPAS must be clearly recognizable for what/who they are to ATC and other airspace users.

It is important to underline that Solution 117 will target the following Operational Improvement for integration (as it was defined in Wave 1 but with an enlarged scope for integration):

- AUO-0618 — Enabling integrated RPAS IFR operations

Moreover, new operational improvements will be developed, as suggested for Solution 10.05 during Wave 1, converting the existing enablers in the following specific operational improvements:

- RPAS Command Control and Communication;
- RPAS Contingencies Procedures.

Regarding Solution 115, a dedicated Operational Improvement needs to be derived and developed for accommodation:

- AUO-0618A — Accommodation of RPAS IFR operations.

1.3.2 Methodology

In this chapter, methods and techniques that will be used to validate each Solution will be illustrated. The information will focus on explaining why the validation methods, techniques, tools and sequence are appropriate to demonstrate the viability of the Solution and match the maturity level.

The methodology used along the project to achieve the maturity levels in each solution is in line with the E-OVCM ([5]).

Solution 111 “Collision avoidance for IFR RPAS”

As per the objective of this Solution, it is required to technically and operationally verify and validate DAA including CA and RWC for IFR RPAS operating in airspace class A-C, to V3 level. For the operational validation, in particular, the present Solution will coordinate closely with 115 and 117 in order to ensure that the specification for the CA and RWC functions match the operational requirements defined by those Solutions, as well as coordinate validation assets (models, scenarios etc.) as far as possible to avoid duplication of work.

The validation methodology to achieve the V3 maturity consists of a number of different methods, techniques and tools, which are all in line with the E-OVCM ([5]) and the current maturity level.

Standards and supporting material already exist or are in development within European Standardisation bodies (namely EUROCAE WG-105 for DAA/RWC and WG-75 for ACAS Collision Avoidance). Solution 111 should review, inform and develop this material to provide a single European perspective. In practice this is enabled by many project members working within these forums.

The Solution will establish a close collaboration with Solutions 115 and 117, in order to ensure a coherent approach to validation and testing across all the RPAS Solution projects. Also, building on past and ongoing work is critical to the timely success of reaching V3 maturity level. In particular, this Solution will take into account the free access outcomes of several projects and bodies outside SESAR like:

- PJ.11-A2 wave 1;
- PJ.10-05 wave 1;
- EDA including research projects MIDCAS, MIDCAS SSP and TRAWA;
- Coordination with standardisation bodies (EUROCAE WG-75 and WG-105, ICAO RPAS Panel);
- Coordination with regulatory bodies and groups (EASA, JARUS, national CAAs etc.);
- It should also be noted that, the partners provide stakeholder knowledge from a wide and thorough history of working with RPAS, DAA, CA and ACAS work. For example, projects partners include chairman of both the WG-105 DAA group and the WG-75.

CA Systems acceptability and performance criteria have been developed of many years. For example CA metrics include Risk Ratio (a relativistic measurement of improvement), Rates of alerts and measurements of unnecessary or nuisance alerts. A summary of these is reported in the EUROCAE/RTCA Interoperability MASPS (Minimum Aviation System Performance Standards) document (N.B. foreseen for publication end 2019). The Validation Techniques and associated modelling and European-specific metrics set developed in SESAR Wave 1 will be extended beyond CA to include DAA/RWC horizons. Amongst the stress testing, operational evaluations and individual encounter analysis, a model specific to European Airspace is to be built to de-risk the introduction of systems and inform system design specifically to meet the nature of trajectories and encounters that arise. The Validation of system performance is to be achieved via a sequence of Fast-Time and Real-Time Simulations. Different Surveillance techniques and systems will be examined. Beyond V3 industrial partners within the Solution propose to fly live demonstrations with European RPAS platforms.

The development of ACAS Xu logic is driven by a set of performance metrics and an encounter model. These are used to optimize a set of logic tables, which are then evaluated. Various metrics and criteria may be adjusted such that the system achieves the desired behaviour. Previously in TCAS II all logic paths would have to be exercised to rigorously prove the correctness of the implementation. In TCAS II each line of pseudocode was considered a requirement. In ACAS X most of the TCAS II complexity has been converted into tabular form allowing a more linear evaluation process. Therefore as series of FTS tuning runs to validate system performance of ACAS Xu, specifically in European Airspace, is essential. Solution 111 is the place where this European Validation will occur. It is an essential input to RTCA/EUROCAE standardisation and the results provide evidence to the EASA operational acceptability assessments.

An essential asset in the study of the improvement of safety nets is the use of validation platforms allowing fast-time simulations of the relevant safety nets in situations representative of the European airspace, with the capacity to focus on targeted operations, as the events that trigger safety nets are difficult to reproduce in real time in sufficient numbers and with complete realism.

Each ACAS X variant will be prototyped concurrently with the development of its expected requirements. The initial requirements, initial design and validation analyses (known as sequentially numbered “Runs”) serve as input to the RTCA/EUROCAE standards development process.

Solution 115 “IFR RPAS Accommodation in Airspace Class A to C” and Solution 117 “IFR RPAS Integration in Airspace Class A to C”

The validation methodology to achieve the target maturity in Wave 2 consists of a number of different methods, techniques and tools, which are all in line with the E-OVCM (European - Operational Concept Validation Methodology [5]) and the current maturity level. Activities are foreseen to conclude the Wave 2 with regards to the maturity cycles V2 for integration and V3 for accommodation.

The most difficult point when integrating RPAS into a non-segregated airspace is that the topic has a number of implications of very different nature in several fields: it will be necessary to develop technologies but also new procedures and this implies a number of different activities of validation that will have to cover all the phases of flight. To reach the maturity levels and objectives of the two Solutions, a set of Fast Time Simulations and Real Time simulations will be executed.

Fast Time Simulation (FTS) are planned and will be used to extrapolate quantitative results in terms of specific KPAs like as Capacity, Predictability, Efficiency, in situations where RPAS traffic is inserted in the ATM picture within manned traffic in a non-segregated way. In addition FTS will be useful to gather the minimum performance requirements of RPAS that intends to fly in controlled airspace A-C without any impact on the system or too many limitations.

In order to proceed with the validation activities, Real Time simulations are planned including the use of federated simulation frameworks that will comprise RPAS (aircraft plus ground station) and ATC units. A typical configuration for integration foresees a dedicated ATC station and three different RPAS cockpit simulators (2 fixed wing and 1 rotorcraft) with real remote pilots and dedicated pilots positions for manned aircraft.

The typical configuration for accommodation foresees dedicated ATC stations encompassing cross border FIRs, realistic manned aircraft dynamic traffic scenarios which can be pseudo piloted, fixed wing long endurance RPAS (comprising the RPA “air” platform” and the RPS remote pilot station) to conduct validation with operational remote pilots and air traffic controllers. This will allow reproducing a complete ATM context and sets of scenarios wherein it will be possible to execute several validation exercises of accommodation and integration at an affordable cost. The presence of human actors in the loop will allow the collection of feedback and outputs from ATCOs and RPAS Pilots involved in terms of operational feasibility, workload and situational awareness during nominal, non-nominal/contingency situations.

Great attention will be paid to collect feedback and outputs from ATCOs and RPAS Pilots involved in terms of operational feasibility, workload and situational awareness during nominal, and contingency situations.

The operations will be carried in a mixed mode, considering both RPAS and “manned” traffic. Nominal and non-nominal scenarios will be executed.

Main aspects of RPAS accommodation and integration that will be assessed and validated via FTS and RTS will be:

- Use of RPAS specific procedures related to controlled Airspace (A-C) (e.g. use of en-route network, use of SID/STAR, response to ATCO’s vectoring and execution of ATCO’s clearance).
- Minimum performance requirements for IFR RPAS.
- Minimum CNS Performance requirements for RPAS insertion.
- RPAS technical capabilities used to assist ATC in maintaining separation.
- RPAS technical means used to ensure an appropriate level of situation awareness of ATC and Remote Pilot.
- Contingency situations caused by CNS performance degradation (e.g. loss of C2 link and loss of ATC communications).
- KPAs: Human Performance, Safety, Security, Capacity, Access and Equity, Efficiency.
- Impact of delays of C2 link and ATC link considering different configuration (BRLOS, direct connection ground/ground).
- RPAS Flight plan aspects.
- Airspace structure for the accommodation concept, including multi-FIR (Flight Information Region) environment.

- Operational scenarios and use cases for accommodation measures and integration concept.
- Airborne Separation Assistance (ASA) functions and CPDLC messages used by ATCOs and Remote Pilots for ensuring separation maintenance.
- Interoperability between the ASA and Collision Avoidance considering the work done in Solution 111. In fact, in normal conditions and a cooperative potential intruder, on-board ASA functions control the RPA trajectory in compliance with ATCo instructions to prevent mid-term conflicts. However the execution of these instructions (e.g. lateral passing) could trigger the Resolution Advisory function of the CA capability if the separation minima and the CA functions are not properly managed.

The validation activity will also evaluate how scalability, error rates, delay in communication, network protocols statistics, user application performance and safety aspects will effect on traffic distribution at sectors.

1.4 Ambition

The ambition of ERICA is to enable and coordinate the ATM integration and the safe use of civil and military RPAS into the European airspace A-C. The Project seeks to expedite the safe deployment of commercial RPAS by supporting a risk-based analysis process.

ERICA results will be an important feed to EASA, but also for ICAO in the contest of the RPAS Panel, for the definition of a flexible regulatory framework for RPAS which will allow ATM to accommodate and to integrate RPAS as well as further innovation in air transport.

Solution 111 “Collision avoidance for IFR RPAS”

The safe and transparent integration of RPAS into the European airspace A-C will only be possible if RPAS will be equipped with DAA systems.

- From the **operators’ point of view**, enabling safe integration by DAA, waives the current limit of RPAS operations to operate in segregated airspace only. From the ANSP point of view, safe RPAS integration ensures the safety of ATM and enables the proper handling of RPAS in the current airspace and ATM systems which will contribute to the importance of commercial RPAS operations and the need to move toward full integration into all kind of airspace.
- From a **product development point-of-view**, the Solution enables DAA standards to be further elaborated and matured as well as maturing products in the area of DAA, CA and RWC including sensing/sensor systems. From a manufacturer point-of-view, this enables both the manufacturing of DAA systems or sub-systems to the RPAS market and enables the RPAS market itself, by opening the airspace for safe RPAS operations.
- From an **aviation safety point of view**, the Solution ensures that RPAS are integrated in a manner that continuously provides the safety of all aircraft – manned and unmanned. Expanding the commercial use of RPAS will not pose additional risk to the airspace.

Solution 111 aims to contribute significantly to the development of DAA, including RWC and CA capability for RPAS, through the following steps:

- development and validation of a European DAA: a Detect and Avoid solution to provide the CA and RWC functions, building on the EUROCAE WG-105 European standards (under development) and past/ongoing EDA (MIDCAS) developments;
- development and validation of an RPAS-dedicated variant of ACAS X: ACAS Xu and to provide Europe with the capability to produce ACAS compatible equipment. The key prerequisite for this is to ensure that the standardized ACAS Xu system meets all European operational and technical requirements. The most important ambition of the Solution is to demonstrate the safety benefits to RPAS airspace users, both in Europe and in the US.

- the interoperability with the existing and future CA systems (including ACAS and ACAS-X), that will be ensured through the compliance with interoperability standards such as ICAO SARPs, EUROCAE WG-75 Interop MASPS (under development).

Solution 115 “IFR RPAS Accommodation in Airspace Class A to C” and Solution 117 “IFR RPAS Integration in Airspace Class A to C”

The numbers of RPAS is in rapid expansion. They will bring important benefits applications (e.g. freight, aerial surveillance) to both the public community and to a range of stakeholders in the economy in civil, public services and military domains.

As the demand for access of RPAS is growing, the necessity of inserting their operations into non-segregated airspace has recently drawn much attention. Currently special arrangements are needed to accommodate RPAS operations in manned aviation environments (such as the RPAS operations over the Mediterranean) due, amongst other things, to concerns over safety aspects, particularly related to the risk of mid-air conflicts and collisions and the loss of the C2 datalink.

Recent technological advances in RPAS have brought new possibilities of their use in various commercial markets. However, accepting a large number of RPAS into the ATM system poses many challenges and, since the RPAS operations differ in several aspects from those of manned aircraft, the operational, performance and safety concerns need to be addressed.

The key assumption for RPAS is that in order to insert seamlessly into the airspace, they must, as nearly as practicable, comply with the operational procedures that exist for manned aircraft and flight operations must not present an undue hazard or burden to persons, property, or other aircraft. Furthermore, RPAS operations must not degrade the current level of aviation safety or impair manned aviation safety or efficiency. This applies equally to all operators and all RPA/RPAS. Finally, RPAS should conform to manned aircraft standards to the greatest extent possible. When these principles are not achievable (due to unique RPAS designs or flight characteristics), and no alternate means of compliance are identified, the operation of such RPAS may be subject to safety risk mitigations, such as restricting operations.

Accordingly, the ambitions of the two Solutions are:

- to accommodate at a first stage and then integrate RPAS into the ATM maintaining the overall safety level and allowing operations of manned and unmanned aircraft in the same airspace;
- to identify roles and responsibilities of Remote Pilots (RPs), Air Traffic Controllers (ATCOs) and the other airspace users involved in the IFR RPAS insertion concept;
- to identify and validate procedures, enablers and automatic functions to allow RPAS to manage contingency situations.

Ultimately, the ERICA Project intends to support the *ATM Master Plan* [6] by bringing operational improvements in the fields of Safety nets, Airborne Separation Assistance (ASA) and Contingency Management with performance benefits at least in terms of safety, capacity and ATCOs workload. At the same time, the technological solutions adopted to introduce the aforementioned improvements will contribute to close some of the technology gaps identified in European RPAS roadmap [3].

2. Impact

2.1 Expected impacts

The project is expected to produce the huge positive benefit of assuring the RPAS operations in the European non-segregated airspace that, as a direct consequence, will constitute a key-enabler for opening the market, with a concrete possibility to offer new services to the community and potentially to increase employment.

Based on the challenges that the project will address, the expected main positive impacts can be summarised as follow:

- A valid European operational and technical performance base will be established, facilitating a common air traffic management approach for the European member states, as well as a solid and common contribution to the regulatory and standardisation bodies.
- A common solution for Europe will be set up, to assure the necessary interoperability within and outside Europe, taking into account all the elements that are characterising the RPAS operations into non-segregated airspace.
- An increase of SESAR Key-Performance Indicators in terms of **Access to the airspace, Equity and Safety**, enabling civil and military RPAS, both fixed and rotary wing, to safely operate in Europe in accordance to the needs expressed by the community. A significant **increase of Safety**, considering that DAA and ASA systems will improve the global on-ground situational awareness of RPs and of ATC controllers, as well as the possibility to prevent and safely manage possible conflicts and collisions with the surrounding air traffic. Safety aspects will be covered by safety assessments and production of specific requirements.
- To limit as much as possible the modifications to the existing ATM infrastructures.
- Enhancement of the networking capacity of ATC to manage RPAS without impacting on the manned traffic and capability to accommodate further traffic demands (“scalability”).
- A quicker consolidation of rules and standards, that will provide a strong and clear base to industries (airborne and ground-based) and to air navigation service providers, and that will enable and lead to a common deployment plan. It is important to note that the ERICA project will not work on regulations or standards but it will provide input for standardization and regulation activities in terms of requirements, use cases and results/KPA assessments to specific panels (ICAO, EUROCAE, JARUS etc) and standardization bodies.
- A significant spillover effect is also expected in other areas, considering that most of the RPAS technologies can be applied to other sectors, and they could be a valid means for increasing the safety of manned aircraft or to increase their automation (e.g. single pilot operations).

2.1.1 Technical Impact

The present project will provide a decisive impact on many technical aspects:

- Solution 111 will address the problem of DAA and of its several facets including aspects of situation awareness;
- Solution 115 and Solution 117 will address the issues relevant to the accommodation and integration of this new kind of objects into the ATM system and it will also take care of contingencies management and of aspects relevant to communication systems.

More in detail, for Solution 111, ERICA will bring a decisive contribution to DAA that is the key enabler of safe integration of RPAS in non-segregated airspace and the main KPAs are therefore Safety, Access and Equity and Interoperability. ERICA will assure that DAA (RWC and CA) will be interoperable with present ACAS/TCAS and contribute to the standardisation of DAA ongoing in EUROCAE WG-105, as well as that SESAR will bring a major contribution to ACAS Xu standardisation activities, considering that the European (EUROCAE) and US (RTCA) standardisation bodies work in close collaboration.

As far as Solutions 115 and 117 are concerned, RPAS insertion can have significant impact on separation provision in consequence of their characteristics and peculiarities such as: latency when remotely controlled via SATCOM, reduced flight awareness of the remote crew, sensitivity to weather conditions and IFR environment, limited ability to comply with all existing manned operational rules.

Particular care will be taken to **avoid** that the integration of RPAS in the IFR environment will induce:

- risks in terms of **lack of compatibility** between procedures and required RPAS CNS performance;
- **lack** of interoperability of RPAS with the ATM services;
- **reduction of the overall level of flight safety**;

- an **increase of the complexity** of the controller's monitoring tasks due to the handling of mixed traffic (regular and RPAS), notwithstanding opportunities coming from the increased level of automation.

As RPAS will be integrated, consequently all safety and CNS requirements, including associated Air-Ground and Ground-Ground issues, will need to be re-assessed for unmanned flight. Safety aspects will be covered by safety assessments and production of specific requirements. This will be done in compliance with standard methodologies like the Operational Safety Assessment process described into the EUROCAE ED-125.

The approach in Solution 115 is to minimize the impact by making use as much as possible of existing technical enablers and mature capabilities derived from commercial aviation and ongoing activity. Hence, the technical impact will be lower with respect to the one foreseen for the full integration. The effort on the accommodation Solution will be employed on validation and, if needed, on the necessary adaptations of the existing technologies for Navigation and Flight Planning, ATC Data Link Systems for trajectory downlink, CNS systems. This will be performed in coordination with previous studies outputs and related ongoing activities. It will also be employed on validating the unmanned RPAS traffic accommodation and their operations in a representative ATM environment, assessing the main impacts and deriving guidelines.

The advanced automation aspects and the Commercial Off-The-Shelf (COTS) components and standard protocols that will be employed for the system integration will impose to identify and assess the risks coming from **cyber threats**. In collaboration with the industrial partners, a security assessment will be performed in order to identify system vulnerabilities, data security risks and make sure that the security compliance will be in line with the standards required to critical systems. More in detail, requirements will be produced by the project in terms of Cyber Security aspects considering the main threads: Spoofing, Jamming, Hijacking related to C2 links and to communication links, and possible issues in case of failure in terms of Safety, Capacity and economic impact on stakeholders. The assessment methodology will be the official one produced by SESAR W1 PJ19 with the identification of primary asset, threads and derivation of cyber security requirements.

2.1.2 Economic Impact

DAA and Safety Nets have no direct impact on Capacity in controlled airspace where separation is managed by ATC. The over-riding driver for implementation is to increase the level of safety. However these initiatives provide resilience in the ATM system and the economic impact is in terms of lives and aircraft saved. The Risk Ratio (i.e. Measure of mid-air incidents with and without safety nets) is a measure of this, although not in absolute financial terms.

In addition, accommodating RPAS integration safely is a prerequisite for the development of the RPAS business. ERICA, by delivering and validating collision avoidance specifications will contribute to this integration and its technical approach described above will maximise deployment rate, provide regulation compliance and to minimize risks and costs.

RPAS accommodation and integration is crucial key-enabler that will facilitate the use of RPAS for both civil and military application that will lead to real open the market with significant benefits for the European economy [7]: "The growing drone marketplace shows significant potential, with European demand suggestive of a valuation in excess of EUR 10 billion annually, in nominal terms, by 2035 and over EUR 15 billion annually by 2050 creating over 100.000 new jobs. The impact of civil missions by (either for governments or for commercial businesses) is expected to generate the majority of this value as related services are anticipated to represent more than EUR 5 billion of annual value by 2035, highlighting their importance within the marketplace".

Today, the operations restricted only in some limited areas are significantly reducing the capabilities that these assets are able to offer to the community and are not facilitating a positive business case for the users. To define the way to operate and what technical capabilities are required, coupled with the regulation that is under definition by ICAO, EASA and JARUS, will be a catalyst for accelerating their diffusion in Europe.

The availability of dual use technology will facilitate benefits and synergies also for other sector of application.

2.1.3 Social Impact

Safety nets are not widely advertised as saving lives, however the social benefit to assure safety cannot be measured as they are in relation to events that do not happen, or very rarely. Establishing separation between aircraft is the main purpose of Air Traffic Control and any failures resulting in accidents will have social impact on travelling and, consequently, economic impact on Industry.

The employment of RPAS in an increasing number of applications can offer a range of new services to society and is creating a lot of new market opportunities and their consequent proliferation is pushing governments, industry, standardization and regulatory bodies to solve the issue of their integration with the ATM system. Therefore RPAS access to airspace is the most important benefit that ERICA aims at bringing to the ATM because there is a high demand for integrating all categories of RPAS into IFR airspace.

The safety implications as it relates to preventing hazardous occupations and fatalities are a core societal benefit of the drone industry. This safety benefit includes and extends beyond industrial inspections, as shown by the following examples:

- Safety by limiting dangerous occupations: Drones keep workers from hazardous inspections that lead to multiple deaths a year and protect our first responders and the victims they assist;
- More lives saved & protected: Search and rescue operations will become more effective, resulting in more successful searches.

RPAS is a valid asset that can provide significant benefits to the citizen through the availability of new services for a wide range of application from governmental, commercial and military sector.

It paves the way towards more original operations in manned aviation as the single pilot case.

2.2 Measures to maximise impact

Given the importance of the project topics that will enable the RPAS operation in Europe outside segregated airspace, it is of prime importance to communicate broadly on the ERICA objectives and to disseminate project results. Dissemination and exploitation measures are of paramount importance for ERICA in order to maximize its impact and trigger effects across the entire range of targeted stakeholders, potential users and communities.

The ERICA Consortium, by fully recognising the above, intends to implement a dedicated dissemination and exploitation plan, predominantly aiming at ensuring:

- The effective and sustainable dissemination of ERICA generated knowledge and technologies. This will happen not only within the European Aeronautics Community but also in other industrial sectors through suitable and specialised communication activities for each target group and end user group;
- The dialogue with regulation and standardization bodies. This step is crucial in order to maximise the positive effects of the project and its success. It is expected a strong relationship and contribution with EASA/JARUS, EUROCAE as well as with the major counterparts in the US: FAA and RTCA. Also, key results will be provided to the ICAO RPAS Panel for the benefit of global harmonization.
- The exploitation of the project's results by the Aeronautic Industry. The aim is to maintain and reinforce the technological advantage in the competition from outside Europe.
- The conveyance of new knowledge into the engineering education base. This is essential for aeronautical industries and Air Navigation Service Providers to meet the evolution of skill needs of the aeronautic sector.

In order to achieve the above points and to maximise the diffusion of the project results and achievements in the European Community, the project will take advantage of the existing networks of each partner (Industries, Air Navigation Service Providers, Sector Associations).

2.2.1 Dissemination and exploitation of results

Dissemination is a significant tool that will be used to connect the consortium members, the stakeholders of the related fields (technological, operational, and regulation), and the general public to the achievements and activities performed within the project. By effectively and strategically disseminating the project's results, greater public awareness is created as well as knowledge sharing, transparency and education are promoted. Also, the potential of market uptake and commercial exploitation of the project results is considerably increased. As EU-funded activities and projects distinctly contribute to the creation of new jobs, novel technologies and improve the citizens' quality of life, public interest for research findings and achievements is increasingly growing over time. Moreover, since one of the main financiers of such projects is the European taxpayer, it is an imperative precondition to ensure:

- maximum return on the investment through exploitation, and
- full openness about the actions financed through the implemented communication measures.

In this context, a dedicated plan for the dissemination of ERICA results has been prepared and is detailed below. It is based on the project development deliveries of the main results and on the dissemination needs and objectives of the project at each stage of its lifecycle.

The objective of the dissemination plan is to identify and organise the activities to be performed in order to maximise the impact of the project and to communicate the right information to the right people at the right time using the right language and taking into account the dissemination needs of the project at each stage of its lifecycle.

The dissemination plan is based on the identification of target groups, dissemination messages and communication tools.

The ERICA Target groups

An extremely imperative precondition in order to ensure augmented exploitation, high impact and increased likelihood of uptake of the project's results, is to **prudently and effectually communicate the appropriate information to the relevant and interested audiences in a concise, well-articulated, understandable and attractively packaged manner**. Consequently, the first step towards developing a successful dissemination plan relies on the identification and classification of the groups which need to be targeted, as well as the messages and information to be consigned to each of them. Based on the concept, objectives and expected impact of the ERICA project, the following groups of interest have been identified.

Target group	Why
<i>Scientific community</i>	This group includes mainly Academic Institutions, Research Agencies/Establishments. Operation outside segregated airspace is an enabler valid for different types of RPAS, with significant capabilities and performances differences. The scientific community should propose research and technological developments to enlarge the footprint of possible users and the RPAS categories that can be eligible for operating in non-segregated airspace.
<i>Industrial stakeholders</i>	This group includes mainly the European Aviation Industry, yet it is not limited in this way, as technology spill overs with other industries (e.g., automotive, railroads, naval, space) will be pursued. The efficient communication of the project results to this group will significantly contribute to the future exploitation of the current research, the achievement of even higher TRL, and the advancement and competitiveness of European SMEs and large enterprises.

<i>Policy makers and regulatory organizations</i>	Policy makers and regulatory authorities should be targeted for proposing specific measures and/or setting standards for the validation and certification of the new technologies, in order to accelerate their adaptation and integration within the industry.
<i>Users and investors</i>	The dialogue with users is crucial: the aim is to create the correct awareness on where we are in term of results and how close we are to their expectations/needs. Due to the increased TRL level of the project results, it is important to plan dissemination activities targeting private investors as well.
<i>General public</i>	It is an obligation to ensure that the European taxpayers are well informed of the technical, environmental and societal impacts of the project outcomes: this will facilitate the public acceptance of the RPAS insertion into non-segregated airspace.

Table 1 – ERICA Target Group

The ERICA Dissemination Messages

Table 2 resumes key ERICA messages to be delivered to each identified target group.

Target group	Key message
<i>Scientific community</i>	Technical and performance needs, with the aim to trigger future research. The most important topics will be: safe and secure communication and control means both in radio line of sight and beyond radio line of sight; detect and avoid solution able to be accommodated also in RPAS with limited room and available energy; advanced sensors to increase the situational awareness of RP and controllers in all the flight phases; health monitoring systems to support the pilot in long endurance operations; cognitive aspects for the remote control and advanced remote pilot stations, etc.
<i>Industrial stakeholders</i>	Technical, operational and performance industrial results. The dissemination of these topics can provide clear indication and recommendations on what is needed and what to take into consideration when developing the solutions for RPAS Air Traffic Insertion. The main expected areas of interest at least will be: CONOPS, OSED, Technical Specifications, SPR/INTEROP.
<i>Policy makers and regulatory organizations</i>	The key message to this group will be that the insertion of RPAS in non-segregated airspace requires a solid regulation and standardization base that must be developed at several levels: international (ICAO and JARUS), European (EASA, EUROCAE, EUROCONTROL), US (FAA and RTCA) and National (CAA). Considering that in most of such activities the ERICA consortium members are deeply committed in technical activities, a solid dialogue and coordination with such authorities will facilitate to provide a validated contribution that can accelerate the establishment of a common base reference for enabling RPAS insertion. A special attention to the dialogue with FAA and RTCA will be promoted with regard to the ACAS Xu standard with the aim to assure a correct interoperability and compatibility of the system among Europe and US. In such context, the project will provide inputs and influence the work on Airborne Safety Nets at global and regional standardisation level, within ICAO (in coordination with FAA for ACAS), EUROCAE and RTCA. Special attention will also be put on the standardization of DAA within EUROCAE WG-105 and in particular the DAA sub-group material (OSED, MASPS, MOPS), to assure that the ERICA results contribute to the verification and update of these standards with a particular focus on interoperability and compatibility with the European ATM system including currently under development Collision Avoidance Systems as well as global interoperability (ICAO

	SARPs), in airspace A to C.
<i>Users and investors</i>	<p>It is fundamental to establish a continuous dialogue with them in order to create awareness on project activities and results and how close they are to their expectations/needs.</p> <p>Such a dialogue with different kind of users has to be promoted and pursued with the aim to: address the requirements of all airspace user groups, guaranteeing their interoperability with the ATM system; take into account all the possible needs and constraints that characterise the RPAS operations in Europe.</p> <p>In particular, the dialogue will start from the military users under EDA framework for which the need to fly outside the segregated airspace seems more urgent.</p> <p>A dedicated dialogue with EC will be taken also with the aim to properly plan the subsequent deployment phase of the developed solution.</p>
<i>General public</i>	<p>Information about the validity of the obtained results (safe, secure and reliable RPAS integration into airspace) and about the positive impacts that are expected for the community and for citizens (e.g. more services, quality of life improvement, creation of new jobs, etc.)</p>

Table 2 – ERICA main dissemination messages

It is worth noting that the planned dissemination activities will focus and address the full range of potential end-users, including research, commercial, investment, social, environmental, policy making, setting standards, skills and educational training. For each case, the disseminated/communicated messages will be adapted to each of the related target groups, in order to ensure an effective outreach strategy and successfully achieve the corresponding objectives.

The ERICA Draft Dissemination Plan

Based on the described dissemination needs and objectives, in the following the initial draft of the ERICA dissemination Plan:

Dissemination Needs	<p>Initial Awareness phase (M1- M6): Create the project visual identity, develop the main dissemination tools and identify some initial dissemination opportunities.</p>	<p>Mid Awareness Phase (M6-M24): Perform dissemination activities in order to increase awareness about the developed solutions.</p>	<p>Full Awareness Phase (M25 – M36): Perform dissemination activities in order to keep all potential users and project “followers” updated and informed about the project and results.</p>
Dissemination Objectives	<ul style="list-style-type: none"> • Raise Awareness : Present the project and its expected results. • Inform on ERICA actions to stimulate the interest of all target groups. 	<ul style="list-style-type: none"> • Increase and Maintain Awareness about the project, its objectives and expected impact to all identified target groups • Keep the full range of potential end users informed about ERICA actions so as to ensure the maximum exploitation of the developed solutions. 	<ul style="list-style-type: none"> • Keep the full range of potential end users informed about ERICA actions • Support ERICA dissemination to all target groups in order to pave the way for successful exploitation
Communication tools	<ul style="list-style-type: none"> • Create the project communications material • Identify some preliminary dissemination opportunities • Set up info for Partner’s websites 	<ul style="list-style-type: none"> • Dissemination of project results and activities in the identified target audiences • Other Publications & Press releases • Diffusion of project results via social media 	<ul style="list-style-type: none"> • Dissemination of project results and activities in the identified target audiences • Other publication & Press releases • Diffusion of project results via social media

	<ul style="list-style-type: none"> • Update up info for Partner's websites 	<ul style="list-style-type: none"> • Exhibition of the developed validation exercise ("Open Days") • Update up info for Partner's websites
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Table 3 – ERICA Draft Dissemination Plan

The ERICA Draft Exploitation Plan

The consortium partners, by fully embracing the benefits accruing from the innovative operational concept and technology to be developed within the project have identified many and different exploitation measures for maximizing the project's impact and address the full range of potential uses of the project's results.

After the successful completion of the project, the exploitation of the project's foreground(s) will begin. If exploitation of results involves contributions from multiple project participants, the need for cooperative agreements between these parties will arise. Once an agreement has been obtained, the contract will be used for any exploitation action which may result from the project activities.

Based on the nature of the ERICA project that will constitute an essential transversal enabler for Europe to allow the insertion of RPAS into non-segregated airspace, the exploitation of the expected results will have a significant magnitude involving, at different level, different aviation stakeholders.

The main exploitation streams are listed below:

- **Exploitation of the results by the policy makers and standardization bodies:** possibility to reuse the obtained validated results for defining and consolidating a common European regulatory and standardization base. The dialogue among ERICA project and policy makers and standardization bodies will be guaranteed for the entire project duration and dedicated contribution will follow also after the project conclusion with special attention to the industry participation in EUROCAE and JARUS working groups
- **New Research Directions.** The project will generate R&T gaps that have to be covered forming the basis for further scientific activities. Knowledge on these gaps and needs will be disseminated to the scientific community for the entire duration of the project, exploiting also the SESAR JU Scientific Committee.
- **New culture and training needs.** The new concepts and technologies developed will contribute to define a new culture on how to control and manage the RPAS in non-segregated airspace. Moreover they will be a base for identifying the future necessary skills of the operators (ground and air) and their needs for training. Based on the wide level of participants in the ERICA consortium and considering the planned communication measures, the impact of such exploitation stream is expected significant.
- **Industrial exploitation.** In accordance to the validity and maturity of the solution developed within the project, for some of them it is expected that Industry will be in condition to work on their future development and industrialisation in accordance to a solid and recognised standard. This exploitation of the results will facilitate to meet the user needs and industry solutions in a reasonable schedule.
- **Market opening and new services to community.** As a fallout of the consolidation of a regulatory and standardisation base, more demands from the airspace user to fly in non-segregated airspace are expected with significant benefits for the European economy (new services to community).
- **Spill over effects.** The transversal nature of the technology developed for the insertion of RPAS into non-segregated airspace, can be exploited also in the current manned aviation (e.g. additional safety layer for the flight crew in new concept of more autonomy such as the single flight crew) as well as in other sector with high autonomy.

Knowledge management and protection

Each ERICA partner will exploit the project results according to its own business and industrial objectives. Knowledge and innovation management encompasses three different activities, being part of the same strategy:

- Protection of project results will be adequate, effective and adjustable in order to let the partners respond to the market needs in the most appropriate manner,
- Use of project results via utilisation in new innovation activities or commercial exploitation,
- Dissemination of project results while respecting the IPR provisions and confidentiality.

The project will take care of the rules for protecting the Intellectually Property Right in accordance to Horizon 2020 rules and SESAR Joint Undertaking Membership Agreement.

2.2.2 Communication activities

The ERICA Communication Measures

Communicating relevant knowledge about the project's latest activities and achievements to the relevant identified target audiences is certainly a way to keep all partners actively involved in the project.

In this context, the communication measures to realize the draft dissemination plan presented in the previous section includes **an efficient and effective mix of both interpersonal and mass communication tools**. The following table presents the main communication tools to be used for effectively diffusing project-related knowledge and information to each of the identified target audiences and end-users:

Target Groups Communication tools	Research, Scientific & Academic Community	Industrial stakeholders	Investors and users	General Public	Policy makers and regulatory organizations
Electronic and printed dissemination material	☒	☒	☒	☒	☒
Website (via the ERICA partner's existing websites)	☒	☒	☒	☒	☒
Conferences / Workshops	☒	☒	☐	☐	☒
Exhibitions	☒	☒	☒	☐	☐
Press releases	☐	☐	☒	☒	☐
Newsletters	☒	☒	☐	☐	☒
Scientific Publications	☒	☒	☐	☐	☐
Social Media (via the ERICA partners' channels)	☒	☒	☒	☒	☒

Table 4 – ERICA Communication measures by target group

Electronic and printed dissemination material: “Eye-catchy” and attractive dissemination material, such as the project logo, posters, banners, leaflets and newsletters, will be developed to structure the visual identity of the project. Printable material with information for different target groups will be provided to all partners to distribute at conference venues, while electronic copies will be used for online publications, articles and other references such as local and international press.

Website: The use of SJU website and social media is expected with the aim to reach a more wide spectrum and magnitude of communication at European level. In addition the partner company websites will be used for providing information about the project objectives, progress and results for different target groups and levels of dissemination (from members only to public). Special care will be taken to present information in

an easily-comprehensible way, thus allowing grand access to the general public. **The partners' websites will act as an effective way to continuously disseminate and promote the project's progress, list of publications and publishable reports.** These websites will also serve as a gateway to a private (password protected) collaboration platform for the consortium partners and for such a scope the OneSky EUROCONTROL extranet is already established. Furthermore, it is planned to build up a database on the OneSky extranet containing all relevant documents produced in ERICA. At least all programme documentation will be stored in order to have full electronic access to documentation.

Workshops/Conferences: Participation in conferences and workshops related to RPAS air traffic insertion and, in general terms, ATM aspects, will be considered essential for obtaining "feedback" on the acceptance of the project results by both academic and industrial communities, and on the economic potential and recommended market-oriented exploitation pathways, the identification of which is considerably important for the ERICA project. All partners will be responsible for publishing project results in conferences and workshops, nevertheless **the content of the publication must be circulated to the partners and agreed in advance.** The Project Leader will maintain an overview of all published results. In the following the approach that will be used as well as the main public events which will be considered for the dissemination activities of the project:

- It is expected that the consortium will submit technical papers to international conferences on the RPAS topics covered by this project, thus allowing the activities to be presented.
- Open Days will be conducted after a significant validation exercise has taken place. Stakeholders will be invited to see the developed tools and procedures being applied in a realistic target environment, and also allowing the attendees to put 'hands-on' and have a first-sight experience of the achieved solution results. This in turn also allows the Solution partners to get important feedback from people not directly being involved.
- As soon as the solution is released and initial results or progress can be reported, it is intended to propagate the achievements through events such as the ATM EUROCONTROL-FAA Seminars. Specific events can also be used for such propagation (e.g. the Digital Avionics Systems Conference/DASC, the International Conference on Research in Air Transportation/ICRA or the International Council of the Aeronautical Sciences Congress/ICAS).
- Participation to annual congress (e.g. World ATM Congress, ATC Global, Aerodays, Paris Air Show/ Aviation & Environment Summit, SESAR Showcase, SESAR Innovation Days) are expected and the following key-stakeholders will be invited: Professional (pilots, engineers, technical experts, avionics, etc.); Organisational (ICAO, EASA, EC, EUROCAE); Industrial (Airframe and Avionics, Systems engineers) ANSP; Research Organisations and Universities, ASD, CANSO.
- Another major forum for dissemination/impact of the results will also be RTCA/EUROCAE, RTCA and also other ICAO Standardisation Forums of which the Plenary body meets about four times per year and technical groups with specific interest in DAA, ACAS X variants meet with a similar frequency. In particular the EUROCAE WG-105 and WG-75, RTCA SC-147 and ICAO RPAS Panel are of importance.

Technical Publications: All partners will be responsible for publishing project results in local and international press (press releases in magazines and newspapers, newsletters, etc.) and in **EC communication channels** (e.g. Horizon the EU Research and Innovation Magazine, research*eu results magazine, research*eu focus, etc.). These publications could be in the form of papers in technical journals and conferences, press releases or newsletters in magazines and newspapers, etc.

Social Media: Project related information will be published and the project outcomes will be discussed and promoted. The Twitter accounts of the ERICA partner companies will be used communication means for informing the community on the main project results.

3. Implementation

3.1 Work plan — Work packages, deliverables

3.1.1 Project Structure

The project is divided into 3 different Solutions; each split into a certain number of activities and to a certain extent, coordinated independently by its SL. The project structure is displayed in Figure 4.

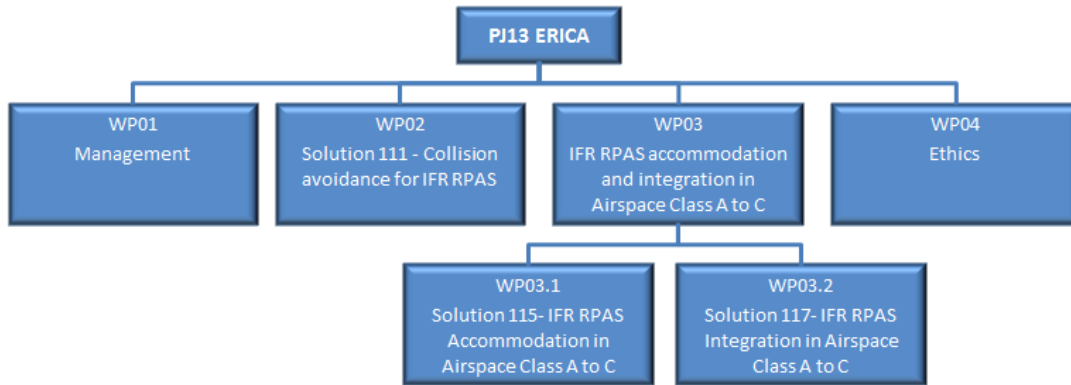


Figure 4: ERICA Work Break Down Structure

A detailed work package description follows in chapter 3.4, while the Gantt and Project Pert are in the following figures.

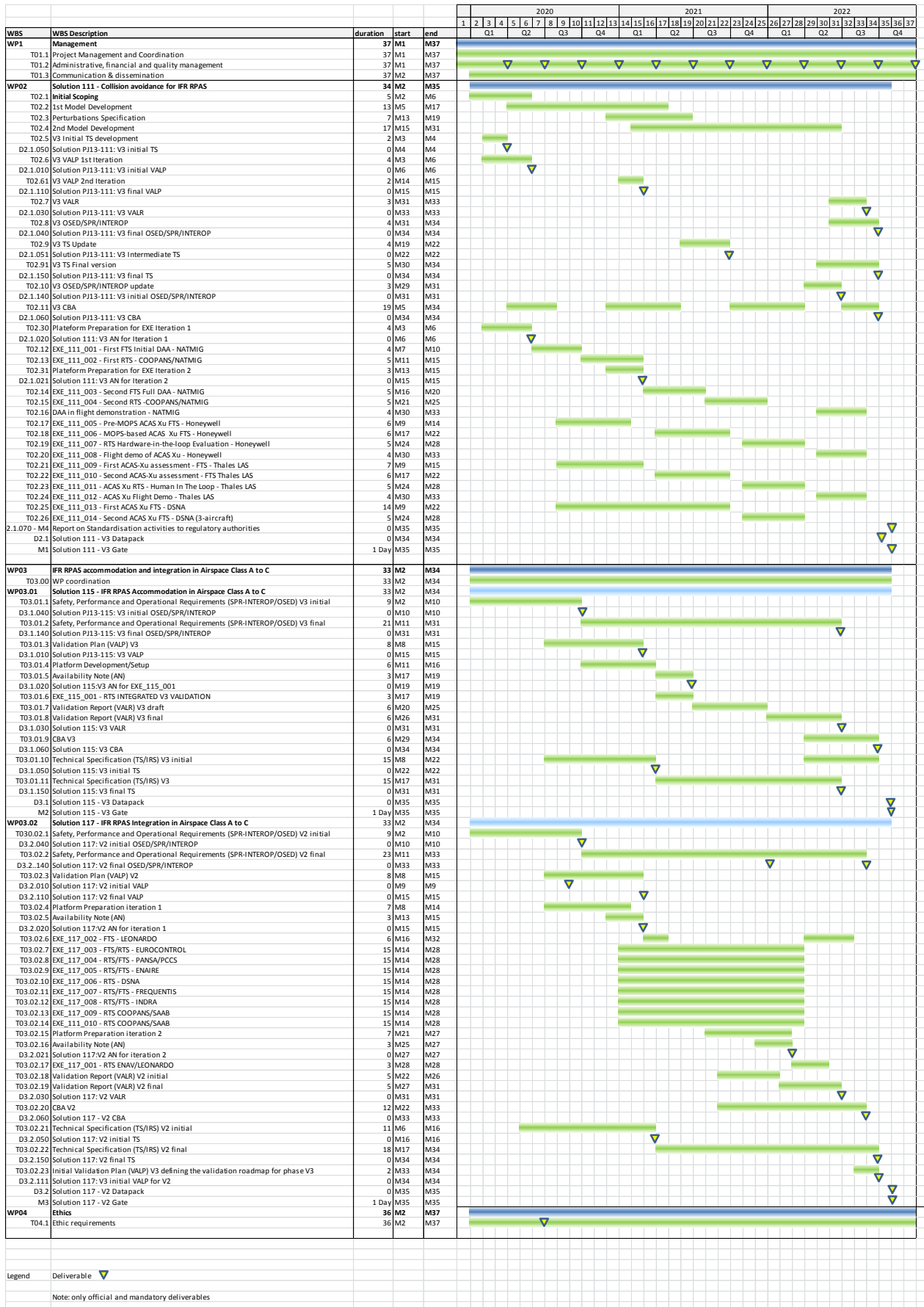


Figure 5 – ERICA Gantt Chart

The **start date** of the project will be 01/12/2019, the **duration** 37 months.

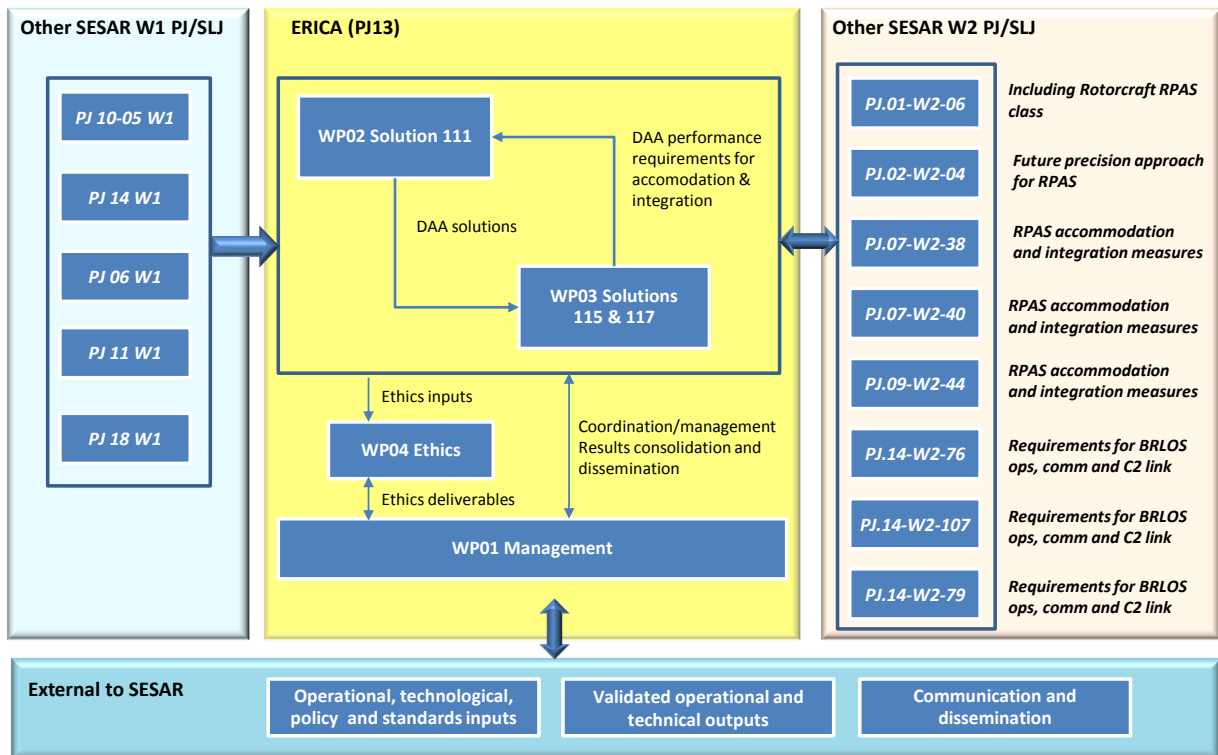


Figure 6: Project Pert Diagram

With reference to Figure 6: Project Pert Diagram, the following table lists the titles of the Solutions/project related to ERICA.

PJ.01-W2-06	Advanced rotorcraft operations in the TMA
PJ.02-W2-04	Advanced geometric GNSS based procedures in the TMA
PJ.07-W2-38	Enhanced integration of AU trajectory definition and network management processes
PJ.07-W2-40	Mission trajectories management with integrated Dynamic Mobile Areas Type 1 and Type 2
PJ.09-W2-44	Dynamic Airspace Configurations (DAC)
PJ.14-W2-76	Integrated CNS and Spectrum
PJ.14-W2-79	Dual Frequency / Multi Constellation DFMC GNSS/SBAS and GBAS
PJ.14-W2-107	Future Satellite Communications Data link

3.2 Management structure, milestones and procedures

A lean and efficient management structure will be applied that allows for fast decision making to ensure that the pursued objectives are met. The SESAR2020 Management Agreement (SMA) will specify management rules that govern the project's workflow as well as all responsibilities and duties of the partners during the course of the project. The SMA will be negotiated and signed before the project starts. The administrative and organisational management activities are hosted in WP01. This approach will allow an effective and

efficient assignment of partner contributions, while facilitating separation of research and technology tasks from the administrative work necessary to carry out the project.

The project management structure is composed of two main levels that are presented in Figure 7.

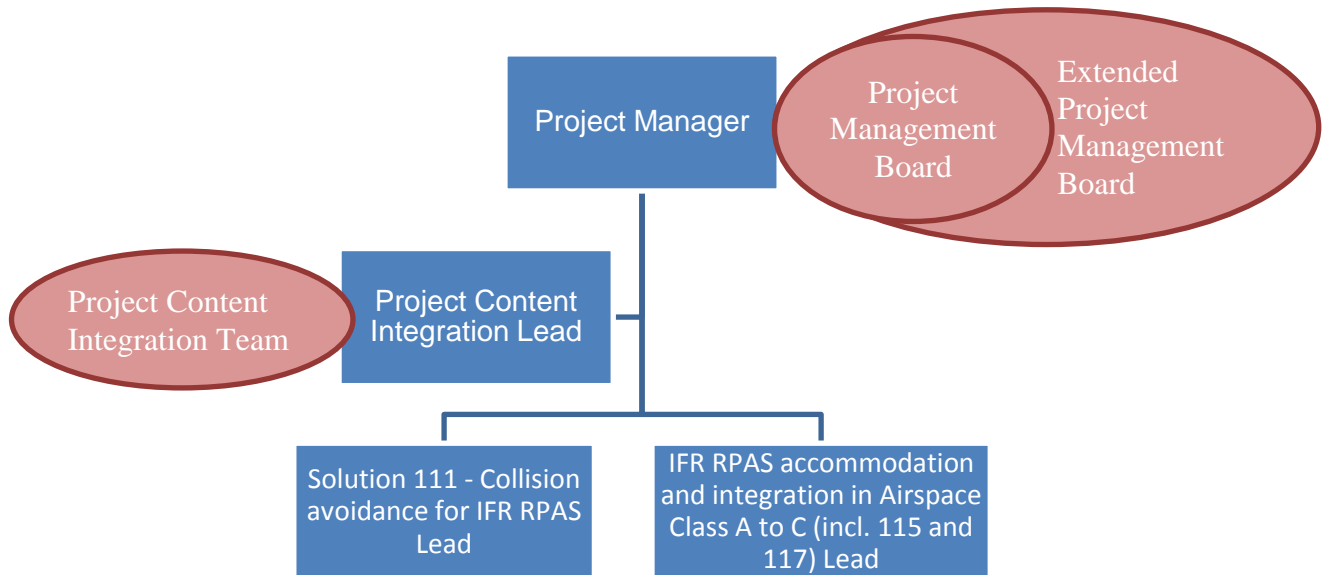


Figure 7: Project Management Structure for the ERICA Project

The combined legislative-executive level is composed of the Project Manager (PM) and a set of dedicated panels. The PM, as a central point of reference, participates in the Project Management Board, ensuring the overall coordination and follow-up of Project activities. The PM reports to the SESAR Joint Undertaking (SJU) on behalf of the project partners (e.g. the quarterly project reports). The Project Content Integration Lead (PCIL) ensures that the project content information is consistent across Solutions. At the implementation level Solution Leaders (SLs) manage the execution of technical development and control implementation steps. The PM leads also the two workpackages relevant to Project Management and Ethics (WP01 and WP04).

Due to the multilevel structure of Project, the management of solutions 115 and 117 will be unified and in charge of WP03 (“IFR RPAS accommodation and integration in Airspace Class A to C”).

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;
- the engagement of 3rd parties (such as but not limited to airspace users, staff associations, etc.), where applicable;
- Escalation of issues internal to the Project that cannot be resolved by the PMB to the contribution managers of the Project Partners;
- proper and timely communication of information, within and outside the Project; and
- an appropriate preparation and contribution to the operational closure of the Project.

As regards the dissemination and exploitation activities, the Project Manager will:

- Revise and update the dissemination and exploitation plan with contribution from Solution Leaders;
- Coordinate, with Solution Leaders contribution, the definition of messages to be disseminated to each target group at project level;
- Promote at Project level the dissemination and exploitation of results.

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 or WP leads;
- Representatives of key contributor to the project (if not represented by above categories).

3.2.3 Extended Project Management Board (EPMB)

An Extended Project Management Board meeting (including all contributors of the project) will need to be convened annually at a minimum.

In addition in case of significant changes to the project, the Extended Project Management Board shall be asked for approval by correspondence, e.g. for:

- critical deliverables of the project :
 - Initial PMP and updates
 - 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. He/She is responsible for the SESAR Solution refinement, the overall management of related validation activities and timely delivery of the Solution deliverables. In particular, the Solution Lead will:

- Organise and coordinate the activities of the Solution Team;
- Report to the Project Manager on progresses and issues;
- Make proposal for update and amendments of the validation roadmap, to be agreed at project level
- Ensure consistency within the Solution and in particular of the different deliverables in support of the different maturity evolution/levels (V1, V2 and V3)
- Prepare and represent the Solution at the maturity gate, notably responsible for producing the Maturity Report.
- Participate to the PMB;

As regards the dissemination and exploitation activities the Solution Lead will:

- Contribute to the revision and updating of the dissemination and exploitation plan;
- Define messages to be disseminated to each target group at Solution level;
- Take into account the feedback/input coming from the stakeholders target group at Solution level;
- Promote at Solution level the dissemination and exploitation of results.

3.2.5 Solution Team

The main role of the Solution Team is to:

- Define, validate the SESAR Solution and produce the associated deliverables and prototypes. A Project validation roadmap will be agreed at project level. The Solution Team will conduct validations according to the agreed roadmap.
- Identify and initiate required changes to the SESAR Solution, including the validation roadmap.
- Contribute, under the coordination of the Project Content Integration Lead, to update the relevant sections of Transversal Projects deliverables.
- The Solution Team is composed of all contributors to the work of a given Solution.

3.2.6 Project Content Integration Lead (PCIL)

The Project Content Integration Lead:

- Reports to the Project Manager
- Coordinates and organises the work of the Project Content Integration Team
- Acts as a focal point for interaction with the Transversal Projects, supported by the Project Content Integration Team. He/she is in particular the focal point for the project's change requests to the project content information.

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 dependent Solutions in other Projects and to coordinate interactions with Transversal activities. It ensures that the outputs provided by the projects are compliant with the guidance material provided by Transversal Projects. It shall identify and seek for Solutions for any gaps or conflicting choices between the Solutions of the project in order to ensure the project fulfils its objectives. It also supports the Project Manager for the organisation of the technical gates, and for the communication of project results.

The following table shows the partners who have taken responsibility for the ATM Focal Points, which are needed in this project:

ATM Focal Point	ERICA Partner
CBA expert	All the partners (Service Providers and Industry) have experience on such matter.
Operational Performance expert	Mainly the Service Providers: ON (B4), PANSa (B4), LFV/COOPANS, DFS, DSNA, ENAIRE, ENAV, EUROCONTROL, NATS, NLR but also industry: Leonardo, HC (FSP), Honeywell SAS, INDRA, SAAB, Thales AIR SYS, Thales AVS
Human performance expert	As per the Operational Performance Expert
Safety Expert	As per CBA expert
ATM Expert Operations	Mainly the Service Providers: ON (B4), PANSa (B4), LFV/COOPANS, DFS, DSNA, ENAIRE, ENAV, EUROCONTROL, NATS, NLR;
RPAS expert	As per CBA expert
Security/ Cyber security expert	As per CBA expert
Regulation expert	As per CBA expert
Military	As per CBA expert considering that most of ERICA partners are working also for military products and services

Table 5 – ATM Focal Points in ERICA

3.3 Consortium as a whole

The members of the SESAR Joint Undertaking PPP work and cooperate together to the best of their abilities with a view of implementing SESAR 2020 in a correct, efficient, open and timely manner and of attaining the objectives and the deliverables as envisaged by the ATM Master Plan. The Consortium involves key stakeholders of the Airborne Systems, Ground ATM Systems, Service Provision and EUROCONTROL hence providing a wide range of expertise covering all aspects of EUROPEAN ATM.

At the time of submitting this proposal, this consortium comprises 20 organisations² from 12 member states³ of the European Union, and no organisations from nations beyond the EU. The consortium was carefully selected according to the skills and experiences required to accomplish the proposed work.

The operational expertise, which is crucial for the conceptualisation and implementation phase of the project, is found in the strong representation of end-user organisations in the consortium. The work is structured in a very collaborative way throughout all work packages and will ensure the transfer of knowledge and know-how between all participants.

The Consortium partners' inter-alia has a wealth of experience and expertise in the development and validation of safety nets and related ATM tools from across Europe and across ATM stakeholders. In addition, this consortium consists of experts that work across the RPAS domain within the whole SESAR 2020 programme. This ensures good management of the inter-project dependencies.

² Only active partners were considered here.

³ Only states of active partners were considered here.

The mix of participants includes ground industry, airborne industry and ANSPs who complement each other, provide a breadth of appreciation of the integration and safety issues for RPAS from across the full scope of ATM whilst also ensuring a cross-industry consensus of the future direction of developments to achieve industry goals. The work of this project activity is complementary to US activities. Non-involvement in the domain risks Europe being rule-taker rather than rule creator. EASA look to the EUROCAE Standardisation Groups for evidence and expertise in the adoption of new airborne systems.

The activities will also benefit from the expertise of EUROCONTROL who will participate in the project actions without requesting funding. EUROCONTROL will fully engage in the project and, in particular, is committed to providing the necessary effort, contribution to deliverables and to other activities as set out in this tender and in the accompanying administrative forms.

The required expertise to fulfil the Project objectives will be drawn from the Project partners who will come together to collectively achieve the goals of the Project. In particular, the project benefits from:

- **ATM operational expertise provided by ANSPs;**
- **Ground industry partners** who bring vital technical knowledge related to technical system development;
- **Airborne industry** that brings operational and technical platform expertise essential to addressing the scope of the project since it includes a wide range of RPAS manufacturers/integrators and RPAS equipment/system developers.

The members of the Project will bring their individual innovative approaches to the tasks and this in turn will stimulate further innovation to determine find the most suitable and complementary method to progress the Project's goals.

The results from the Project will have a high visibility and will be disseminated and exploited by the participants. The coordinated benefits to be derived will be advantageous for European ground industry, airborne industry and service providers individually whilst also advancing the state-of-the-art in European aerospace innovation and unlock a key dependency for the safe integration of RPAS operations into European airspace (and the wider economic benefits to Europe that this brings).

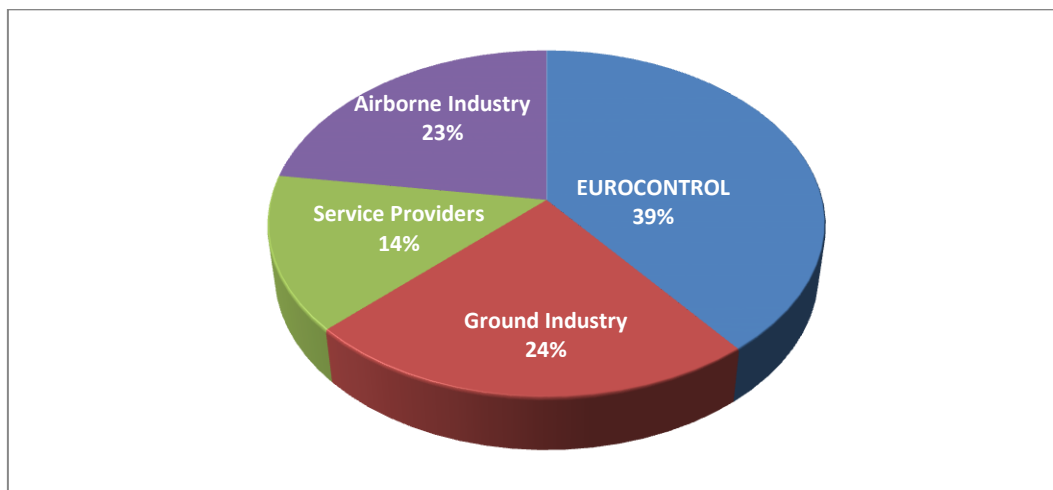


Figure 8 - Budget share between stakeholder groups

3.4 Resources to be committed

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

Therefore, the SJU contribution to the Action shall be broken down into several instalments. The first instalment (“First SJU Contribution” of the Action), corresponding to the initial “maximum grant amount” as per Article 5.1 of the Grant Agreement, will be calculated in proportion of:

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

On the basis of the First SJU Contribution for this Action established at a maximum grant amount of 8.486.176,57 € 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:

List of contractual deliverables to be completed with the funds of the First SJU contribution:

- D1.1 – Project Management Plan
- D1.3 – Management Progress Report
- D4.1 – H - Requirement No. 1
- D4.2 – POPD – Requirement No. 2
- D4.3 – GEN – Requirement No. 3

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

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

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

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

Participant 1 / Leonardo		Justification
Travel	€ 81.500	Travel expenses to participate to workshops, integration activities on platforms, validation exercises. Travel expenses were estimated considering: <ul style="list-style-type: none"> • 3 senior engineers, 10 travels to destinations in

		<p>Italy (€500)</p> <ul style="list-style-type: none"> • 6 senior engineers, 31 travels to Brussels (€1500) • 3 senior engineers, 15 travels to other European destinations (€2000) <p>Travels will mainly be necessary for Programme Management purposes and for performing validation activities jointly with other partners, and other activities of technical and management coordination.</p>
Equipment	€ 0	-
Other goods and services	€ 350.137	<p>€153.063</p> <p>Costs for software licences (e.g. networking, software development, sensor simulation, geographical database tools, recording tools), system architecture upgrades, €161.874</p> <p>Costs relevant to the following items:</p> <ul style="list-style-type: none"> • n.1 action Cam (GoPro Hero 8) with dedicated accessories • n.2 Mobile workstation HP Notebooks with high capabilities and/or with graphic card dedicated • n.12 Desktop workstations for professional purposes including two 27 inches monitors for each workstation • n.2 4K 55 inches monitors, n.1 dedicated furniture for RPA ground control station, n.1 network switch • n.1 NAS computer data storage server • SSD for workstation, SSD portable, spare graphic cards, vertical mouse, table lamp, electric multi-take with USB charger <p>€28.000</p> <p>Cost for hardware/software upgrades.</p> <p>€2.200</p> <p>Costs relevant to project management tools.</p> <p>€5.000</p> <p>Costs relevant to workshop activities, open days, courses and other dissemination means, catering for meetings at the Leonardo premises with external guests.</p>
Total	€ 431.637	

Participant	6	/	Justification
LFV/COOPANS			

Travel	€ 21.000,00	Average cost of travels 1.500 euro, expected number of travels 14 – expect primarily SESAR experts to travel for project and coordination meetings and for validation activities.
Equipment	€ 0,00	-
Other goods and services	€ 3.766,86	Cost of catering for meetings at LFV/COOPANS premises with external guests. LFV/COOPANS will conclude a contract with an external entity that will provide support in non-core activities.
Total	€ 24.766,86	

Participant 12/ FRQ (FSP)	Cost (€)	Justification
Travel	€42.500	Travels for PJ13 Solution 117 Travel within Europe with 21 trips for average EUR 2000 p.p. covering KOM, EPMB, preparation of validation exercises, attendance of validation exercises (certain trips with more than one person).
Equipment	-	-
Other goods and services	€ 20.000	Costs for the rental of servers and for the purchase of software licenses.
Total	€62.500	

Participant 13 / HC (FSP)		Justification
Travel	€ 22.500	Travel costs are based on HC (FSP)'s participation at validation activities, project or solution meetings, coordination meetings, integration work, tests and preparation work at non-HC (FSP) site. Trips for PJ13-W2 includes an average of 6 travels/year for 2 person, on the approximated cost of €625 per travel and person.
Equipment	€ 0	-
Other goods and services	€ 900	Marketing and representation: publicity for the results of the solution (electronic press, social media etc)
Total	€ 23.400	

Participant 16/ SAAB	Cost (€)	Justification
Travel	€ 71.262	SAAB will be active in all Solutions of the project and deeply

		involved in the requirements, development, simulations, demonstrations and validation reporting. Travel from Sweden often require travelling in the day before a meeting. Travel expenses were estimated considering: <ul style="list-style-type: none"> 15 travels to destinations in Sweden (€550) 42 travels to European destination (€1500) Travels will mainly be necessary for project execution purposes including performing validation activities jointly with other partners. Trips within and to Europe are booked and paid, while expenses abroad is paid in € i.e. the calculation is prone to exchange rate and this is why the above cost per travel is rounded off close to the estimate during the bidding phase.
Equipment	€ 0,00	-
Other goods and services	€ 318.102,29	Rental cost of UAV for test and demonstrations, including ground stations, preparation and operation of the UAV.
Total	€ 389.364,29	

Participant 17/NATS	Cost (€)	Justification
Travel	€38.573	European meetings (including project progress and technical standards meetings):€ (9 meetings @ approx. €1550 each) Non-European meetings (for concept development and global standardisation with US stakeholders):€ (4 meetings @ €6100 each) Project progress meetings and technical meetings in Europe. The goals of the project (to ensure European airspace and operational considerations are actively incorporated in the global standardisation for the collision avoidance system to be deployed on RPAS) require that Europe has strong representation in these global standardisation activities and includes a range of stakeholder perspectives including industry and ANSPs. This was a fundamental impediment to European involvement in the standardisation of the manned variant of ACAS X and hampered the European validation of the system. Non-participation in global standardisation activities increases the assurance challenges, possibly poses future safety risks and impairs the desired business benefits from RPAS platforms since a solely US-designed technical solution will likely be unsuitable for European needs and incompatible with European airspace.
Equipment	-	-
Other goods and services	-	-
Total	€38.573	

Participant Number/Short Name	Cost (€)	Justification
Large research infrastructure	0	-

4 Members of the consortium

4.1 Participants

4.1.1 Companies profile

4.1.1.1 LEONARDO – SOCIETA' PER AZIONI

Organisation	1	Leonardo	Airborne Industry / Ground Industry
Description	<p>LEONARDO is a global player in the high-tech sectors and a major operator worldwide in the Aerospace, Defence and Security sectors. LEONARDO is based in Italy, has over 45,000 employees, of whom about 36% abroad, and in 2017 recorded 11.5 billion euro in revenues and received orders in the amount of 11.5 billion. Gianni De Gennaro has been the President since 4 July 2013 and Alessandro Profumo has been the CEO since 16 May 2017. LEONARDO designs and creates products, systems, services and integrated solutions both for the defence sector and for public and private customers of the civil sector, both in Italy and abroad.</p> <p>The wide range of defence and security solutions that LEONARDO offers Governments, private citizens and institutions includes every possible intervention scenario: airborne and terrestrial, naval and maritime, space and cyberspace. In close contact with local customers and partners, LEONARDO works every day to strengthen global security, provide essential physical protection and cybersecurity services for people, territories and infrastructure networks and supports scientific and technological research.</p> <p>LEONARDO operates in about 20 countries with offices and industrial plants in all of the five continents and can rely on a very large network of subsidiaries, joint ventures and international partnerships, with significant industrial presence in three main markets, United Kingdom, Poland and United States and structured partnerships in the most important high potential markets in the world.</p> <p>The new Leonardo is the culmination of a radical renewal and transformation process: from a financial holding company to a great integrated industry focused on five divisions:</p> <ul style="list-style-type: none"> • Helicopters • Aircraft • Aerostructures • Electronics • Cyber Security <p>LEONARDO also retains Parent Company and Corporate Centre functions for participated companies and joint ventures not included in the divisional scope. These are: the US subsidiary DRS Technologies, which deals with the supply of products, services and integrated support for the military, intelligence agencies and defence companies; ATR, the joint venture established with Airbus Group for the manufacture of regional aircraft; MBDA, the joint venture established with BAE Systems and Airbus Group for missile systems;</p>		

	<p>Telespazio and Thales Alenia Space, the two joint ventures established with Thales as part of the Space Alliance, for satellite services and the manufacture of satellites and orbiting infrastructures, respectively.</p>
Previous experience	<p>The main previous experience can be clustered in three main areas:</p> <ul style="list-style-type: none"> - ATM core business activities that provide an overview of the proven experience gained by the involved divisions mainly in the SESAR partnership as well as in other ATM initiative; - Specific RPAS activities in which the divisions were and are still involved; - Project management experience necessary to manage the relevant Project and Solutions activities. <p>ATM core business Experience Aircraft Division</p> <p>The relevant previous experience connected to the call have been identified in the following SESAR 1 projects:</p> <ul style="list-style-type: none"> • SESAR 1 Project 9.1 «Airborne initial 4D for trajectory management» The project aim was to allow a continuous synchronization of the aircraft trajectories between air traffic controllers and pilots. Leonardo Aircraft Division contributed to develop and integrate new algorithms in the FMS of the regional aircraft simulator that were used to demonstrate the possibility to implement the i4D function on board a regional aircraft. • SESAR 1 Project 9.2 «Airborne Full 4D Trajectory Management & 4D contract capability» The project aim was to allow gate-to-gate 4D trajectory management, from planning to post-flight, through the sharing of aircraft trajectories between various participants in the ATM. Leonardo Aircraft division contributed to the validation of the capability by using its regional aircraft simulation facility. • SESAR 1 Project 9.3 «Interoperability of Business Trajectory & Mission Trajectory». The project aim was to determine and validate means that allow military aircraft systems to support SESAR ATM capabilities such as trajectory management, new separation modes and 4D contract. • SESAR 1 Project 9.6 «Airborne Separation Assistance System (ASAS) – Airborne Separation (ASEP)». The aim of the project was to study the airborne implementation of the ASEP applications. The ASEP applications are applications using ADS-B information from surrounding aircraft and ensuring separation of an aircraft from one reference aircraft during a limited period defined by the controller, either in oceanic or continental environment. Based on the description of the operations and environment provided by the two operational projects linked to the ASEP topic (respectively 4.7.4b and 4.7.6), the project 9.06 proposed: - a functional analysis of ASEP applications for both oceanic and continental operations, - some first elements of functional architecture for mainline and business aircraft, - a first set of safety analysis based on the preliminary elements provided for ASEP operations, - and some thoughts for the implementation of ASEP on-board mainline, business and regional aircraft collected through

evaluations made with pilots and supported by V1 mock-ups.

- **SESAR 1 Project MedALE (Mediterranean ATM Live Exercise).**
The Project was one of the 9 projects co-funded by the SESAR Joint Undertaking in the frame of RPAS Demonstration Projects activities. The MedALE Project aimed to demonstrate, using existing assets which included an experimental demonstrator (Sky-Y RPAS), the validity and limits of: ad-hoc operational procedures to operate RPAS in non-segregated airspace; airworthiness rules that normally are used to “certify” an RPAS for experimental scope; existing technologies and systems when compared to the requirements and capabilities of the existing ATM and of the new one that SESAR is developing.
The first demonstration activity, the simulation campaign conducted with the 3 RPAS Pilots and the ATCOs with different traffic scenarios and non-nominal events, was carried out on November 2014. The simulation platforms interacted in a distributed virtual environment completely representative of the current ATM real one. In the distributed scenario real (human) RPAS Pilots and Air Traffic Controllers interacted as in a real scenario, safely simulating different typologies of real contingencies evaluating operational procedures and Human Performances, also by simulating audio and data communications. NATO M&S COE in Rome hosted the demo exercise during the two weeks of activity. BRLOS C2 datalink using aeronautical Satellite communication system (RAPTOR Simulator) was developed by Thales Alenia Space Italy for the MedALE BRLOS Operations. The Sky-Y RPAS was adapted and modified by the Leonardo Aircraft Division to meet the MedALE Live Trial configuration directly in Grazzanise. The demonstration flight activity was performed using Sky-Y RPAS remotely piloted from LIRM Airport, under the remote pilot’s command from the ground control station in the FTA under ATCO instructions and also by performing two unusual events, i.e. loss of up-link and loss of engine power.

Electronics Division

The involvement of Leonardo into the ATC domain includes the participation to several programs; among the others:

- SESAR several projects within WP 3, 4, 5, 6, 8, 10, 12, 14, 15
- SESAR 2020 Wave 1 projects pj01, pj02, pj03a, pj03b, pj04, pj05, pj06, pj10a, pj10b, pj11, pj16.
- EMMA – Preoperational validation of A-SMGCS level 1, 2 (ICAO Spec.)
- SWIM-SUIT – A European program carried out by a Consortium led by Leonardo for the technical implementation of the System Wide Information Management (SWIM) concept, i.e. the information sharing among different actors (Air Navigation Service Providers, Aircraft Operators, Airport Companies, CFMU, etc.)
- HLM – High Level Modeling for ATM system design through advanced modeling technique

Specific RPAS activities

Aircraft Division

The relevant five previous experience connected to subject of the PJ13 proposal have been identified in the following items:

- **RPAS demonstrators.** Conception, design, integration, verification and in flight experimentation of two RPAS demonstrators, the Sky-X (Combat category) and Sky-Y (Medium Altitude Long Endurance category).
- **MidCAS (Mid Air Collision Avoidance System) and MidCAS Standardization Support (SSP).** The project brought together 13 of the leading European aviation industries who gathered the multiple European initiatives on Detect & Avoid (DAA) to achieve a coherent route forward, supported by the EDA route map for insertion of RPAS into the air traffic system. The project was aligned with the later EC RPAS Air Traffic Insertion policy paper and ongoing Roadmap activities. The overall objectives of MidCAS were to demonstrate the technological feasibility of a DAA system for RPAS, to fulfil the requirements and safety objectives for short-term traffic separation and mid-air collision avoidance in non-segregated airspace and, in close cooperation with European and International organizations such as EUROCONTROL, EUROCAE (European Organization for Civil Aviation Equipment) and EASA (European Aviation Safety Agency), to provide them with the technical background to establish a DAA standard. Transatlantic coordination was conducted throughout the project with organizations such as the RTCA (Radio Technical Commission for Aeronautics) SC 203 and the Federal Aviation Authority (FAA) mainly through their cooperation with EUROCAE WG-73. Flight tests were performed using the Sky-Y demonstrator of Leonardo Aircraft Division on 2014 and 2015 with the aim to evaluate the developed DAA suite. The good results achieved encouraged the Government and industries to launch an additional phase, MidCAS SSP, mainly devoted to mature the relevant standards, by exploiting the obtained results and the existing dialogue with the national and European Competent Stakeholders.
- **ERA (Enhanced RPAS Automation).** In the EDA framework (Joint Initiatives Programme RPAS), the ERA project will allow not only to develop and validate capabilities that are considered crucial for the air traffic insertion but also will contribute to their standardization. In particular the following technologies are planned to be developed: Automatic Take-Off and Landing (ATOL), Autotaxi and Automation and Emergency Recovery. In such project the Leonardo Aircraft Division is significantly engaged, with special focus on ATOL activities, of which it is leader, and with an important contribution also to automation and emergency recovery work.
- **SESAR 2020 Project PJ.10-05: «IFR RPAS Integration».** The scope of PJ.10-05 solution is to investigate ways in which RPAS may be able to use a technical capability or procedural means to be safely integrated in ATM including complying with ATC instructions in order to be integrated in non-segregated airspace. According to this scope the main topics treated by the solution can be summarised as follows:

- understanding and determining whether RPAS fit into the current manned aircraft classification criteria, or whether there is a need to establish a specific RPAS operation classification;
- addressing flight preparation, requiring information management for flight planning, where all intended flight-trajectories are planned in a manner compatible with the ATM Network;
- assessing of whether RPAS might, in the early phases of ATM integration, not behave exactly the same as other aircraft, because of the latency and a different flight awareness of the crew, and the consequent impact of these factors on separation provision;
- understanding of RPAS-specific trajectories that are not easy to describe in the existing B/MT format;
- addressing ATC that will need awareness of RPAS activities in their Area of Responsibility. Activities must be preannounced and the flight plan will need to indicate the fact that the flight is an RPAS. During flight, the air traffic controller and the other airspace users shall have some indication that the aircraft in question is unmanned. ATC shall have knowledge of the contingency procedures;
- addressing whether RPAS to be able to fly IFR in managed IFR airspace where VFR flight is permitted, the RPAS will need to be able to meet the obligations of IFR flight, including ‘traffic avoidance’, maintaining VMC conditions and terrain avoidance;
- analysing the effects of loss-of-C2 link procedures, which will be developed for RPAS contingencies conditions.

The main objectives addressed by the solution and derived from the topics above are:

- Analysis and development of methods and models of trajectory description.
- Analysis of existing and proposed ATM procedures, new technologies, approaches and trends dealt with RPAS.
- Operational mission and scenario analysis for RPAS.
- Initial validation of minimum performance requirements for RPAS IFR/VFR flights and separation criteria.
- Operational validation of minimum performance requirements for RPAS IFR/VFR flights and separation criteria.
- Assessment of contingency situations, assessment related to cyber security aspects.

Patent US8744737B2 “Method Of Collision Prediction Between An Air Vehicle And An Airborne Object”. The patent claims a method of predicting collisions between a mission air vehicle, even unmanned, and a plurality of airborne objects, even not cooperative, the mission air vehicle and said airborne objects moving along corresponding routes that can include curved and circular trajectories represented by means of fixed-radius waypoints. The method comprises the means for: predicting conflicts both at short and

medium/long term; differentiating the surveillance frequencies of the airborne objects according to their danger level and traffic density; assigning to each of said airborne objects the more appropriate between a deterministic or probabilistic algorithm of conflict prediction; generating, for each conflict detected, an alert message that includes information about the risk and the kinematic characteristics of that conflict.

Electronics Division (formerly “Airborne & Space Systems”)

The Leonardo Electronics Division designs, produce and operates the Falco RPAS and several Small/Mini. Its Falco RPAS is operating worldwide 24h 7/7 with several Customers, and in harsh environment, but notably, is operating like a GA traffic, in controlled airspaces, and leads the Command and Control and the mission management system of major National remotely piloted aircraft system. Moreover Leonardo is active in the Sense, Detect and Avoid arena, intended as an enabler for safe insertion of RPAS into ATM. Given the costs and risks involved into this aspect, Leonardo will provide support also by exploiting its Simulator part, able to analyse, design, create, test, integrate and validate a comprehensive simulator environment able to replicate the overall picture and able to validate solutions.

The Division has provided significant contribution in MIDCAS European RPAS R&T projects as member of the Project Management Team, Chief Engineering Group, WP leader of Sense&Avoid Demonstrator Integration, developed cooperative sensor models (ADS-B and Active Mode-S Surveillance) and provided ADS-B sensor for flight tests.

It has also provided significant contribution in MEDALE Real Time Simulations, integrating its RPAS Simulator (Falco).

The Division is involved in MIDCAS SSP and ERA projects, regarding DAA standardization and Enhanced Automation in RPAS (ATOL, TAXI and other safety management aspects)

The Division designs, produce and integrates Mission Management, Vehicle Avionics, Ground Control Stations and RPAS C2 and Payload Communication systems for MALE/HALE UAS

Participate to EUROCAE (WG-73) standardization activities on RPAS and WG105.

Electronics Division (formerly “Security & Information Systems”)

The main relevant projects are:

- **SESAR PJ10.05:** The scope of PJ.10-05 solution is to investigate ways in which RPAS may be able to use a technical capability or procedural means to be safely integrated in ATM including complying with ATC instructions in order to be integrated in non-segregated airspace
- **Desire 2:** Demonstration of the use of Satellites complementing Remotely Piloted Aircraft Systems integrated in non-segregated airspace
- **RPAS Federated Simulator:** The Leonardo SIS RPAS Simulation Environment has been developed for replicating substantial aspects of

real RPAS operations under realistic working conditions and in a fully interactive fashion. The Environment is composed by several subsystems federated via High Level Architecture protocol (HLA). The glue among the different subsystems is the Leonardo's simulation ecosystem SimLabs that works as coordinator in managing the federated nodes.

- **RPAS in air:** The project intends to develop new aerospace and ICT solutions to enable an innovative land monitoring and control service which integrates data collected by RPAS equipped with innovative sensors when flying into not segregated airspace fused with data from other sources.
- **TERRA:** The TERRA project scope is to leverage existing state-of-the-art and potential new technologies, to develop elements of a ground-based U-Space architecture that will accommodate a large base of RPAS in a mixed mode (manned and unmanned) environment.
- **D-FLIGHT:** This project intend to develops a DTM system, a concrete technical implementation comprising software, the necessary infrastructure for running the software, and the drones themselves, all contributing to the achievement of provisioning of U-Space services. The D-Flight system can be represented as a system of individual sub-systems, standardized by operational procedures, in which DRONES are operating more autonomously, and in which information is shared and exchanged, with a high degree of decision-autonomy, allowing more efficient adaptations, to achieve a common objective: the safe, orderly and efficient use of the available, limited and shared airspace.

Project management experience

The Leonardo Aircraft Division has gained a significant experience in the programme and project management thanks its long engagement in the aeronautic sector business. In special way, the peculiarities that characterize the aeronautic products, given to the Division the capability to manage activities in the field of:

- From the conception to the definition, design, integration, realization, validation, certification, commercialization and in service support of very complex products for civil and military application;
- Management of multi customer with different background, experience and culture;
- Management of wide supplier and sub-supplier spectrum including research centres and Universities;
- Dialogue and liaison with National, European and International stakeholders in the domains of regulation, certification and standardization;

In particular, the main experiences, relevant to product and R&D activities, can be summarized as follow:

- MEDALE project management as project leader (4 industrial player, IT MoD, Italian Civil Aviation authority, SESAR JU)
- MIDCAS project management at National level (complex project where Aircraft Division taken the overall responsibility of flight test in Italy)
- Global System Study management as project leader (5 nations, 5 main aeronautic industrial player)

	<ul style="list-style-type: none"> • Green Regional Aircraft management under Clean Sky Initiatives as project leader (several players, EC, CS JU, flight test activities) • SESAR 1 project management (project 9.20, project 9.24, project 9.3 on which flight test activities performed using C-27J) and complex simulation and flight test activities managed by the Leonardo Aircraft Division using both its own and affiliate assets; • SESAR2020 solution management (PJ03b-03 “Conformance monitoring safety net for Pilots”.) • SESAR2020 W1 PJ14 project management.
<p>Entity Profile matching the task</p>	<p>Aircraft Division</p> <p>The experiences of Leonardo Aircraft Division on RPAS and relevant issues to be solved in order to allow their operations outside segregated airspace is a mix of National, European and International collaboration activities with other Industries and competent bodies on such sector.</p> <p>In the National context, Leonardo Aircraft Division has competencies and significant experience in the following technological areas:</p> <ul style="list-style-type: none"> - conception, design, realisation, verification (test benches and flight simulator) and in flight operational demonstration of RPAS technology; - capability to qualify the product and operate it using its qualified pilot by the National CAA; - capability to fly RPAS in flight test ranges and in civil aerospace through the important support of Italian Air Force and ENAV. <p>Most of the developed technologies (such as automatic take-off and landing, emergency recovery, ground control station functions) are part of the existing European RPAS roadmap technology.</p> <p>Leonardo Aircraft Division is a very active Company also in the European framework through its engagement in different European Industrial Groups that are the official interfaces to dialogue in a coordinated manner with the European competent bodies in charge to define the action lines to be undertaken in matter of new standards, new regulation and new technologies to be developed in order that the RPAS insertion outside segregated airspace can be a reality.</p> <p>With special attention to RPAS, the main industrial groups which Leonardo Aircraft Division is today involved with are: ASD (Aerospace and Defence Industries Association of Europe) Aircraft Sectorial Group; ASD UAS Working Group; ASD Airworthiness Committee; ASD ATM Committee.</p> <p>Through the above groups, and in special way with the ASD UAS Working group, which Leonardo Aircraft Division is currently leading, the following dialogues with European Stakeholders are established:</p> <ul style="list-style-type: none"> - Main European Industries at ASD level to define in a common way the vision in matter of RPAS Insertion into non segregated airspace - European Commission, through the Director General of ENTR, MOVE, R&T respectively to address the industrial and market perspectives, research and technology development and regulation that in matter of RPAS insertion are to be considered.

- SESAR Joint Undertaking that will be the technological arm of EC to develop the key-technologies necessary for RPAS to fly outside segregated airspace
- EASA to define the regulation actions to be planned and undertaken being sure that the technology developed will fit the European regulation framework for RPAS operations in non-segregated airspace
- EUROCAE in matter of standardisation to be developed in the future on such sector
- ESA for all the space key- technologies to be developed to allow the RPAS insertion

Moreover Leonardo Aircraft Division is a member of EUROCAE and is especially active within the WG-105 (UAS) Working Group, where it contributes to prepare and deliver the set of European standards for RPAS. In particular Leonardo Aircraft Division is leader the sub-group SG-51 (ATOL) that is working to standardize the Automatic Take-Off and Landing for IFR RPAS operating in controlled areas.

Electronics Division (formerly “Airborne & Space Systems”)

Chief Engineers and Senior Engineers that participated to the MidCAS DAA integration and flight testing.

Electronics Division (formerly “Security & Information Systems”)

The Leonardo Electronics Division has an key role into the Desire2 project (Demonstration of the use of Satellites complementing Remotely Piloted Aircraft Systems integrated in non-segregated airspace 2nd Element) by analyzing in detail the Air Traffic Insertion Requirements having impact on the ATM component, by specifying the interfaces and architecture of the DeSIRE 2 Simulation Environment, and contributing to the demonstration requirements definition document, relevant to ATI Requirement Section, ATM Subsection.

The DeSIRE2 project is commissioned by ESA and EDA and implemented by a consortium of the following companies: Telespazio (IT), Leonardo former Selex ES (IT), Piaggio Aero Industries (IT), e-Geos (IT), ENAV (IT), ViaSat (CH, UK), AEDEL Aerospace (CH), Skyguide (CH)

The Division has a leadership position in Global ATM Security Management (GAMMA) project that aims to the following objectives:

- Extend the scope of threat assessment performed within SESAR to a more comprehensive system of systems level,
- Develop a Global ATM Security Management framework, representing a concrete proposal for the day-to-day operation of ATM Security and the management of crises at European level.
- Define the requirements and architecture of an ATM security solution, suitable to support the security management of the global ATM system (including crisis and incident management),
- Design and implement representative prototype components of the above ATM solution so as to demonstrate, through concrete developments, the functionalities and operations proposed for the future European ATM.

	<ul style="list-style-type: none"> - Set up a realistic validation environment, representative of the target ATM solution, through which to perform validation exercises aimed at validating the feasibility and assessing the adequateness of the procedures, technologies, and human resources issues proposed - Leonardo Electronics Division is an Industrial global player in the high-tech sector, including job profiles of system engineer, software and architecture specialists, validation and platform experts, aircraft and RPAS experts.
Contribution	<p>Aircraft Division <u>Project Management</u></p> <p>The Leonardo Aircraft Division will lead and coordinate all the necessary activities to be undertaken to successfully reach the project objectives putting in place an appropriate organisation and involving key-personnel able to manage the entire project activities in line with the project management plan.</p> <p><u>Technical contributions</u></p> <p>In the PJ13 ERICA Project, the Leonardo Aircraft Division will continue to increase experience and strengthen expertise in the domain of the airborne separation, already explored in SESAR 1, SESAR 2020 Wave 1 and other research programs dealing with traffic avoidance.</p> <p>In particular, in solution 115 of PJ13, the Leonardo Aircraft Division will contribute to define the IFR RPAS accommodation concept while in solution 117 it will contribute to solve the issue of the full integration of IFR RPAS in class A-C airspaces by developing some separation assistance applications. These applications will assist ATC to maintain separated the mixed traffic (i.e. RPAS and manned aircraft) as well as to manage contingency situations created by degradation of RPAS CNS performance.</p> <p>The Leonardo Aircraft Division will also support the real-time and fast-time validation activities performed within solution 117 by providing both a full RPAS (RPS+RPA) simulator (that will be federated with an ATC platform and other manned/unmanned aircraft simulators) for RTS validation and an FTS simulation framework for preliminary validation of the Airborne Separation Assistance concept and related on-board functions.</p> <p>Electronics Division (formerly “Airborne & Space Systems”)</p> <p>Within PJ13, the Leonardo Electronics Division will contribute with a focus on Cooperative Sensor D&A subsystem. In particular it will: contribute in the assessment of previous work (e.g. MIDCAS, RTCA SC-228), in the OSED/SPR/Interop revision to guarantee consistency with cooperative sensor feasibility (in particular with a trade-off analysis on Mode-S bearing measurement FOV/accuracy vs system complexity/SWaP trade-off analysis); contribute in the definition of the future D&A Cooperative Sensor requirement consolidation; provide simulation models adapting/enhancing ADS-B and IFF Interrogator models developed within MIDCAS project; contribute in the Technical Specification/Interface Requirement Specification.</p> <p>Within PJ13 the Division will contribute with a focus on the DAA System level; in particular it will: contribute into the assessment of already available</p>

standards and Project results, OSED/SPR/Interop definition, and standardization support. The Line of Business will support the RT Validation Environment development taking care of DAA functional aspects and its integration with the simulation framework. Another focus will be on the operational insertion within an ATM framework, where APS will contribute both for requirements and for operational experience.

Electronics Division (formerly “Security & Information Systems”)

The Leonardo Electronics Division will continue to increase experience and expertise in the domain of RPAS insertion into ATM, already explored in SESAR 2020 Wave 1 and other research projects.

In particular, in solutions 115 and 117, Leonardo Electronics will contribute to Operational and Technical Requirements and at the assessment of work related at C2 Link Safety and Security and C2 Required Communication Parameters. Leonardo SIS will contribute to the definition and consolidation of the real time simulation environment requirements applicable to Air Traffic Management (ATM) Validation Platform for RPAS Air Traffic Insertion.

Leonardo SIS will participate at the validation exercise with the integration of the RTS environment, providing ATM system, SATCOM simulator and the SimLabs network for the project and configuring the ATM scenarios in order to fit with the simulated environments and actors.

4.1.1.2 AIRBUS SAS

Organisation	2	Airbus	Airborne Industry
Description	<p>Airbus is a leading global manufacturer of the most innovative commercial aircraft. Its comprehensive product line comprises highly successful families of aircraft, from the single-aisle A220 Family to the double-deck A380. Over the last years, Airbus has built a reputation on reacting to market demands, developing and evolving its products to meet the needs of customers and the wider world. As such, technological innovation has been at the core of Airbus’ strategy since its creation.</p> <p>The A320 is one aircraft in four sizes (A318, A319, A320 and A321), representing the most successful and versatile jetliner family ever. Seating from 100 to 240 passengers and flying throughout the world – and landing on every continent – an A320 takes off or lands every 1.6 seconds. The A320neo (new engine option) is the latest upgrade to the A320 Family. These new A319, A320 and A321 models feature new engines and large wingtip devices known as Sharklets. Together they result in a 15% fuel-burn reduction, corresponding to an annual CO2 reduction of 3,600 tonnes per aircraft. The A220 expand the Airbus single-aisle family to cover the 100-150 seat segment – and respond to a worldwide market demand for smaller single-aisle jetliners. In the wide-body segment, the A330neo is powered by high-bypass ratio, new generation engines and designed with an advanced high-span wing vastly improving the aerodynamics. New materials have also been used across the wing including titanium pylon and composite nacelle. All these features combined, ensures that the A330neo has the lowest seat-mile cost of any mid-</p>		

	<p>size widebody and burns 25% less fuel burn than the previous generation A330.</p> <p>The A350 XWB brings together the very latest in aerodynamics, design and advanced technologies to shape the efficiency of medium- to long-haul operations. The aircraft's innovative all-new carbon fibre reinforced plastic fuselage results in lower fuel burn as well as easier maintenance. Meanwhile, the combination of low operating costs, flexibility and optimised performance makes the A330 Family popular with an ever-increasing operator base.</p> <p>The A380 provides airlines with the best opportunities to optimise revenue across their networks, with more seats for growth, connecting traffic and higher yields by offering more capacity when and where people want to fly. Continuously striving to develop new technologies, Airbus is a world leader in the modern aviation industry. Helping it stay at the forefront is the introduction of new systems, materials and designs that improve the quality and efficiency of aircraft to benefit everyone – from the passengers to airlines.</p> <p>In SESAR Airbus provides expertise in several areas. More precisely Airbus has a large development background for UAVs (drones) and integration of these novel platforms in airspace. With the European Medium Altitude Long Endurance Remotely Piloted Aircraft System (MALE RPAS) major development steps such as the System Preliminary Design Review are achieved.</p>
Previous experience	<p>AIRBUS has thorough ATM knowledge of commercial air transport operations. More specifically for this operational project :</p> <ul style="list-style-type: none"> - Airbus contributed to the SESAR 1 and SESAR 2020 Wave 1 activities related to TCAS enhancements and to ACAS X - Airbus contributes to International bodies related to RPAS and drones, such as ICAO – RPAS Panel, JARUS, EUROCAE WG105 - Airbus contributes to International bodies related to ACAS, Detect & Avoid such as EUROCAE WG75 and WG 105 - In EDA projects Airbus participate in technology projects for RPAS airspace integration such as MIDCAS (Mid Air Collision Avoidance System) for the demonstration of acceptable solutions for the critical UAS self separation and mid-air collision avoidance functions and ERA (Enhanced RPAS Automation) for setting the European standards providing the technical grounds for the certification of the Automatic Take-off and Landing, Autotaxi and Automation and Emergency Recovery functionalities. <p>SESAR 1 WPs 4.8.2, 4.8.3 SESAR 2020 Wave 1 PJ 11-A1</p>
Entity Profile matching the task	<p>As the leader aircraft manufacturer, capable of managing large complex programmes, AIRBUS staffs are highly skilled professionals, competent and motivated in their fields and well accustomed to working within an international, multicultural environment.</p>
Contribution	<p>Within Solution 111 and 117, AIRBUS will contribute to concepts developments and validations (from both RPAS and Commercial Aviation points of view), and contribute to the related standards within EUROCAE. For Solution 111 Airbus focus to requirements analysis related to platform</p>

integration, avoid performance and trade-off analysis.
In Solution 117 the focus lies on aspects related to RPAS Emergencies and Contingencies, based on the activities in the EDA ERA project.

4.1.1.3 STICHTING NATIONAAL LUCHT- EN RUIMTEVAARTLABORATORIUM

Organisation	3	NLR	Airborne Industry / Ground Industry / Service Provider
Description	<p>NLR is the Netherlands Aerospace Centre for identifying, developing and applying advanced technological knowledge in the area of aerospace. NLR activities are relevant to society. They are market-oriented and carried out on a non-profit basis. NLR strengthens the innovativeness, competitiveness and effectiveness of government and business.</p> <p>The mission of NLR is to increase the sustainability, safety and efficiency of air transport. NLR is renowned for its leading expertise, professional approach and independent consultancy. NLR moreover possesses an impressive array of high quality research facilities. The activities of NLR span the full spectrum of Research Development Test & Evaluation. NLR thereby bridges the gap between research and practical applications, while working for both government and industry. Founded in 1919, and employing some 650 people. NLR is participating with two divisions in SESAR which are shortly introduced in the following:</p> <p>The division Aerospace Operations of NLR supports its customers – worldwide- with the realization of an excellent operation. With our extensive expertise and unique simulation facilities we contribute to the sustainable performance of air traffic: futureproof, safer, more efficient and more environmentally friendly. Through consultancy and R&D our flexible and state-of-the-art activities find their way to customers such as airlines, air traffic control, airports, ATM industry and governments. We find our customers both in The Netherlands and beyond its borders and also contribute to European programmes such as SESAR and CleanSky. From the integration of drones in civil airspace to new airport concepts, with our passion for aerospace and our excellence and extensive knowledge of air traffic we always strive for the best result for the customer.</p> <p>The division Aerospace Systems of NLR is active in several domains: avionics technology, definition and flight testing of aircraft systems, application and testing of military systems, and application of space systems. Experts are active in the recent developments of RPAS technology, their certification and integration into non-segregated airspace. Furthermore the division is active in defining and facilitating experimental flight testing. The division has wide expertise in the certification of civil and military aircraft and systems. In the field of navigation NLR has deep expertise in GNSS.</p> <p>AT-One Consortium is composed of its two members Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR) and Netherlands Aerospace Centre (NLR).</p>		
Previous experience	<ul style="list-style-type: none"> • SESAR 2020 W1: PJ01, PJ02, PJ03a, PJ03b, PJ04, PJ05, PJ14, PJ17 • AIRPASS – Advanced integrated RPAS avionics safety suite 		

	<ul style="list-style-type: none"> • TERRA – Technological European Research for RPAS in ATM • AIRICA – ATM innovative RPAS integration for Coastguard applications • PODIUM – Proving Operations of Drones with Initial UTM Management • UAM – Urban Air Mobility • DESIRE – Demonstration of Satellites enabling the Insertion of RPAS in Europe • SINUE – Satellites for the integration in non-segregated airspace of UAS in Europe
Entity Profile matching the task	NLR has experience with drone accommodation and integration into non segregated airspace. Extensive experience is available for the Dutch airspace, with multiple testing and projects successfully finalised or ongoing. NLR has its own specific drone test centre, and is moreover holder of a drone operating certificate and provider of drone training courses. Research and simulations have been done regarding drone interaction with ATC, and NLR has also experience with conflict detection and resolution concepts and technologies.
Contribution	<p>AT-One will provide contributions to the following topics:</p> <ul style="list-style-type: none"> ▪ Integration of drones in the air traffic control system. The operational concept will describe how the ATCO is informed on drone traffic and how he will interact with the drone. ▪ Definition of the architecture. Analysis of the pros and cons of different solutions to exchange information between different subsystems, i.e. the ATC-system, flight Planning, surveillance, communication between the ATCO and the remote pilot. <p>Back-up communication in case of failure of the standard communication system.</p>

4.1.1.4 VALSTYBES IMONE ORO NAVIGACIJA

Organisation	4 ON (B4)	Service Provider
Description	<p>Founded by the Ministry of Transport and Communications of the Republic of Lithuania in 1995, valstybes imone Oro navigacija (ON) is a state-owned enterprise providing Air Navigation Services, including Air Traffic Management Services, Communication, Navigation and Surveillance Services, Aeronautical Information Services, as well as Search and Rescue, in the airspace of Republic of Lithuania and over the part of Baltic Sea.</p> <p>With a total staff of 290 (including 90 ATCOs) and altogether five operational units, among them one ACC (Vilnius), three APPs (Vilnius, Kaunas, Palanga), one TWR (Siauliai), ON (B4) controls the airspace of Republic of Lithuania and over the part of Baltic Sea (Vilnius FIR) of the total size of 76 126 km² and provides ATC services at four designated Lithuanian international airports. In 2018, compared to the previous year, an increase in air traffic was seen in the Vilnius FIR, namely from 243,022 to 265,919 IFR movements, i.e. by 9.4 %. The European-wide increase in air traffic is also reflected in the evolution seen in the airspace of Republic of Lithuania in the last decade when the total number of IFR movements increased by 47%. Each year providing safe and efficient air traffic control services to more than 250 thousand flights ON (B4)</p>	

	<p>continues to maintain zero delays level and to meet users' expectations. ON (B4) is a Member of Baltic FAB, a part of B4 Consortium composed of four ANSPs from Central and Eastern European countries and a Member of SESAR Joint Undertaking. Being a member of SESAR Joint Undertaking via B4 Consortium, ON (B4) actively participates in the industrial and transversal projects by SESAR 2020 Programme while participation in SESAR Deployment Programme allows to implement several projects. In 2017, ON (B4) officially joined the European iTEC (Interoperability Through European Collaboration) alliance developing a high-end air traffic management system for busy and complex airspace.</p>
Previous experience	<p>ON (B4) participates in 6 projects and 8 solutions (Workpackages (WPs)) under SESAR 2020 Programme in Wave 1 within the framework of Horizon 2020 Programme (EU Research and Innovation Programme). Currently, ON (B4) actively participates in the following SESAR 2020 Wave 1 projects:</p> <ul style="list-style-type: none"> • PJ.05: Remote Tower for Multiple Airports • PJ.06: Trajectory based Free Routing • PJ.14: Essential and Efficient Communication Navigation and Surveillance Integrated System • PJ.19: Content Integration • PJ.20: Master Plan Maintenance • PJ.22: Validation and Demonstration Engineering and solutions (workpackages (WPs)): • PJ.05-02: Remotely Provided Air Traffic Service for Multiple Aerodromes • PJ.05-03: Remotely Provided Air Traffic Services from a Remote Tower Centre with a Flexible Allocation of Aerodromes to Remote Tower Modules • PJ.06-02: Management of Performance Based Free Routing in Lower Airspace • PJ.14-01: CNS Environment Evolution • PJ.19-04: Performance Management • PJ.20-02: Master Plan Maintenance • PJ.22-03: Maintenance of the Platform Development Methodology • PJ.22-04: Communalization of Validation Tools and Interoperability Solutions <p>ON (B4) has experience in contribution and development of all main projects deliverables and performing solutions validation exercises. ON (B4) has a SESAR 2020 Programme Management team and an internal team of experts specializing in different ATM related fields.</p>
Entity Profile matching the task	<p>ON (B4) intends actively participate in different projects related to Unmanned Aerial Systems, including autonomous and remotely piloted systems. Recently ON (B4) has submitted proposal under work programme "Smart, green and integrated transport" (call "Innovative applications of drones for ensuring safety in transport") sponsored by Horizon 2020 (EU Research and Innovation</p>

	<p>Programme). The project proposal “Airport Inspections by Drone Applications” (AIDA) was submitted by the consortium of air navigation services providers, airport operators, R&D institutes and technology developers from Italy, Lithuania, Germany and The Netherlands (9 partners). The AIDA project envisages development of new technologies for usage of drones in such important functions as Obstruction Inspection and Air-Side Pavement Inspection. Through rising accuracy, continuity and efficiency of these functions, the AIDA is to contribute to more effective airport operations and, as result, improved airspace users’ performance and overall ATM efficiency.</p> <p>ON (B4) experts have experience in fixed wing and multirotor autopilot based drones design, drones flight platform building, drones flight tests, commercial drones based wind turbine inspections. In addition, ON (B4) has ATM Operational experts, Air Traffic Controllers, Safety experts, RPAS experts.</p>
Contribution	<p>ON (B4) intends to contribute to the following activities related to SESAR 2020 Wave 2 Solution #115 (IFR RPAS accommodation in Airspace Class A to C) and SESAR 2020 Wave 2 Solution #117 (IFR RPAS integration in Airspace Class A to C):</p> <ul style="list-style-type: none"> • Contribution to project management and corresponding documents, • Contribution to development ATC procedures to allow IFR RPAS accommodation, • Contribution to assessment of the potential impact on ATC capacity and efficiency of accommodating IFR RPAS, and producing guidance material for managing this impact (e.g. guidance for quantifying impact on sector capacity, guidance for quantifying the impact on SES flight-efficiency indicators), • Contribution to assessment of the impact on ATC of the increased variety of performance envelopes and RPAS characteristics, and assessment of the impact on the complexity metrics used to support demand and capacity balancing, • Expert review of all documents and deliverables.

4.1.1.5 POLSKA AGENCJA ZEGLUGI POWIETRZNEJ

Organisation	5 PANSА (B4)	Service Provider
Description	<p>PANSА (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. PANSА (B4) 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 PANSА (B4), being one of the biggest ANSPs in the Central and Eastern part of Europe, provides safe, effective and highly efficient air traffic control services.</p>	

	<p>In 2018 PANSA (B4) handled over 830 thousands movements (IFR traffic). PANSA (B4) is constituent entity of B4 Consortium, composed of four ANSPs from Central and Eastern part of Europe and their Linked Third Parties. B4 Consortium is a member of A6+ on SESAR 2020 Programme content.</p> <p>PANSA (B4) is a Member of the Baltic FAB and Gate One, a regional platform of Central and Eastern European ANSPs.</p> <p>PANSA (B4) is also a founding member of the SESAR Deployment Alliance that was mandated by the European Commission to perform functions of the SESAR Deployment Manager that is responsible for synchronisation and coordination of PCP-related implementation projects.</p>
Previous experience	<p>PANSA (B4) has an outstanding and extensive experience in various domains related to subject and scope of SESAR Solution PJ.115/117 aimed at the successful integration of civil Remotely Piloted Aircraft Systems (RPAS) with the Commercial Aviation being nowadays one of the key issue for the Single European Sky (SES). The experience relevant to this project has been proved during the implementation of a large number of R&D projects on:</p> <ul style="list-style-type: none"> ▪ SESAR020 PJ10 PROSA, WP06 “IFR RPAS Integration“ ▪ CEDD (Central European Drone Demonstrator) initiative ▪ PansaUTM initiative ▪ Everyday work on the RPAS VLOS and BVLOS flights coordination within the polish airspace
Entity Profile matching the task	<p>Air Navigation Service Providers including the profiles:</p> <ul style="list-style-type: none"> ▪ RPAS expertise (PansaUTM, CEDD) ▪ ATM Operational expertise, ▪ ATM System expertise, ▪ En-Route and Approach Air Traffic Controllers, ▪ Human Factors expertise ▪ Safety expertise ▪ PANSA (B4) will bring profile of its Linked Third Party in the area of scientific expertise, development of advanced algorithms, hosting calculating algorithms providing hardware and software requirements for systems and simulators designing.
Contribution	<p>PANSA (B4) supported by its Linked Third Party is intending to contribute to SESAR 2020 Solution #117 through the participation in activities related to implementation, modelling and simulation of real world network use cases based on ATM scenarios and requirements regarding minimum IFR/VFR performance operational standards.</p> <p>PANSA (B4) in cooperation with its Linked Third Parties will work on network (new/modified) scenarios modelling and simulation, performance analysis and optimization (traffic distribution, scalability, error rates, delay in communication, network protocols statistics, user application performance, security of the datalink). Assuming, that non-verbal communication in aviation proved to be efficient and will become more and more important, PANSA's LTP will develop an application that allow to send text messages between ATC and RPAS pilot (similar to CPDLC in manned aviation) on the basis of ATN (ground) network.</p> <p>Validation activities will be performed on PANSA (B4)'s Linked Third Party Validation Platform and PANSA's ATM system test Platform.</p>

4.1.1.6 SWEDISH CIVIL AVIATION ADMINISTRATION - LUFTFARTSVERKET

Organisation	6 LFV/COOPANS	Service Provider
Description	<p>Luftfartsverket (LFV) 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.</p> <p>LFV/COOPANS has three main divisions:</p> <ul style="list-style-type: none"> - Operational Systems & Development - ATM Operations - Sales <p>All supported by corporate services.</p> <p>Governance Structure:</p> <p>LFV/COOPANS has a Board of Directors having responsibility for the corporate governance. The Director general is appointed by the Board of Directors.</p> <p>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/COOPANS), Naviar/COOPANS, Navegação Aérea de Portugal (NAV Portugal) and Luftfartsverket (LFV/COOPANS). Cooperation between COOPANS partners goes beyond SESAR, partners has for a long time worked together with Thales under a common framework agreement in a joint program based on the incremental development of a common ATM platform. The overarching goal for COOPANS is to enable each individual ANSP to achieve financial savings through cost, resource, and competence sharing and to meet the EU objective of harmonizing ATM systems. This work is expanded to Research & Innovation by the establishment of the COOPANS Consortium.</p> <p>Luftfartsverket (LFV/COOPANS) has many years of experience, both in the delivery of Air Traffic Services; design of concepts and in development, validation and implementation of Air Traffic Management tools.</p> <p>LFV/COOPANS has an extensive experience and a close interaction with the industry and Swedish Transport Agency, developing new technology. The effect of this is a flexible product portfolio of functional and cost efficient solutions, like the development of Remote Tower Services (RTS) that went from idea to reality in record time.</p> <p>The enterprise is certified ISO 9001.</p>	
Previous experience	<p>LFV/COOPANS has participated, contributing to and also been leading projects in SESAR 1 within NORACON Consortium in the following WPs:</p> <ul style="list-style-type: none"> - WP00 - 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
- **WP C - Master Plan Maintenance:** C.02, C.03

LFV/COOPANS have worked together with SAAB in Midcas projects and are well experienced to work with Remote Technology within the Remote Tower program.

In SESAR 2020, Wave 1, LFV/COOPANS has contributed to and also been leading solutions within COOPANS Consortium in the following solutions:

- **PJ.01-01** - Extended Arrival Management with overlapping AMAN operations and interaction with DCB
- **PJ.01-03B** - Use of Arrival and Departure Management Information for Traffic Optimisation in the TMA
- **PJ.02-08** - Traffic optimisation on single and multiple runway airports (lead)
- **PJ.02-11** - Enhanced Terminal Area for efficient curved operation
- **PJ.05-02** - Remotely Provided Air Traffic Service for Multiple Aerodromes (lead)
- **PJ.05-03** - Remotely Provided Air Traffic Services from a Remote Tower Centre with a flexible allocation of aerodromes to Remote Tower Modules (lead)
- **PJ.06-01** - Optimized traffic management to enable Free Routing in high and very high complexity environments
- **PJ.10-01a** - High Productivity Controller Team Organisation
- **PJ.10-02b** - Controller Automated Support Tools in En-Route Environment
- **PJ.10-05** - IFR RPAS Integration
- **PJ.15-09** - Data Centre Service for Virtual Centres Service
- **PJ.16-03** - Virtual Centre Concept
- **PJ.16-04** - Workstation, Controller productivity
- **PJ.18-02** - Integration of trajectory management processes
- **PJ.19-CI01** - ATM operations
- **PJ.19-CI02** - Systems and services
- **PJ.19-CI04** - Support and Evolution of the Content Integration Framework

	<ul style="list-style-type: none"> - PJ20 - Masterplan maintenance - PJ.25 - E-AMAN VLD - PJ.27 - Flight Object Interoperability VLD - PJ.31 - Initial Trajectory Information Sharing VLD <p>In SESAR 2020, Wave 1, LFV/COOPANS has been contributing and hosted validated in PJ.10-05 - IFR RPAS Integration.</p>
Entity Profile matching the task	<p>LFV/COOPANS is planning to run trials in cooperation with SAAB to validate the concept IFR RPAS integration in airspace class A to C, and Collision avoidance for IFR RPAS.</p> <p>Expertise is present in the company in many areas:</p> <ul style="list-style-type: none"> • Remote airport ATC • Development and supervision of operational concepts • Safety concepts & Safety Assessments • Airport safety support tools • Collaborative Decision Making • Air traffic forecast/Capacity planning incl. runway capacity enhancement • CWP design • Development and implementation of ATM systems & Tools (common development and implementation of TopSky) • Trajectory management (core functionality in TopSky) • Development and implementation of safety and monitoring tools (core functionality in TopSky – 4D MTCD) • Flight procedures, special approach procedures (incl. RNAV) • Performance Based Navigation • Integration, validation and analysis of test result • Extended lab environment including NARSIM and Thales IBP • Participation in European deployment activities (IDSG) • Human performance assessment
Contribution	<p>LFV/COOPANS will contribute with skills aiming to give access to airspace for all airspace users in a safe and controlled way. LFV/COOPANS will contribute to trials and to develop a concept for coexistence of different stake holders in the future a common single European sky.</p> <p>LFV/COOPANS will contribute with operational skills to the development of IFR RPAS integration in airspace class A to C, and Collision avoidance for IFR RPAS.</p>

4.1.1.7 DASSAULT AVIATION

Organisation	7	DAV	Airborne Industry
Description	<p>With more than 8000 military and civil aircraft delivered to 83 countries over the past 60 years and having logged nearly 28 million flight hours to date, Dassault Aviation is a major player in the Aeronautics field.</p> <p>On the one hand, more than 2,200 Falcons are today in operation worldwide, for the benefit of companies, major economic magnates and governments; they cover from 3350nm (Falcon 2000 S) up to 6450nm (Falcon 8X can</p>		

	<p>connect Paris to Singapore).</p> <p>On the other hand, over 1000 combat aircraft produced by Dassault Aviation, ranging from the Mirage III to the Rafale, are currently in service in nearly thirty countries.</p> <p>Dassault Aviation is also fully involved in UAV/UCAV programs as:</p> <ul style="list-style-type: none"> • Designer of nEUROn combat drone, a European UCAV technology demonstrator program, which successfully completed its maiden flight on December, 1st 2012 and has completed its demonstration program; • Teaming with Airbus and Leonardo on a design study for the development of a European Male drone for Medium Altitude long-range surveillance missions. <p>The Research and Development employs nearly one quarter of the 9000 people company's workforce. Fundamental and pre-competitive research is usually carried out in close co-operation with universities, research institutes and other industrial partners via a wide international network.</p> <p>Dassault Aviation is part of ACARE and is a founding member of the JU Clean Sky and member of its Governing Board. Within European framework research programs, Dassault Aviation has led numerous PCRD projects. Within National context, Dassault Aviation is member of CORAC (Council for Civil Aeronautics Research), created in July 2008 following commitments made in late 2007 during the Grenelle Environment Forum and is member of the Steering Committee.</p>
Previous experience	<p>Dassault Aviation has a long experience on the user side of ATM, designing, integrating and certifying avionics systems to allow safe and efficient operations and traffic insertion (within their respective requirements) of civil aircraft, military aircraft, and even UAVs.</p> <p>Dassault Aviation has been the first to receive CAT III operational qualification on the Falcon 900EX equipped with Head-Up Guidance System and is also pioneer in innovation on flight controls (Fly by wire systems).</p> <p>Dassault Aviation has also developed large relationships with airports and National ANSPs, to evaluate new types of approaches (e.g. CDA, SBAS based) and has been the first in Europe to use published LPV (Pau – France).</p> <p>Dassault Aviation has developed a good knowledge of many ATM stakeholders, mainly through the participation in standardisation working groups (EUROCAE...), standards harmonisation of operations working groups, implementation of regulatory guidance and procedures that will support the introduction of new concepts and in the validation of safety compliance of the systems.</p> <p>In SESAR, Dassault Aviation participates to EFVS to land operations in low visibility conditions projects (SESAR 1 open call AAL project, and SESAR 2020 Wave 1 VLD AAL2 project); in SESAR 2020 Wave 1 IR projects , Dassault Aviation contributes to some projects in order to highlight Business Aviation needs specificities as well as unmanned systems and pave the way for the deployment of beneficial solutions; in particular, in PJ01, PJ03a, PJ03b, PJ10, PJ11, PJ18 and PJ19/PJ20.</p>
Entity Profile matching the task	<p>Dassault Aviation participated to many of the French and European projects concerning unmanned systems and its derivative the RPAS. The team involved in PJ13 Solution 115 and Solution 117 participated to the MALE RPAS work onto the insertion in the GAT as well as the previous work</p>

	<p>SESAR2020 – PJ10-05. Its expertise is focussed in the definition of CONOPS dedicated to the military field and specifically for the use of unmanned systems in collaborative international projects such as the FCAS or the NEURON projects not mentioning the MALE RPAS project.</p> <p>In this team, specifically The prospective directorate will be the main contributor. It participated to the A4A project funded by EDA leading to the first definition of an agreed step approach. In the OPARUS project funded by the European commission it provided the first concept dedicated to management of an unmanned platform assuming a surveillance mission inside GAT above Mediterranean sea. In the SIGAT project funded by EDA it led the work package dedicated to the transposition of the safety aspect to the data link dedicated to the control of the RPA when defining the necessary bandwidth. It is part of SESAR 2020 PJ10-05 providing the support for the modelling of the business cases.</p>
Contribution	<p>Dassault Aviation will focus its contribution to the short term insertion to GAT concept (solution 115) part providing its knowledge of the platforms to model their operations and mainly what is possible considering the contingencies. After the exercises, Dassault Aviation will contribute to the review of the OSED taking into account their RETEX to adapt the insertion concept to the actual possibilities of the existing platform. This work will be mainly a part of solution 115 “accommodation”. However, Dassault Aviation will take into account the different coming possibilities of this type of platform and provide to Solution 117 “Integration” a transposition of the capabilities to come in order to orient the work done on the CONOPS.</p>

4.1.1.8 DIRECTION DES SERVICES DE LA NAVIGATION AERIENNE

Organisation	8 DSNA	Service Provider
Description	<p>DSNA (Direction des Services de la Navigation Aérienne) is the national air navigation services provider of France. DSNA is entrusted with the provision of air traffic services, associated communication, navigation and surveillance services and aeronautical information services in all airspace under French responsibility and at designated airports. DSNA is member of A6, FABEC and SESAR JU. DSNA has supported the principle of the SESAR programme since its inception and has participated as a major contributor to its definition phase study, has been a major active contributor to the SESAR 1 development phase and is an active contributor to SESAR2020 Wave 1.</p> <p>DSNA is also involved in the deployment of many PCP and non PCP SESAR solutions.</p>	
Previous experience	<p>Previous projects:</p> <p>In SESAR 1 DSNA led more particularly :</p> <ul style="list-style-type: none"> • WP04 (En Route operations) • P04.07.02 (Separation Task in En Route Trajectory based environment) • “Ground-Based Separation provision in En-Route” Operational Focus Area (OFA 03.03.01) • Free Route Operational Focus Area (OFA 03.01.03) • P04.02 (Consolidation of operational concept definition and validation 	

	<p>including operating mode and air-ground task sharing - En Route)</p> <p>During SESAR2020 Wave 1, DSNÁ was involved in PJ10-05 in the definition of the OSED for IFR RPAS Integration and in PJ11-A2 in the validation of ACAS Xu.</p> <p>Publications:</p> <ul style="list-style-type: none"> • SESAR 1 P04.02 D98 & D08 En Route Detailed Operational Description Step 1 and 2 • SESAR 1 P04.02 D97 En Route Concept Validation Strategy document Step 1 • SESAR 1 P04.07.02 D22 Preliminary Operational Service and Environment Definition (OSED)_4 <p>SESAR 1 P04.07.02 D37 Free Route Operational Service and Environment Definition (OSED) for Step 1 - iteration 2</p>
Entity Profile matching the task	<p>DSNA has extensive experience of research, development, validation and implementation of advanced trajectory prediction and conflict detection concepts and tools for Separation Management. This is a key topic where DSNÁ has played a significant role in the current SESAR 1 programme as WP4 leader and project 4.7.2 manager. As a core part of ATC service provision, the work to be carried out in SESAR 2020 is of strategic importance to DSNÁ in order to meet the future traffic demand.</p> <p>DSNA has been involved in the SESAR JU RPAS Demonstrators ODREA and TEMPÁERIS. In these projects, the feasibility of RPAS integration in civil airspace has been demonstrated. DSNÁ experience of such projects and the tight collaboration with industrial people is very relevant for SESAR 2020 RPAS solutions. In Wave1, DSNÁ and its third parties, SAFRAN and ENAC, are involved in PJ10-05 and PJ11-A2.</p>
Contribution	<p>During SESAR2020 Wave2, DSNÁ and its third parties will contribute to solutions:</p> <ul style="list-style-type: none"> - 111 by assessing the overall system performance of ACAS Xu and the interoperability with manned collision avoidance systems; - 115+117 by developing tailored procedures for RPAS in TMA and En-route. Real time simulation and real flights will be used to validate those procedures. Normal, ab-normal and emergency procedures will be tackled. Safety and ATC workload criteria will be considered. C2Link and operational procedures linked to C2Link failures will be assessed.

4.1.1.9 ENTIDAD PUBLICA EMPRESARIAL ENAIRE

Organisation	9 ENAIRE	Service Provider
Description	<p>The Spanish Business Public Entity “Entidad Pública Empresarial ENAIRE”, hereinafter referred to as “ENAIRE”, is the entity designated by the Spanish State to provide Air Navigation Services for En-Route and Approach phases, ruling 7 En-route/TMA ATC Centres and 22 Control Towers, being one of the major Air Navigation Service Providers in Europe.</p> <p>Airspace under ENAIRE control includes the Peninsula Ibérica (except</p>	

	<p>Portugal), Balearic and Canary Island, and part of North Atlantic, West Mediterranean and West Sahara.</p> <p>ENAIRES is a major European company in ATM, R&D and project management in the field of Airspace and Air Navigation and a founding member of the A6 alliance, which represents the ANSPs common view within SESAR Programme.</p> <p>ENAIRES has already been an active part of SESAR Programme from the very beginning and has substantially contributed as a SJU member in the different fields of airport and air navigation services management, planning and provision, and other ATM R&D related activities, in order to support the cooperative accomplishment of the European ATM Target Network and the associated European ATM Master Plan. As a quantitative illustration of this commitment, the more than ninety SESAR projects in which ENAIRES has been involved up to the present could be mentioned, playing a leading role in sixteen of them.</p> <p>As a services provider and also as owner of related systems and infrastructure, proactive promoter of research and development activities which are at the leading edge and highly experienced executor of validation and system integration processes, ENAIRES expects to maintain its participation in the SJU as one of its major members in those areas of activity where its technical and managerial expertise and know-how, systems and projects can bring the most added value to the deployment of the European ATM Master Plan.</p> <p>The added value provided to SESAR 2020 by ENAIRES and its linked third parties is based in the large set of available assets:</p> <ul style="list-style-type: none"> • Up to 7 En-route/TMA ATC centres, covering both Continental and Oceanic Airspaces, fitted with an advanced and evolving ATM system (SACTA/LIS ATM and in the future iTEC). Four of them, those covering the Continental Spanish Airspace, interconnected and working as a network; • Platforms are able to assume validations and simulations in a wide range of maturity levels, covering from the more immature phases of the R&D till complex simulations using both industrial products and also prototypes; • ATCOs from different ACC's, who are familiar with traffics, contingencies and events of multiple characteristics; and also from towers of different categories; • Engineers/ATCOs with vast expertise on the definition of future CNS and ATM; • Paving the way for deployment of mature concepts, especially those included in the PCP, will constitute a paramount and permanent priority for ENAIRES.
Previous experience	<p>ENAIRES is the company designated by the Spanish State to provide air traffic services in the en-route and approach phases. As part of an extensive ANSP work, ENAIRES manages the air traffic control and aeronautical information services, as well as the communication, navigation and surveillance networks required so that airlines and their fleet can fly safely and smoothly throughout the Spanish airspace. In addition, ENAIRES has defined several requirements in order to develop and improve the trajectory management within and among different ACCs. ENAIRES also participates in the definition and specification of the iTEC flight plan processing systems, besides the definition of its</p>

interoperability requirements to be compatible with other service provider initiatives.

ENAIRE is the leading air navigation and aeronautical information service provider in Spain, the fourth largest in Europe by traffic volume and one of the most important in the world. As a public business entity reporting to the Ministry of Public Works, we manage the Spanish airspace over a territory of 2.19 MN square kilometres. ENAIRE provides air traffic services to 2 million flights carrying over 250 million passengers each year. Through our five control centres, 21 control towers and a comprehensive network of aeronautical infrastructure and equipment, we provide en-route, approach and aerodrome ATC services, as well as flight information, alerts and consulting services. We are the communications, navigation and surveillance service provider across the whole of the Spanish airspace and at airports in Aena network.

This activity as Service Provider has been combined with several research and deployment projects. Actually, ENAIRE has been an active part of the SESAR from the very beginning of the Programme, contributing substantially as a SJU member in different fields (airports, ANS management, ANS planning and provision, etc.). This has been done in order to support the cooperative accomplishment of the European ATM Target Network and the associated European ATM Master Plan. The participation within the SESAR Programme began with SESAR 1, where ENAIRE took an active role in several projects, being the project leader in some of them. After the work performed in SESAR 1, ENAIRE has contributed in the great majority of the projects launched in SESAR 2020 Wave 1 programme, being an important part of the Service Providers Stakeholder group.

Participation in SESAR 1 projects:

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

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

Participation in SESAR 2020 Wave 1:

- PJ01: Enhanced Arrivals and Departures
- PJ02: Increased Runway and Airport Throughput

- PJ03a: Integrated Surface Management
- PJ04: Total Airport Management
- PJ06: Trajectory based Free Routing
- PJ07: Optimised Airspace Users Operations
- PJ08: Advanced Airspace Management
- PJ09: Advanced DCB
- PJ10: Controller Tools and Team Organisation for the Provision of Separation in Air Traffic Management
- PJ11: Enhanced Air and Ground Safety Nets
- PJ14: Essential and Efficient Communication Navigation and Surveillance Integrated System
- PJ15: Common Services
- PJ16: Controller Working Position / Human Machine Interface - CWP/HMI
- PJ17: SWIM Technical Infrastructure
- PJ18: 4D Trajectory Management
- PJ19: Content Integration
- PJ20: Master Plan Maintenance
- PJ24: Network Collaborative Management
- PJ27: Flight Object Interoperability VLD Demonstration

Other projects managed by the SESAR Joint Undertaking:

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

Previous participation in EC projects:

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

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

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

	<p>Regarding deployment activities, the Spanish Automated Air Traffic Control System (SACTA) has been continuously evolved. One example could be the following TENT-T project:</p> <ul style="list-style-type: none"> FRASAI, TENT-T, 2014, Free Routing concept implementation in Santiago – Asturias sector. <p>In addition to these projects, ENAIRE is currently carrying out the following research projects related to RPAS:</p> <ul style="list-style-type: none"> DOMUS SAFEDRONE <p>As well as the contribution, through any of ENAIRE's Linked Third Parties, to TERRA, IMPETUS and the advisory board of CORUS.</p>
Entity Profile matching the task	<p>PJ13 project will have a strong component based on ATC procedures, for that reason ENAIRE will contribute with their long experience like ANSP, matching the task with the following profiles:</p> <ul style="list-style-type: none"> Operational expert ATC system expert En Route, App and Tower Air Traffic Controllers Environment expert Performance expert Platform integration/maintenance
Contribution	<p>ENAIRE mainly will contribute with the definition and development of procedures and operational concepts (if required) for the accommodation and integration of RPAS in controlled airspace. ENAIRE will also elaborate the scenarios based on the PJ13's defined use-cases that will be tested in a validation exercise using Fast Time Simulations.</p> <p>Moreover, ENAIRE will participate in the elaboration of the following deliverables: Safety, Performance and Operational Requirements (SPR-INTEROP/OSD) V2, Validation Plan (VALP) V2 and Initial Validation Plan V3 defining the validation roadmap for phase V3.</p>

4.1.1.10 ENAV SPA

Organisation	10	ENAV	Service Provider
Description	<p>ENAV S.p.A. (ENAV) is one of the 5 largest European Air Navigation Service Provider in terms of traffic managed, investments in innovation technology and R&D and is one of the top performers in terms of quality of services provided.</p> <p>ENAV is fully committed to the Single European Sky and, since 2006, operates under the Common Requirement for ANS provision and from 2012 is subject to the European Performance Scheme, as all other European ANSPs.</p> <p>ENAV is a Joint-Stock Company, the only ANSP worldwide listed on a stock exchange, 53% of the share capital is held by the Italian Government, in charge of the provision of air traffic control and navigation services within the airspace and the airports placed under its own responsibility by national law</p>		

without time limit.

ENAV's core business is to manage the regulated Air Traffic Control Services (ATCS), for which it is entrusted, allowing aircraft to fly within the assigned airspace with constantly enhanced levels of safety, optimizing the effectiveness of the service provided and the efficiency of the company, in particular:

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

Thanks to these complex operational units, ENAV provides around the clock air traffic services ensuring air traffic flow and regularity, with absolute safety. ENAV provides ATCS to more than 1.8 million flights per year, with peaks of up to 6,575 per day.

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

ENAV leverages its significant experience and reputation for promoting development projects worldwide, pursuing further opportunities for growth: currently delivers services in Malaysia, Saudi Arabia, Kenya, Morocco, Albania, UAE and Libya.

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

For this reason, ENAV continues to invest in modernisation, new technologies and professional training. ENAV is a component of the European ATM (Air Traffic Management) system and it participates with full rights in all the activities of development, operational validation, research and coordination with systems that are perfectly integrated with the international technological context.

ENAV Group consists of:

- Techno Sky, responsible for the operational management, the support, the maintenance and the hardware/software development of entire range of systems and equipment used to provide flight assistance services.
- IDS AirNav is the company of the ENAV Group that serves the world of Air Traffic Management (ATM) and airports with Commercial Off-The-Shelf (COTS) solutions and software products aimed at supporting the transition from Aeronautical Information Services (AIS) to Aeronautical Information Management (AIM) in full compliance with the ICAO and EUROCONTROL mandates for Aeronautical Data Quality (ADQ).
- D-flight Is the first public-private partnership created by ENAV and its partners for the timely development and deployment of U-space, in order to safely and seamlessly integrate complex drones operations within the civil aviation airspace. The company is controlled by ENAV, with a 60% stake, with the remainder of the share capital held by a group of leading Italian technological partners.
- ENAV Asia Pacific, set up in 2013 with head office in Kuala Lumpur, provides air traffic control management and consultancy services, as part of marketing and sales activity, as well as other essential air navigation services.
- ENAV North Atlantic is a company established in USA on January 2014 for the purpose of managing the acquisition of 12.5% of the Aireon LLC

	<p>share capital. Aireon is the company responsible for the development, financing and deployment of a global satellite surveillance system.</p> <ul style="list-style-type: none"> • ESSP - with a 16.6% stake in the Company, ENAV provides the European satellite navigation service EGNOS. <p>The services supplied by the Company are Planning, management and provision of Air Navigation Services (ANS) including:</p> <ul style="list-style-type: none"> • Air Traffic Services (ATS), including Air Traffic Control Service (ATC), Flight Information Service (FIS) and Alerting Service (ALRS); • Aeronautical Information Service and related publications (AIS); • Meteorological Services for Air Navigation (MET); • Communication, Navigation, Surveillance Services (CNS); • Air Space Management; • Air space design and air traffic capacity planning; • Flight procedures design and obstacles analysis; • ATM system definition, acquisition, operation and maintenance of operational infrastructures; • Flight inspection services of radio nav aids, broadcasting and surveillance systems for Air Traffic Services; • Training of ATM personnel. <p>ENAV is among the main players in SESAR (Single European Sky ATM Research), the ambitious initiative launched by the European Commission to implement the Single European Sky by supporting technical developments for fully interconnected and interoperable systems at European level.</p> <p>ENAV is also member of the SESAR Joint Undertaking, created under European Community law on 27 February 2007, with EUROCONTROL and the European Union as founding members, in order to manage the SESAR Development Phase. ENAV contributes to SJU in a lot of projects providing the technical and operational expertise and infrastructures necessary to develop and validate the evolution of the operational concepts.</p>
Previous experience	<p>ENAV is involved in R&D, strategic planning, technical co-operation and service provision programs with international organisations (e.g. SESAR Joint Undertaking, EUROCONTROL, European Commission, ESSP) and foreign countries, aiming at contributing to the advancement of ATM technology and processes and at improving the service level provided.</p> <p>ENAV has a long-lasting experience in international initiatives and has been participating, managing, coordinating and actively contributing to several international projects and large scale researches, developments and validations.</p> <p>ENAV has been participating in SESAR Programme since its very beginning (SESAR 1 and SESAR 2020 Wave 1) and is strongly determined to support the successful outcome of the initiative in line with its strategic objectives.</p> <p>Previous R&D projects:</p> <ul style="list-style-type: none"> • SESAR 1 (2009-2016): WPB, WPC, WP3, WP4, WP5, WP6, WP7, WP8, WP10, WP12, WP13, WP14, WP15, WP16 • SESAR 1 Large Scale Demonstrations: <ul style="list-style-type: none"> ○ ATC Full Datalink (AFD) ○ WE-FREE ○ MEDALE ○ RACoon

	<ul style="list-style-type: none"> ○ 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) • RETINA (H2020, 2016-2018) • BLUEGNSS (H2020, 2016-2018) <p>Current R&D projects:</p> <ul style="list-style-type: none"> • SESAR 2020 Wave 1 IR Projects (H2020, 2016-2019): PJ01, PJ02, PJ03a, PJ03b, PJ05, PJ06, PJ08, PJ09, PJ10, PJ15, PJ16, PJ18, PJ19, PJ20, PJ22 • SESAR2020 Wave 1 VLD PJ31 (H2020, 2016-2020) • DIODE VLD (SJU/CEF2017, 2018-2020) • CORUS ER (H2020, 2017-2019)
Entity Profile matching the task	<p>ENAV profiles matching the tasks include:</p> <ul style="list-style-type: none"> • ATM Operational expert • Air Traffic Controller • Pilot and Pseudo-pilot • KPA expert • RPAS expert • Project manager • Procedure designer • Validation expert and engineer <p>All those skills will be made available by ENAV to support the project developments and conduct validation activities.</p>
Contribution	<p>In continuity with the work done in SESAR2020 Wave 1 PJ.10-05, ENAV will lead the workpackage WP03 related to the Integration and accommodation of RPAS in airspace class A to C (117&115) in the frame of PJ13.</p> <p>ENAV contribution will be focused on solution 117, where ENAV will investigate RPAS operations integration aspects in controlled airspace (A to C) in particular during phases in and out TMA during transition from / to En-Route airspace according to IFR rules.</p> <p>ENAV, in its role of WP03 leader, will also monitor the solution 115 developments so to ensure the needed alignments given the strong links and synergies between the two solutions.</p>

4.1.1.11 EUROCONTROL - EUROPEAN ORGANISATION FOR THE SAFETY OF AIR NAVIGATION

Organisation	11	EUROCONTROL	Intergovernmental Organisation
Description	EUROCONTROL, the European Organisation for the Safety of Air Navigation, is an intergovernmental Organisation with 41 Member States,		

	<p>committed to building, together with its partners, a Single European Sky that will deliver the ATM performance required for the 21st century. EUROCONTROL employs more than 1,900 highly qualified professionals spread over four European countries. Their expertise is deployed to address ATM challenges in a number of key roles:</p> <ul style="list-style-type: none"> • The Network Manager has extended the role of the former Central Flow Management Unit to proactively manage the entire ATM Network (nearly ten million flights every year), in close liaison with ANSPs, airspace users, the military and airports. • The Maastricht Upper Area Control Centre provides air traffic control services for the Netherlands, Belgium, Luxembourg and northern Germany. • The Central Route Charges Office handles billing, collection and redistribution of aviation charges. • It provides a unique platform for civil-military aviation coordination in Europe. • 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. • EUROCONTROL is supporting the deployment through contributions to the Deployment Programme and is supporting the European Commission, EASA and National Supervisory Authorities in their regulatory activities.
Previous experience	<p>Shortly after the 2002 Überlingen mid-air collision, it was recommended that it is imperative that safety nets (system safety defences) be widely implemented and standardised. This marked the start of a considerable EUROCONTROL involvement with Europe-wide aviation community effort to prepare for implementation of effective safety nets by developing the prerequisites for successful implementation.</p> <p>The implementation action of safety nets involved the drafting of EUROCONTROL Specifications, together with detailed guidance material, introducing some newly developed awareness material that explains safety nets and the life cycle approach.</p> <p>EUROCONTROL through its working arrangement, the SPIN SubGroup (Safety nets Performance Improvement Network), provide support to various implementations of ground based safety nets across Europe (e.g. UK, Germany, Switzerland, Malta, Armenia, Georgia, Czech Republic, Hungary), including safety and human factors assessments, parametrization and optimization for daily operations.</p> <p>EUROCONTROL experts have been involved in the work of EUROCAE WG-75 and RTCA SC-147 updating TCAS II MOPS and developing MOPS for ACAS X. Moreover, EUROCONTROL has been advocating the integrated approach to the development of ground and airborne safety nets, providing inputs for ICAO, EUROCAE and RTCA. EUROCONTROL provides support to Airspace Users and ANSPs on operations and performance analysis of TCAS, including investigations of incidents.</p> <p>Each year several bulletins, newsletter and papers are issued promoting and advocating the implementation and operations of ground and airborne safety nets.</p>

	<p>EUROCONTROL has more than 50 years of experience in ATM concept development and validation, on its own and at the core of a pan European network of collaborators. EUROCONTROL has researched countless concepts and has enabled the implementation of many, from Short Term Conflict Alert to Reduced Vertical Separation Minima.</p> <p>Over the years, EUROCONTROL has lead and participated to many research projects exploring innovative ATM concepts (free route, free flight, autonomous separation procedures) and the related enabling technologies (both the ground and avionic segment, such as Airborne Separation Assurance Systems, ADS-B, ADS-C).</p> <p>In the framework of SESAR PJ10.05 EUROCONTROL has conducted a validation campaign for the integration of RPAS with IFR (v1/v2).</p> <p>EUROCONTROL employs skilled researchers; ATM concept experts, cognitive psychologists and engineers.</p> <p>As an intergovernmental agency, EUROCONTROL maintains an objective viewpoint, unswayed by commercial interest. EUROCONTROL operates several simulators of different kinds to support ATM research and over the years has funded and steered the development of several of these; SAAM, NEST, RAAMS, ESCAPE and so on. EUROCONTROL is the author of an RPAS ATM Concept of Operations document.</p>
Entity Profile matching the task	<p>Experience includes European evaluation of TCASII leading to Standardisation. From Project ACASA to SESAR1 in 04.08.01</p> <p>Leadership of PJ11 I SESAR 2020 Wave 1</p> <p>ATM operational experts, supporting the development of OSED and use cases.</p> <p>ATM technical experts, supporting the development of encounter models for the Conflict Avoidance aspects.</p> <p>Real time and model based validation expertise.</p> <p>RPAS concept of operation expertise.</p>
Contribution	<p>EUROCONTROL will lead the Solution 111 within PJ13.</p> <p>EUROCONTROL contribution to PJ13 will be a direct continuation of SESAR 2020 Wave 1 work with the aim to achieve the full V3 maturity level by 2018. This will be continued support of the ACAS Xu Validation Runs simulation through support to EUROCAE/RTCA activities to development of the ACAS Xa MOPS. EUROCONTROL is the chair of EUROCAE WG-75 and co-chair of RTCA SC-147/WG_75 joint meetings.</p> <p>EUROCONTROL will support also ACAS Xu activities focusing on iterative validation of ACAS Xu releases (Runs) using EUROCONTROL simulation platforms. In particular, this involves the development of new encounter models using the EUROCONTROL CAFÉ platform and analysis of acceptability metrics. Through support to EUROCAE/RTCA activities, this work will lead to development of the ACAS Xu MOPS. EUROCAE WG-75 has recently taken ACAS Xu into its scope and Terms Of Reference (TORs).</p> <p>EUROCONTROL will extend this modelling work to meet the requirements of the European evaluation of DAA/RWC.</p> <p>EUROCONTROL will also participate to the Solution 117 within PJ13.</p> <p>EUROCONTROL contribution to PJ13-117 will be a series of validation studies, building on the findings of the activity performed in SESAR 2020 Wave 1 (PJ10.05), aiming at providing a quantitative evaluation of the impact of the integration of RPAS on the ATM as well as the investigation of</p>

additional elements and possible mitigation means.
EUROCONTROL will also participate to solution 115, contributing to the preparation of the OSED/SPR and the CBA deliverables.

4.1.1.12 FREQUENTIS AG

Organisation	12	FRQ (FSP)	Ground Industry
Description	<p>Frequentis AG, member of SESAR1 and SESAR 2020, is an international expert for communication and information systems for control centres with safety-critical tasks. Frequentis AG maintains a worldwide network of subsidiaries and local representatives in more than 50 countries to ensure closeness to our customers.</p> <p>Frequentis AG successfully designs and supplies systems and solutions for the domains of communication, 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 and S2020 Wave 1 we successfully demonstrated remarkable achievements towards the next generation ATM system architecture.</p> <p>Special interest is given to the users of ATM systems. Our expertise and tooling guarantees early indications of the future user acceptance.</p> <p>Frequentis AG is member of the Frequentis SESAR Partners consortium together with the companies HUNGAROCONTROL MAGYAR LEGIFORGALMI SZOLGALAT ZARTKORUEN MUKODO RESZVENYTARSASAG and Atos Belgium founded in 2014 for the main purpose of joining SESAR 2020 activities. Frequentis SESAR Partners is member of the SESAR Joint Undertaking.</p> <p>The consortium is comprised of companies having a variety of complementary capabilities. Having former SESAR 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 SESAR 2020 efforts.</p>		
Previous experience	<p>Since 2009 FREQUENTIS AG is member of the SESAR Joint Undertaking, participating in more than 20 projects since then.</p> <p><u>Previous relevant projects:</u></p> <ul style="list-style-type: none"> • SESAR 1 contribution to PJ08, PJ13, PJ14 in the area of <ul style="list-style-type: none"> ○ Data model definition ○ Service model definition ○ Implementation of prototypes supporting the validation ○ PJ13.02.02 Aeronautical Information Management – Digital Integrated Briefing • SESAR 2020 W1: PJ15-10, PJ15-11 <p><u>Current relevant R&D projects:</u></p> <ul style="list-style-type: none"> • SJU GOF U-Space VLD (2018-2020) 		
Entity Profile matching the	<p>Frequentis AG's profile matches the tasks in the proposal regarding the following skills, knowledge and capabilities in the areas:</p>		

task	<p>Technical:</p> <ul style="list-style-type: none"> • Data and service modelling • Software engineering • Software development and design • Requirements engineering • Agile development <p>Operational:</p> <ul style="list-style-type: none"> • Detailed AIM expertise • NOTAM management • Flight planning • AIXM management • SWIM • Standardisation experience • Validation and verification expertise <p>Frequentis AG will contribute with a productive SWIM enabled AIM solution that will be the basis for evolutionary developments in the project for V&V</p>
Contribution	<p>Frequentis AG will contribute to the solution related to integration and accommodation of RPAS in airspace class A to C (Solution 117&115) in the frame of PJ13.</p> <p>Frequentis AG will support the requirements engineering, design process and will support the developed concepts with mock-ups, demonstrators and simulator to validate existing procedures and functions to meet the future RPAS integration requirements.</p> <p>Frequentis AG will contribute to:</p> <ul style="list-style-type: none"> • AIM Information Services • AIM Basic Information Service Development • AIM Data Set enhancements • Support to Information Service Verification • Information Service Definition • Information Service Development • Information Service Verification

4.1.1.13 HUNGAROCONTROL MAGYAR LEGIFORGALMI SZOLGALAT ZARTKORUEN MUKODO RESZVENYTARSASAG

Organisation	13 HC (FSP)	Service Provider
Description	<p>HUNGAROCONTROL MAGYAR LEGIFORGALMI SZOLGALAT ZARTKORUEN MUKODO RESZVENYTARSASAG is a state-owned company in Hungary, which provides air navigation services in the Hungarian airspace and (on a NATO assignment) in the upper airspace over Kosovo, trains air control personnel and conducts air navigation research and development.</p>	

	<p>HC (FSP) is member of the Frequentis SESAR Partners consortium together with the companies Atos Belgium and Frequentis AG and was founded in 2014 for the main purpose of joining SESAR2020 activities. Frequentis SESAR Partners is member of the SESAR Joint Undertaking.</p> <p>The consortium is comprised of companies having a variety of complementary capabilities. Having former SESAR1 experience within its framework, an ANSP whose expertise will result in early feedback loops during certain projects, and the wide range IT, data management and security expertise of the consortium forming entities, Frequentis SESAR Partners believes in the high added value of its participation in SESAR2020 efforts.</p>
Previous experience	<p>HungaroControl Zrt. has participated in SESAR 2020 Wave 1 as a member of FSP Consortium in the following projects, solutions or VLDs:</p> <p>PJ.03-A PJ.05-02 PJ.05-03 PJ.10-01B PJ.16-03 PJ.16-04 PJ.28 (as a linked third-party) SESAR Exploratory research - USIS project</p>
Entity Profile matching the task	<p>Air Navigation Service Providers including the profiles:</p> <ul style="list-style-type: none"> • ATM Operational expertise, • ATM System expertise, • Simulation expertise (Simulation HUB) • En-Route and Approach Air Traffic Controllers, • Human Factors expertise, • Safety expertise <p>Experience relevant to the project is the U-Space Initial Services (USIS) project, which aims to demonstrate the technical and operational feasibility of providing in a very short time frame U-Space services to UAV/RPAS operators and to authorities focusing on:</p> <ul style="list-style-type: none"> • UAV/RPAS/Pilot/Operator Registration Service • Flight Wish/Mission Notification & Authorization Service • U-Space NOTAM Service (including dynamic NOTAM for VLL) • UAV/RPAS Traffic Monitoring (including non-conformance vs regulation/authorized mission). <p>HungaroControl Zrt. fully participates in all phases of USIS.</p>
Contribution	<p>HungaroControl Zrt. (as member of FSP) will contribute to the solution related to integration and accommodation of RPAS in airspace class A to C (Solutions 117 and 115) in the frame of PJ13.</p> <p>The main contribution of HungaroControl Zrt., as ANSP, will be:</p> <ul style="list-style-type: none"> • Support with ATCOs • ATM system experts • Airspace Design Specialists • UAV/RPAS experts • Human Factor expertise • Safety expert

4.1.1.14 HONEYWELL AEROSPACE

Organisation	14 Honeywell SAS	Airborne Industry
Description	<p>Honeywell Aerospace provides integrated avionics, engines, electrical and mechanical systems, and service solutions to aircraft manufacturers, airlines, military, and space and airport operations. It serves aerospace customers all over the world and provides products for any type of aircraft (from small and unmanned, over business jets and regional aircraft, to large long range aircraft like the Airbus 380). Worldwide, Honeywell SAS is investing heavily in ATM (Air Traffic Management) related developments, notably through participation in the European SESAR programme and the US NextGen programme. Also, Honeywell SAS has established an ATM laboratory in China in partnership with China's Avic. These activities add value to our SESAR work by ensuring global harmonization and a global impact of SESAR solutions.</p>	
Previous experience	<p>Relevant previous projects:</p> <p>SESAR2020 Wave 1 projects (2016-2019):</p> <ul style="list-style-type: none"> • PJ.11 CAPITO (Enhanced Air and Ground Safety Net) <ul style="list-style-type: none"> ○ <u>Honeywell SAS leading the solution PJ.11-A2 addressing ACAS Xu</u> ○ Honeywell SAS leading the solutions PJ.11-A3 (ACAS Xo) and PJ.11-A4 (Traffic situation awareness and Collision Avoidance for GA/R) ○ Honeywell SAS being a major contributor to PJ.11-A1 (ACAS Xa) • Honeywell SAS is also contributing to multiple other projects including PJ.01, PJ.02, PJ.03a/b, PJ.14, PJ.17, PJ.18, PJ.28, PJ.31. <p>EMPHASIS - SESAR2020 Exploratory Research project focusing on affordable CNS capabilities tailored for GA/R users addressing also interoperability with unmanned systems.</p> <p>SESAR 1 projects (2009-2016):</p> <ul style="list-style-type: none"> • TCAS Evolution (9.47) project <u>led by Honeywell SAS</u> with EUROCONTROL, DSN and Airbus as partners. Addressing TCAS II enhancements including extended hybrid surveillance and initial ACAS Xa work. • 1090 MHz ADS-B Higher Performance Study (9.21) project led by Honeywell SAS addressed 1090 capability study for ADS-B service. • Mid & Full ADS-B Capability Research (9.22) project led by Honeywell SAS addressed high level functional, operational and performance requirement of next generation of ADS-B Out datalink service. • ASAS-ASPA – Airborne Spacing (9.5) project led by Airbus with Honeywell SAS, EUROCONTROL, Thales and Alenia as partners. • ASAS-ASEP – Airborne Separation (9.6) project led by Airbus with 	

Honeywell SAS, Alenia, EUROCONTROL and Thales as partners.

- Airport Surface Alerts (9.14) project led by Airbus with Honeywell SAS, Thales and Alenia as partners, focused on the development of Airport Surface Alerts system providing situational awareness to pilots.

TACR (Technology Agency of the Czech Republic) projects:

Technology Agency of the Czech Republic is an organizational unit founded in 2009 to support research, experimental development and innovation.

- ATIS (2011-2013) project led by Honeywell SAS focused on the improvements of the issues with reception of the ADS-B messages on the airport surface originated by the shadowing, multipath and interference.
- TDAAS (2012-2014) project led by Honeywell SAS focused on the development of Sense and Avoid system supporting RPAS integration into civil non-segregated airspace.
- Helo Bumper (2013-2015) project focused on development of an affordable system providing helicopter pilots with increased situational awareness about ground obstacles when manoeuvring close to the ground.
- RESPOL (2013-2015) (Position, Attitude & Heading Reference System) focused on a development of the inertial navigation, attitude and heading reference system mock-up, using inertial sensors of lower performance integrated with satellite navigation system allowing significant reduction of the system cost.

Projects with European Space Agency (ESA):

- Iris Antares (2009 - 2015) project aiming at development of a new, purpose-built, satellite-based communication system including low-cost user terminals and an open satellite communication standard.
- ESPRIT (2011-2012) (Emerging System Concepts for unmanned aircraft system command & control via satellite) project was focusing on preliminary satellite system design for UAS C2 (Command & Control) link.
- CERES (2013-2014) (CERTification REquirements and performance Standards of satcom links for RPAS C2/ATS/D&A) project provided Research and Analyses on various options for beyond line of sight command and control datalink for unmanned aircraft enabling their integration in non-segregated airspace (direct continuation of the ESPRIT project).
- EGNOS v3 Demonstrator (2014-2016) The objectives of this project were to develop an EGNOS v3 aviation receiver demonstrator and to support DFMC SBAS (EGNOS v3) standardization activities.

iFly project (2007-2012)

A specific targeted research project within the 6th Framework Programme addressing self-separation concept in the context of dense airspace and trajectory-based operations.

Beyond European R&D activities, Honeywell SAS was also involved in many US R&D projects including for instance:

	<p>ACAS Xu NASA Flight Tests (2014-2016) Honeywell SAS contributing to ACAS Xu flight tests by NASA, the Federal Aviation Administration (FAA), and General Atomics Aeronautical Systems (GA-ASI).</p> <p>First flight of Large Unmanned Aircraft in the US Public Airspace Without Chase Plane, by NASA the 12th June 2018 The Ikhana aircraft was equipped with detect and avoid technologies, including an airborne radar developed by General Atomics Aeronautical Systems, Inc., a Honeywell SAS Traffic Alert and Collision Avoidance System, a Detect and Avoid Fusion Tracker, and an Automatic Dependent Surveillance-Broadcast capability.</p>
<p>Entity matching task</p> <p>Profile the</p>	<p>Since pioneering collision avoidance development Honeywell SAS is incessantly one of the key players and technology leaders in this area. Honeywell SAS collision avoidance and traffic situation awareness systems are installed across a large variety of platforms including mainline, regional, and business aviation, general aviation (via Bendix King) and rotorcrafts. This enables Honeywell SAS to address the individual needs of a large variety of airspace users but at the same time to consider large spectrum of interoperability aspects.</p> <p>Since its start, Honeywell SAS is deeply involved in developing ACAS X for both manned and unmanned systems including several sets of flight tests with the Honeywell SAS unit for both these platforms. Honeywell SAS led the SESAR project 9.47 addressing TCAS II evolution and ACAS X development. This project has delivered for instance the world's first flight tests of TCAS II with extended hybrid surveillance capability as well as several validations of ACAS Xa – whether directly within the project or through external support to FAA (2015 flight tests) or SESAR operational project 4.8.1 (cockpit validations planned in 2016). Honeywell SAS is a major contributor to SESAR2020 Wave 1 PJ.11 project, leading the solution PJ.11-A2 focused on ACAS Xu and being responsible for two ACAS Xu validation exercises (one in V1 and one in V2 phase).</p> <p>Besides collision avoidance, Honeywell SAS is for a long time one of the leading companies in area of ADS-B In and traffic situation awareness applications with active involvement in standardization activities for these areas. This is particularly important considering potential interactions between traffic situation awareness remain well clear and collision avoidance applications.</p> <p>Honeywell SAS has been intensively working on Detect & Avoid systems already for many years both in the US and in Europe – in Europe beyond SESAR2020 PJ.11 for instance in the Honeywell SAS led research program TDAAS funded by the Technology Agency of the Czech Republic, which has successfully developed and flight tested a Detect And Avoid (DAA) algorithm for small RPAS.</p> <p>Honeywell SAS has also a strong expertise concerning communications</p>

	including C2, surveillance sensors, as well as flight guidance and control.
Contribution	<p>Honeywell SAS's contribution to PJ.13 (ERICA) will be primarily focused on solution 111 with the aim to bring ACAS Xu, as a DAA system suitable for European operations, to V3 phase. This will be direct continuation of Honeywell SAS work in SESAR2020 Wave 1 (PJ.11-A2). Honeywell SAS plans to contribute to this goal through a series of progressive validations (4 exercises being proposed) covering fast time and real time simulations as well as flight demo using a manned aircraft. Beyond this Honeywell SAS will contribute to development of supporting documentation and requirements definition/consolidation. An important part of Honeywell SAS activities will be related to standardization, in particular addressing finalization of ACAS Xu and DAA MOPS and development of ACAS Xu TSO and ETSO.</p> <p>Honeywell SAS will also use its technical expertizes (beyond DAA also concerning C2 and airborne systems in general) to support development of operational, performance, safety, and interoperability requirements as well as validation planning and results discussion in solutions 115&117.</p>

4.1.1.15 INDRA SISTEMAS SA

Organisation	15	INDRA	Ground Industry
Description	<p>Indra is one of the leading global technology and consulting companies and the technological partner for core business operations of its customers worldwide. It is a world-leader in providing proprietary solutions in specific segments in Transport and Defence markets, and the leading firm in Digital Transformation Consultancy and Information Technologies in Spain and Latin America through its affiliate Minsait. Its business model is based on a comprehensive range of proprietary products, with a high-value focus and with a high innovation component. In the 2017 financial year, Indra achieved revenue of €3.011 billion, with 40,000 employees, a local presence in 46 countries and business operations in over 140 countries.. Indra ranks second in Europe by R&D spent.</p> <p>With the aim to provide our Customers with comprehensive, full and turnkey solutions, Indra product range covers the whole range of Air Traffic Management Systems, including Surveillance, Automation, Communications, Simulators and NAVAIDs.</p> <p>At Indra we have developed air traffic management systems that are deployed across the world, with over 4,000 installations in 160 countries. We are positioned as the market's leading supplier of air traffic management and communications, navigation and surveillance (ATM-CNS) systems. In the field of R&D, we are one of the leading companies in the SESAR program, the key technology behind the Single European Sky initiative.</p> <p>Indra has the in-depth experience and products necessary to undertake any Air Traffic Management programme, with both a proven international management approach and a history of responsible program execution. That experience, together with a solid technology base, permanent innovations and quality in processes and projects are the pillars sustaining Indra leadership position in Air Traffic Management, completely oriented towards Customer</p>		

	<p>needs and aimed to provide our Customers with the highest level of service. Indra is the world leader for Flight Data Processing Systems, having supplied over 40 installations worldwide and has grown to be leader Air Traffic Management system supplier in Europe. In December 2008, Indra supplied EUROCONTROL with the new next-generation interoperable Flight Data Processing System at Maastricht Upper Area Control Centre, one of the busiest and most complex en-route Air Traffic Control Centres in Europe. The implementation of this Flight Data Processing System is a high technological advance directed to improve the safety, capacity, efficiency and environmental performance of Air Traffic management in Europe, and actively contributing to achieving the European's Commission Single European Sky objectives.</p> <p>Indra has been selected by the most advanced European Air Navigation Service Providers to develop the future Air Traffic Management systems following the Single Sky Concept, through the iTEC Program (Interoperability Through European Collaboration). This is currently formed by ENAIRE (Spain), DFS (Germany), NATS (United Kingdom) and LVNL (The Netherlands), with Indra as industrial partner. Recent new partners are PANSA (Poland), AVINOR (Norway), Oro Navigacija (Lithuania). iTEC is currently the most advanced next-generation air traffic management system, after entering full operational service at the Prestwick control center in Scotland</p>
Previous experience	<p>Since 2009, Indra is full member of the SESAR Joint Undertaking. In SESAR 1 Indra participated in more than 120 projects within the Programme and co-leading both WP10 (En Route and Approach ATC) and WP12 (Airports), as well as playing a key role in many projects under WP14 (SWIM), WP15 (Non-Avionics CNS) and WP13 (NIMS).</p> <p>In SESAR2020 Wave 1, Indra participated in IR/VLD Projects 01, 02, 03a, 03b, 04, 05, 06, 07, 08, 09, 10, 11, 14, 15, 16, 17, 18, 19, 20, 22, 24, 25, 27 and 31, being Project Coordinator in PJ15 and PJ18. We have also participated in other SESAR related projects (VLDs and RPAS).</p>
Entity Profile matching the task	<p>Indra is participating in the definition and evaluation of different aspects of the insertion of RPAS in ATM:</p> <p>ARIADNA SESAR project, demonstrated the feasibility of RPAS integration into the ATM system using SBAS-based approach procedure for rotary wing RPAS as well as concepts for a "ground based" situational awareness system (GBSAS) with the use of ADS-B and ATC radar data to increase the remote pilot situational awareness of the surrounding traffic.</p> <p>Airborne Collision Avoidance for IFR Remotely Piloted Aircraft Systems – ACAS Xu. The objectives are to evaluate the performance and benefits of ACAS Xu within European operations/airspace.</p> <p>IFR RPAS integration in Airspace Class A to C. To provide the technical capabilities and procedural means to allow IFR RPAS to comply with ATC instructions and the development of new procedures and tools to allow ATC to handle IFR RPAS in a cooperative environment in full integration with manned aviation.</p>

Contribution	<p>The main contribution of Indra, as Ground Industry Supplier, will be:</p> <ul style="list-style-type: none"> • Support to the elaboration of the operational concepts from the industrial perspective. • Support to the elaboration of the technical specification. • Specification, development and testing of the Industry Base Platforms to perform the Validations.
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4.1.1.16 SAAB AKTIEBOLAG

Organisation	16 SAAB	Ground Industry
Description	<p>SAAB AKTIEBOLAG is part North European ATM Industry Group (NATMIG) Consortium. The NATMIG consortium consists of Airtel ATN (SME - Ireland), Saab AB (multinational industrial concern - Sweden) and SINTEF AS (non-profit research organisation - Norway).</p> <p>While SAAB AKTIEBOLAG originates in military and civil aircraft manufacturing and is one of the few companies in the world with the ability to develop, integrate and maintain complete aircraft systems, we are today active in several transport modes and a global supplier in the ATM domain.</p> <p>SAAB AKTIEBOLAG's over 75 years of history in aeronautics, over 4000 civil and military aircraft produced and as well as our broad involvement in ATM businesses, provide a solid background and deep competence in aeronautics in general and RPAS in specific. For the future we plan to continue to be able to provide market-leading aeronautical products including manned and unmanned (RPAS) products that can operate safely in civil airspace, as well as solutions to facilitate others to allow safe RPAS operations in their airspace, whether it's an RPA, a Detect & Avoid system or related ATM components.</p> <p>SAAB AKTIEBOLAG is a global supplier in the ATM domain and Saab has a long history of developing and delivering ATM solutions. SAAB AKTIEBOLAG has pioneered future concepts such as the Remote Tower, which in operational use in Sweden and is undergoing trials in several other countries. In total, SAAB AKTIEBOLAG has deployed 240 ATM systems and subsystems to serve over 60 customers in 40 countries. Our air traffic management systems and tools serve 18 of the 20 busiest airports in the world, 10 of the 12 largest Air Navigation Service Providers (ANSPs), and the 3 largest airlines by passenger count. SAAB AKTIEBOLAG ATM systems guide 2 million aircraft movements each month via our airport surface safety systems.</p> <p>SAAB AKTIEBOLAG's main areas of interest are:</p> <ul style="list-style-type: none"> • RPAS • Remote Tower 	
Previous experience	<p>This list provides sample activities with relevance for PJ13. Please see 2014 Expression of Interest for further details.</p> <ul style="list-style-type: none"> • Automatic Ground and Air Collision Avoidance System (Auto-GCAS & 	

	<p>Auto-ACAS) [1999-2004]</p> <ul style="list-style-type: none"> • MIDCAS – The European Detect & Avoid Project (DAA) [2009-2019] • Roadmap work including main contributor to ERSR RPAS Roadmap, leading Detect & Avoid (activity 1) in SESAR RPAS Definition Phase, ASD representative in working group for the European Roadmap for Drones. [2013-2018] • National projects, e.g. Sense/Detect & Avoid Technology (flight) Demonstrator, RPAS integration studies including e.g. ATC simulations with ANSP of Sweden (LFV/COOPANS), Remote Technology Demonstration (world first RPAS + Remote Tower demo). [2006-2019] • RPAS development: RPA (e.g. Skeldar, Neuron), RPS, Detect & Avoid (including traffic & collision avoidance algorithms, sensor fusion etc.), Emergency recovery/contingency solutions, pilot stations and more. [past – ongoing]
Entity Profile matching the task	<p>SAAB's over 75 years of history in aeronautics, over 4000 civil and military aircraft produced and as well as our broad involvement in ATM businesses, provide a solid background and deep competence in aeronautics in general and RPAS in specific.</p> <p>As an OEM in the aeronautical business, we have all skills required to design and integrate aeronautical products as well as a strong focus on R&D. SAAB long term commitment on the topic of RPAS and specifically separation and collision avoidance, accumulates to a very strong holistic understanding of the topic and a development capability for such systems that includes excellent system design, integration and safety knowledge together with a leading knowledge for avoidance technologies. In addition, Saab has strategic partnership and a long history of working with the relevant ATM stakeholders. With respect to RPAS and its' integration into non-segregated (ATC/ATM) airspace, a summary of past experience was provide above and a summary of ongoing activities and roles can be found below:</p> <ul style="list-style-type: none"> • Participant in SESAR RPAS activities e.g. PJ.10-05, PJ.11-A2, U-space projects (e.g. AIRPASS) • MIDCAS Standardisation Support Phase (DAA) • ERA (Enhanced RPAS Operations) program (ATOL, Auto-TAXI, Automation and Emergency Recovery/Contingency) • Standardization: Permanent members and actively working in EUROCAE (WG-105, WG-75) incl. chairman of WG-105 Detect&Avoid group, permanent members and coordinating with RTCA SC-228; European industry advisor to ICCAIA in the ICAO RPAS Panel. • Regulation: Member and actively working in JARUS; coordinating closely with EASA as well as National Safety Agencies. • National projects including live trials of integration of RPAS in national airspace. • RPAS development: Ongoing (see past experience) <p>Relevant infrastructure in support of the work include Detect & Avoid models and prototypes, FTS, RPA models integrated in ATC simulators, VTOL RPA, Remote Pilot Stations. Adaptations to PJ13 will be required.</p>
Contribution	<p>SAAB (NATMIG) contribute to all three Solution 111, 115 and 117, with a particular focus Detect & Avoid (DAA) i.e. in Solution 111 specifically. This will include work with requirements (OSD/SPR/INTEROP etc.), development (DAA models, FTS platform adaptation, integration into RTS</p>

platforms, adaptation and integration on VTOL RPAS), standardisation and validation.

4.1.1.17 NATS (EN ROUTE) PUBLIC LIMITED COMPANY

Organisation	17	NATS	Service Provider
Description	<p>NATS (En Route) plc is the core business and the sole provider of ATC services for aircraft flying ‘en route’ in UK airspace and the eastern part of the North Atlantic. NATS manages 11% of Europe’s airspace and circa 25% of Europe’s traffic. It is regulated by the UK Civil Aviation Authority (CAA) within the framework of the European Commission’s (EC) Single European Sky (SES) and operates under licence from the UK Secretary of State for Transport. It operates from two ATC centres at Swanwick in Hampshire (England) and Prestwick in Ayrshire (Scotland).</p> <p>NATS (En Route) plc purpose is to provide safe, efficient and effective air traffic control services to aircraft operating within airspace where such services are either required or provided, specifically providing:</p> <ul style="list-style-type: none"> • En-route and Terminal Air Traffic Control (ATC) for all UK airspace under a 30 year operating licence to UK Government. In 2017, NATS handled over 2.5 million flights, carrying more than 200 million passengers safely through some of the busiest and most complex airspace in the world. • The design and management of airspace, engineering project and maintenance activities for ANS communications, navigation and surveillance systems, and IT and network management. • Cross business support to UK Ministry of Defence (MoD) which includes the provision of a joint ATC service in the UK FIR, and support to communications systems, radar, facilities and training. • Provision of Instrument Flight Procedure design services, publication of the International Air Pilot Publication (IAIP), Notice to Airmen (NOTAM) documentation, data management and charting services for the UK. • Consultancy services to UK and overseas customers in air traffic management, airspace design, instrument flight procedures, control tower system integration and transition, safety management, engineering, project management. • Training of ATC staff, both as ab-initio controllers, for transition to new airspace or facilities and via supplementary courses including Supervisor Management, On Job Training (OJTI) and Incident Management. • Training of engineering staff. 		
Previous experience	<p>NATS is an approved ISO9001 (Quality Management System – Requirements) organisation and operates under an approved Safety Management System for the development, deployment and operation of Air Traffic Services.</p> <p>NATS has a wealth of experience and competence in the management and delivery of advanced ATM concepts and technical systems. NATS has experience in leading and contributing to European collaborative investments including those supported by EC’s INEA (TEN-T), SESAR 1 and SESAR</p>		

	<p>Deployment Manager funded initiatives.</p> <p>NATS contributed to the development of Ground and Airborne Safety Net concepts in SESAR 1 project 4.8.1 & 4.8.2. NATS provide Safety Management expertise in the safety transversal project 16.6.1.</p> <p>This experience will be made available to the development of Solution 111 within Project 13 of SESAR2020 Wave 2.</p>
Entity Profile matching the task	<p>NATS has globally recognised and extensive experience in the research, development, validation and implementation of advanced concepts for air traffic management.</p> <p>NATS brings the following competencies that are specific to ACAS development and airborne equipment technical standardisation and application specification:</p> <ul style="list-style-type: none"> • Member of EUROCAE WG75 and RTCA SC147 for over 25 years • Support to FAA TCAS Program Office through provision of expertise to support realistic operational validation and simulation • Support to ICAO ACSG, SASP, ASP (and their precursor working groups) • Technical support to ACASA and EMOTION-7 ACAS analysis and monitoring projects • Support to ADS-B technical standardisation through EUROCAE WG51 and RTCA SC-186 • Key partner to EUROCONTROL CASCADE programme for ADS-B development and validation • Leading contributor to CAA CAP1391 Electronic Conspicuity devices <p>NATS brings the following competencies which are specifically related to RPAS integration:</p> <ul style="list-style-type: none"> • Work Package Leader for CORUS • Lead for the development of U-SPACE operational requirements including rules and the definition of innovative services to ensure the safe and efficient integration of UAS and the phased roll-out for the U-SPACE concept. • Technical review for JARUS SORA safety justification <p>NATS profiles matching the tasks include:</p> <ul style="list-style-type: none"> • ATM Operational experts • Air Traffic Controllers • Human factors experts • RPAS & UTM experts • Safety experts
Contribution	<p>NATS will contribute the following roles:</p> <ul style="list-style-type: none"> • Contributions to operational validation and simulation exercises for Remain Well Clear (RWC), Detect and Avoid (DAA) and Collision Avoidance (CA) capability for IFR RPAS in complex high-density airspace • Provide ATM Focal Point expertise for: Operations, Technical Architecture, ATM Safety Management, Human Factors, Operational Performance Impact and Remotely Piloted Aircraft Systems <p>Based on the envisaged activities, NATS will support activities related to:</p> <ul style="list-style-type: none"> • ATC Procedure design

- Joint ATC – RPAS working methods, roles and responsibilities
- Safety Management and Risk Assessment
- Air/Ground interface and CNS technical requirements development

4.1.1.18 THALES LAS FRANCE SAS

Organisation	18	Thales AIR SYS	Ground Industry
Description	<p>Thales ATM, from take-off to touchdown and everything in between. World leader in ATM, Thales, represented in SESAR 2020 by the Thales LAS France company and its Linked Third Parties, offers integrated gate-to-gate solutions, from pre-flight to landing, ensuring airport safety, efficient traffic handling operations, data sharing on aircraft and seamless handover operations between territories. Thales has the largest installed base of solutions and technologies with over 360 TopSky - ATM Solutions, 7,000 nav aids, 700 surveillance radars, and 1,800 ADS-B and multilateration equipment.</p> <p>Thales is trusted by key ATM decision makers across 170 nations, and helps key decision makers master complexity and make timely decisions for better outcomes.</p> <p>At the forefront of all major modernisation initiatives around the world Growing aircraft numbers make Air Traffic Management more complex. Thales solutions help to make the skies safer, greener and more efficient. A key player in all major ATM modernisation initiatives, ICAO Aviation System Block Upgrades (ASBU), SESAR and NextGen, Thales focuses on international harmonization. Our product roadmaps are aligned with ICAO ASBU concepts, NextGen and SESAR.</p> <p>Thales has an important experience in approach and more globally in Tower systems developing and deploying systems across the world.</p>		
Previous experience	<p>Previous main projects:</p> <p>SESAR 1: Thales has been involved in all SESAR 1 WorkPackages. Thales has been Co-Leader for :</p> <ul style="list-style-type: none"> • WP10 (En-Route & Approach ATC Systems) • WP 14 (SWIM technical architecture) • WP15 (Communication, Navigation, Surveillance) <p>SESAR 2020 Wave 1: THALES is a key contributor to the programme and is being involved in all S2020 Wave 1 projects.</p> <p>Thales is project coordinator for :</p> <ul style="list-style-type: none"> • PJ16 (Controller Working Position / Human Machine Interface) • PJ17(SWIM Technical Infrastructure) <p>4-FLIGHT: Thales is delivering the future innovative Air Traffic Management system for France, 4-Flight. DSNF will enjoy a new generation ATM system to respond to the increasing complexity and density of air traffic, integrating a new advanced flight data processing system (CoFlight)with Thales's latest generation human machine interface (TopSky - Controller HMI)</p>		

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

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

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

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

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

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

Civil-military data control

TAAATS : provides the Air Traffic Management Service (En-Route and Approach) for the whole of Australia and for the related oceanic areas as well as the civil-military co-ordination. It is the only system in the world that simultaneously provides fully integrated ADS/CPDLC facilities and allows integrated display of radar tracks, ADS-C tracks, ADS-B tracks and Flight Plan tracks.

NESACC: aims at providing the Air Traffic Management Service (En-Route and Approach) for the whole north east of China controlling around 60% of Chinese total air traffic. Air traffic control of areas outside radar coverage is also provided. The Beijing, Shanghai and Guangzhou ATC centres are connected to the three (3) control towers of the largest Chinese airports.

MODERNISATION INITIATIVES

	<p>NextGen</p> <p>Thales has a unique position in the ATM Industry, participating to both SESAR and NextGen. NextGen is transforming the US National Airspace System (NAS) to meet future needs and avoid gridlock in the sky and at airports.</p> <p>Thales is a key contributor to NextGen</p> <p>Member of RTCA NextGen Advisory Committee</p> <p>Key technology provider for ADS-B program</p> <p>Enabling data comm with Thales automation platform</p> <p>Providing analysis work with the areas of safety and security</p> <p>ICAO ASBUs</p> <p>All Thales solutions are compliant with Block 0, and on the way to meet Block 1 requirements. Thales has the knowledge and expertise in the ASBUs together with the largest worldwide ATM installed base to advise our users about implementing them wherever they are.</p>
Entity Profile matching the task	<p>Thales LAS France and linked third party will involve following profiles for completion of the allocated activities :</p> <ul style="list-style-type: none"> • ACAS-X assessment activities • ACAS-X algorithms activities • Mode S and ADS-B experts • Certification experts • Cybersecurity experts
Contribution	<p>Thales LAS France and its third parties will contribute by bringing its expertise and knowledge in Support to ACAS- Xu OSED; Support to ACAS Xu technical specifications and interface requirements (including additional surveillance sources and sensors, in particular radar sensor and optronic sensor);Implementation/integration and validation of the ACAS Xu Run X (both surveillance & logic) with a surveillance input representative for a selected combination of surveillance sensors; and conduct the following Validation Exercises:</p> <ul style="list-style-type: none"> • ACAS-Xu assessment – Fast Time Simulation (V3 level) ACAS-Xu algorithm will be assessed, particularly in term of risk ratio thanks to Thales Fast Time Simulator. Optronic sensor and bearing less interrogator model will be developed and integrated in the FTS. It is envisaged to perform two rounds of FTS. The first round permits to raise some issues which will be solved and verified in a second round. • Human factor assessment thanks to Human In the Loop Simulation (Real Time Simulator) During this phase, Thales ACAS-XU algorithm and HMI is integrated in the SAFRAN Command and Control platform. DSNATC simulator will be used for the EXE. The EXE will be leaded by DSNATC in the frame of sol 117. In the frame of sol 111, Thales will be reader of TVALP and TVALR of this EXE. • ACAS-Xu Prototype for Flight Demo (in relationship with DSNATC sol 115 activities) Thales will integrate the ACAS-Xu prototype in the RPAS platform. ACAS-Xu will be connected to optronic, Bearingless interrogator and internal computer.

- Documentation activities
Thales LAS France will participate mainly on interoperability purpose and compliance with DAA MASPS.
Thales LAS France will attend to EUROCAE/RTCA Working Group, and particularly to WG75/SC147, SC228, WG105 and RPAS Panel OACI for C2 Link.

4.1.1.19 THALES AVS FRANCE SAS

Organisation	19	Thales AVS	Airborne Industry
Description	<p>Thales regroups its competences in Avionics and CNS through Thales AVS and Thales SIX. Its multi-segment platforms and its outstanding expertise in CNS/ATM ideally places Thales as a key partner for the R&D contributing to the definition and validation of the ATM operational improvements. Thales is fully involved in worldwide standardisation activities essential for European and worldwide ATM interoperability; inter alia ICAO, support to SES regulation, EUROCAE/RTCA, ARINC, EASA CNS/ATM, ASAS RFG and AEEC.</p> <p>With over 50 years' experience, Thales AVS is today a global market leader in CNS/ATM airborne equipment and systems, present on all major aircraft platforms: commercial aviation (Airbus, Boeing), business jets (Bombardier, Dassault Aviation, Embraer, Gulfstream), military transport aircrafts (Airbus, Casa), Helicopters (EADS, Bell, Sikorsky) and regional aviation (Bombardier, ATR, Embraer, Sukhoi).</p> <p>In PJ13, THALES AVS will bring particular expertise for the definition of system architecture and provision of avionics supporting surveillance and navigation capabilities, suitable for RPAS operations. Linked Parties will bring expertise for the definition of RPAS components requirements.</p>		
Previous experience	<p>Thales AVS has been involved for many years in a number of European research programs aiming at the definition of navigation capabilities supporting all flight phases.</p> <ul style="list-style-type: none"> • Thales AVS has been a key player in SESAR1, with involvement in many WPs (Operational work packages : e.g. WP5.6.1, WP5.6.6 ; Aircraft and F/WOC work packages : e.g. WP9.01, WP9.02, WP9.05, WP9.39, WP9.40) and in SESAR2020 Wave 1 projects (such as : PJ01, solutions 01,03,06,07 ; PJ18, solutions 02,04,06). • Thales AVS has been a key contributor in FP6 study <u>OPTIMAL (Optimized Procedures and Techniques for IMprovement of Approach and Landing)</u> • Thales was coordinator of FP6 study <u>ANASTASIA (Airborne new and advanced satellite techniques and technologies in a system integrated approach)</u>. • EDA / ERA : Thales AVS is participating to the project, together with other Thales companies being involved, especially in Auto-Taxi and Standardization, and providing key radar asset for Automatic Take-Off and Landing capability. 		

	<ul style="list-style-type: none"> • AVOCETTES : Thales AVS is a major contributor to the AVOCETTES national study whose aim is to study RPAS insertion for operations along lines (railways, power lines for distribution, etc), notably on mission preparation, land ASAP capability, C2 communications, and GNSS localization. <p>Linked Third Party has also been involved in previous study projects such as :</p> <ul style="list-style-type: none"> • SESAR 1 : <ul style="list-style-type: none"> • Project 9.20 : Military Data Link Accommodation • Project 9.24 : ADS-B In/Out for military aircraft • Project 15.1.6 : Spectrum Management & Impact Assessment • Project 15.2.4 : Future Mobile data Link system definition • Project 15.2.6 : Future Mobile Satellite Communication • Project 15.2.7 : Airport Surface Datalink (AEROMACs) • SESAR 2020 Wave 1 : <ul style="list-style-type: none"> • Project 11-A2 ACAS-Xu. • Project 11-A4 : TSAA and ACAS-Xp. • Project 14-04-03. Task 06 : Future ADS-B Communications Link. <p>Publications:</p> <ul style="list-style-type: none"> • Alain Dayot (2018) : EDA RPAS ATI Industry Exchange Platform - 2nd Meeting - 26 October 2018 - IFR RPAS FMS FOR AIR TRAFFIC INSERTION AND AUTONOMY <p>Huan LIU (2018) : RTCA-SC228 WG1 - Bearingless Antenna Study</p>
Entity Profile matching the task	<p>Thales AVS and linked third party will involve following profiles for completion of the allocated activities :</p> <ul style="list-style-type: none"> • Aircraft Pilots • Communication, Navigation and Surveillance experts • RPAS experts • Avionics Systems experts • Human factors experts • Safety experts • Cybersecurity experts • Certification experts.
Contribution	<p>PJ 13 Solution 111 :</p> <p>Linked party will bring its knowledge in the assessment of previous studies on RPAS detect and avoid, and will contribute to OSED, INTEROP.</p> <p>Linked party will contribute to the following areas :</p> <ul style="list-style-type: none"> • ACAS-Xu assessment thanks to Fast Time Simulation <ul style="list-style-type: none"> -Latest ACAS-X revision integration in the Fast Time Simulator. -Performance and safety assessment of ACAS-X algorithm based on EUROCONTROL Encounter Model. • Human factor assessment thanks to Human In the Loop Simulation <ul style="list-style-type: none"> -Latest ACAS-X revision integration in the Human In the Loop. -Performance and safety assessment of ACAS-X algorithm taken into account Human factor and communication link based on specific flight

scenarios.

- **ACAS-Xu Prototype for Flight Test**

- Latest ACAS-X revision integration in the Thales prototype.
- Prototype integration in a RPAS for Flight Test.

PJ 13 Solution 115/117 :

THALES AVS will participate in RPAS insertion in general air traffic activity (solutions 115+117), bringing FMS capability derived from commercial aviation which is a key enabler to ensure navigation in non-segregated airspace and to execute autonomy features and contingency procedures.

- THALES AVS will hold the technical lead role to validate at V3 level the capabilities targeted in the accommodation stream (115).
- THALES AVS will contribute as a major participant in the integration stream (117).

The capabilities for accommodation are an initial set and a subset of targeted full integration capabilities.

In the frame of accommodation stream (V3 maturity targeted), Thales AVS will:

- Contribute to requirements consolidation (safety, performances, cybersecurity)
- Contribute with ANSPs to operational procedures, specifically on RPAS system side.
- Coordinate with ANSPs for airspace structure definition for the accommodation concept.
- Contribute to definition of several use cases of operational scenarios for mission pattern accommodation, in En-Route airspace, and in crossing Terminal airspace for departure from/access to the RPAS base, and for contingency/failure scenarios.
- Contribute to more precise definition of Operation Improvements, and to selection by the accommodation stream of a mature (at least V2/TRL3) and feasible subset, and the associated ENablers.
- Participate to consolidation of the requirements (safety, cybersecurity, performances) needed for the ATM functions coming from ongoing work and existing V2 validation, and to derivation of operational requirements towards Detect and Avoid and Remain Well Clear, in coordination with solution 111.
- Lead technically the validation of global integration and use of capabilities with regard to the overall ATM or ATC Controller-Remote pilot procedures.

In the frame of integration stream (V2 maturity targeted), Thales AVS will:

- Contribute to impact analysis of full integration requirements and operational procedures, for navigation/flight planning, and ATC data communications,
- Contribute to definition of additional use cases of operational scenarios

	<p>(nominal and contingencies) for full integration, from navigation and ATC datalink systems standpoint</p> <ul style="list-style-type: none"> • Contribute to impact analysis on navigation system (Flight Plan filing / modification in flight) • Perform definition and prototyping for navigation and ATC datalink systems • Support overall integration environment with regard to RPS/RPA V2 simulation <p>Support validation of full integration for navigation and ATC datalink Systems.</p>
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4.1.1.20 DFS DEUTSCHE FLUGSICHERUNG GMBH

Organisation	20	DFS	Service Provider
Description	<p>DFS DEUTSCHE FLUGSICHERUNG GMBH (DFS) is responsible for air traffic control in Germany and is headquartered in the town of Langen, near Frankfurt. It is a company organised under private law and is wholly owned by the Federal Republic of Germany.</p> <p>The main business of air navigation services provided by DFS is defined by the tasks set out in Section 27c of the German Aviation Act (LuftVG). DFS provides air traffic services as a sovereign function, coordinates the air traffic flow and manages airspace utilisation (as a company entrusted with State functions). For this purpose, it develops and operates air traffic service systems as well as communications, surveillance and navigation systems. DFS operates control centres in Langen, Bremen, Karlsruhe and Munich as well as 16 control towers at Germany's designated international airports. With its approximately 5,400 operational and administrative staff, DFS ensures that approximately three million flights under instrument flight rules (IFR) reach their destinations safely and on time each year.</p>		
Previous experience	<p><u>International projects:</u> SESAR 2020 (PJ10.5): CORUS (ongoing) ERA (ongoing) <u>National projects:</u> Master UAS (ongoing) KoKo 2 (ongoing)</p>		
Entity Profile matching the task	<p>DFS is involved since 2003 in the topic of RPAS integration in controlled airspace. The company has conducted several national and international projects as well as partner or subcontractor. DFS is also a member in national panels (e.g. German Drone Council) as well as international panels like ICAO Remotely Piloted Aircraft System Panel (RPASP).</p>		
Contribution	<p>DFS will participate within PJ13 W2 without requesting co-funding according to Model Grant Agreement Article 9: "IMPLEMENTATION OF ACTION TASKS BY BENEFICIARIES NOT RECEIVING JU FUNDING" (Option 1, A).</p> <p>The role of DFS will be therefore limited to the review of documents and potentially the participation on stakeholder consultations.</p>		

4.1.1.21 DEUTSCHES ZENTRUM FUER LUFT - UND RAUMFAHRT EV

Organisation	21	DLR	Airborne Industry, Ground Industry, Service Provider
Description	<p>The German Aerospace Center (DLR) is the national aeronautics and space research centre of the Federal Republic of Germany. Its extensive research and development work in aeronautics, space, energy, transport, digitalisation and security is integrated into national and international cooperative ventures. In addition to its own research, as Germany's space agency, DLR has been given responsibility by the federal government for the planning and implementation of the German space programme. DLR is also the umbrella organisation for one of Germany's largest project management agencies. DLR has approximately 8000 employees at 20 locations in Germany. Several DLR research institutes are participating in SESAR which are shortly introduced in the following:</p> <p>DLR Institute of Flight Guidance develops innovative air traffic concepts – from the idea towards the implementation. The goal is to ensure an air transport system that is safe, efficient, environmentally friendly and reliable. In the field of air traffic management (ATM) and airports, the institute acts as a supplier of know-how and ideas while balancing the conflicting interests between fundamental research and applied science. As the largest German research facility for flight guidance, it strives to validate and deliver solutions to one of the greatest challenges in aviation – how to increase the efficiency and capacity of air transport in a safe and green way. Key tasks of the institute are to explore how the interplay of flight guidance on board and on the ground is optimized and how the complex interdependencies between the increasingly optimized aviation systems can be handled in a robust and resilient manner.</p> <p>DLR Institute of Communications and Navigation develops and investigates new systems and methods for radio transmission and positioning. Its work in aviation focusses on enabling technologies for air-traffic management. The Institute has a profound expertise in communications, navigation, and surveillance (CNS) technologies. It actively performs research and development in air-ground, air-air, and satellite communications as well as on the networking concept for the future communications infrastructure. In navigation, the Institute has largely contributed to the development of GBAS as well as future ARAIM. It has developed means to protect navigation systems from harmful interference, spoofing and space weather effects and conceptualized integrity monitoring standards for all phases of flight.</p> <p>The DLR Institute of Atmospheric Physics focusses on the research of the physical and chemical processes of the atmosphere and meteorological applications. On both regional and global scales, the relevant processes and changes of the state of the atmosphere are quantified and systematically investigated using remote sensing, research aircraft and computational models. The knowledge of dynamical, cloud physical, and chemical processes constitute the basis for many aeronautical applications.</p> <p>DLR Institute of Flight Systems is active in the topics of flight mechanics and measurement and system technology of all flying systems. The Institute has extensive knowledge in wake turbulence and aviation flight safety, originating</p>		

	from numerous wake-vortex related research projects. AT-One Consortium is composed of its two members Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR) and Netherlands Aerospace Centre (NLR).
Previous experience	Not applicable.
Entity Profile matching the task	Not applicable, DLR initially will not participate directly in this action.
Contribution	Support to participating AT-ONE members if required

4.1.1.22 RIZENI LETOVEHO PROVOZU CESKE REPUBLIKY STATNI PODNIK

Organisation	22 ANS CR (B4)	Service Provider
Description	<p>Air Navigation Services of the Czech Republic (ANS CR) is a progressive provider of safe and cost-effective air traffic services designated by Czech Ministry of Transport. Its task is to provide services to airspace users within the Czech airspace and at 4 international airports - Prague, Brno, Ostrava and Karlovy Vary. Covering rather small but very complex airspace, the company handled more than 850.000 flights in 2017, reaching to 900.000 flights in 2018, with minimal level of delay.</p> <p>Operating fleet of jet and propeller calibration aircraft, ANS CR (B4) offers wide range of flight inspection services. In addition, ANS CR (B4) provides specialized aviation training. The portfolio includes ATC training, pilot and other aviation staff training using its own facilities including ATC and aircraft simulators. The above-mentioned activities together with ATM consultancy services are provided to international customers on commercial basis by subsidiary companies CANI (Czech Air Navigation Institute) and CATC (Czech Aviation Training Centre).</p> <p>Being member of SESAR Joint Undertaking via B4 Consortium, ANS CR (B4) actively contributes to SESAR 2020 Programme. Participation in SESAR Deployment Programme is ensured by involvement in several implementation projects. Together with other central European countries the Functional Airspace Block Central Europe (FAB CE) was formally established. All such activities contribute to implementation of the Single European Sky (SES) legislation.</p>	
Previous experience	Not applicable	
Entity Profile matching the task	Not applicable, ANS CR (B4) initially will not participate directly in this action.	
Contribution	Support to participating members of B4 Consortium if required.	

4.1.1.23 LETOVE PREVADZKOVE SLUZBY SLOVENSKEJ REPUBLIKY, STATNY PODNIK

Organisation	23 LPS SR (B4)	Service Provider
Description	<p>Founded by the Ministry of Transport, Construction and Regional Development of the Slovak Republic in January 2000, LPS SR (Letové prevádzkové služby Slovenskej republiky, štátny podnik) is a state enterprise providing Air Navigation Services, including Air Traffic Services, Aeronautical Telecommunication Services, Aeronautical Information Services, as well as Search and Rescue, in the Slovak Republic.</p> <p>With a total staff of 500 (including 118 ATCOs) and altogether nine Operational units, among them one ACC (Bratislava), two APPs (Bratislava, Košice), five TWRs (Bratislava, Košice, Piešťany, Poprad, Žilina) and Central ATS Reporting Office (Bratislava), LPS SR (B4) controls the Slovak airspace (Bratislava FIR) of the total size of 48,800 km² and provides ATC services at five designated Slovak international airports as well as within small parts of the Hungarian airspace.</p> <p>In 2017, compared to the previous year, an increase in traffic was seen in the FIR Bratislava, namely from 505,155 to 522,353 movements, i.e. by 3.4%. August 5 was the day with the highest number of movements; on that day LPS SR (B4) provided air navigation services to record-breaking 2,163 flights. The European-wide increase in air traffic is also reflected in the evolution seen in the Slovak airspace in the last decade when the total number of movements increased by 59%.</p> <p>As far as provision of air traffic control is concerned, there were no delays which would exceed the determined limit of 0.5 minute per 1 flight. The average delay was only 0.039 minutes per flight.</p> <p>LPS SR (B4) is a part of B4 Consortium, Member of SESAR Joint Undertaking.</p> <p>LPS SR (B4) is a Member of the FAB CE and a founding member of the Gate One, a regional platform of Central and Eastern European ANSPs.</p>	
Previous experience	Not applicable	
Entity Profile matching the task	Not applicable, LPS SR (B4) initially will not participate directly in this action.	
Contribution	Support to participating members of B4 Consortium if required.	

4.1.1.24 AUSTRO CONTROL OSTERREICHISCHE GESELLSCHAFT FUR ZIVILLUFTFAHRT MBH

Organisation	24 ACG/COOPANS	Service Provider
Description	<p>ACG/COOPANS is a state-owned limited liability company.</p> <p>Location: The headquarter is located in Vienna and subdivisions are situated in Linz, Salzburg, Klagenfurt, Graz and Innsbruck.</p> <p>Organizational setup: Two main divisions - Air Navigation Services (operational functions) comprising Air Traffic Management, Engineering Services, Meteorological Services and</p>	

	<p>Aviation Agency (regulatory matters) supported by corporate services</p> <p>Governance structure: A Supervisory Board and a Management Board are responsible for the corporate governance. An audit committee is also established.</p> <p>The primary business of the ANS part of ACG/COOPANS is the provision of air navigation services, pursuing the basic principle of a high level of air traffic safety in compliance with Single European Sky framework</p> <p>ACG/COOPANS is a member of COOPANS Consortium consisting of 5 Air Navigation Service Providers: Austro Control (ACG/COOPANS), Croatia Control (CCL/COOPANS), Irish Aviation Authority (IAA/COOPANS), Naviair/COOPANS and Luftfartsverket (LFV/COOPANS). All five Air Navigation Service Providers have already for a long time been working under a common framework agreement together with Thales in COOPANS. COOPANS is a joint program based on the incremental development of a common ATM platform. The overarching goal for COOPANS is to enable each individual ANSP to achieve financial savings through cost, resource, and competence sharing and to meet the EU objective of harmonizing ATM systems. This work is now expanded to Research & Innovation by the establishment of the COOPANS Consortium.</p> <p>ACG/COOPANS has many years of experience in the delivery of Air Traffic Services, the design of concepts and in development, validation and implementation of Air Traffic Management tools.</p> <p>The enterprise is certified according to ISO 9001.</p>
Previous experience	<p>ACG/COOPANS has participated in SESAR via NORACON consortium in the following WPs:</p> <p>WP00 SESAR2020 preparation: 00.15</p> <p>WP3 Validation infrastructure adaptation and integration: 03.03.02, 03.03.03</p> <p>WP5 TMA Operations: 05.03.00, 05.06.02, 05.06.04, 05.06.07, 05.07.02, 05.09</p> <p>WP6 Airport Operations: 06.05.05, 06.06.01, 06.07.01, 06.08.08, 06.09.03</p> <p>WP7 Network Operations: 07.05.04</p> <p>WP8 Information Management: 08.01.01, 08.01.06, 08.03.03, 08.03.06, 08.03.10</p> <p>WP10 En-Route & Approach ATM Systems: 10.02.01, 10.02.03, 10.03.01, 10.03.08, 10.07.01, 10.10.03</p> <p>WP12 Airport Systems : 12.02.01, 12.06.03</p> <p>WP13 Network Information Management Systems: 13.02.02</p> <p>WP14 SWIM Technical Architecture: 14.02.03, 14.04</p> <p>WP16 R&D Transversal Areas: 16.01.01, 16.06.01, 16.06.01.b</p> <p>WP B Target Concept and Architecture Maintenance: B.04.05</p> <p>WP C: Master Plan Maintenance C.02, C.03</p> <p>ACG/COOPANS has participated in SESAR 2 Wave 1 in the following Projects, Solutions or VLDs:</p> <p>PJ.01-01</p> <p>PJ.02-01</p> <p>PJ.03a-01</p> <p>PJ.04-02</p> <p>PJ.05-02</p> <p>PJ.05-03</p> <p>PJ.06-01</p> <p>PJ.09-02</p> <p>PJ.10-02A</p>

	PJ.10-02B PJ.16-03 PJ.16-04 PJ.17-08 PJ.18.02 PJ.18.04 PJ.19-CI01 PJ.19-CI02 PJ.20 PJ.24 PJ.27
Entity Profile matching the task	Not applicable, ACG/COOPANS will not initially participate directly in this action
Contribution	Support to participating COOPANS members if required

4.1.1.25 CROATIA CONTROL, CROATIAN AIR NAVIGATION SERVICES LTD

Organisation	25 CCL/COOPANS	Service Provider
Description	<p>CCL/COOPANS is a state-owned limited liability company.</p> <p>Location: The headquarter is located in Zagreb and subsidiaries are located in Pula, Rijeka, Lošinj, Split/Brač, Zadar, Dubrovnik and Osijek.</p> <p>Divisions: Air Traffic Management, Technical Division, Aeronautical Meteorology, Military Operations and Human Resources Management, Legal and Financial Affairs.</p> <p>Governance structure: An Assembly, a Supervisory Board and main Management. The Assembly consists of the Chairman - the Minister responsible for transport, Minister of Finance and the Minister of Defence. The Supervisory Board monitors the activities of the organization. Supervisory Board appoints the Director General. Director General manages and represents the organization.</p> <p>The primary business of CCL/COOPANS 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 CCL/COOPANS has been certified for provision of the following services:</p> <ul style="list-style-type: none"> • Air Traffic Services (ATS) • Communication, Navigation and Surveillance Services (CNS) • Aeronautical Information Services (AIS) • Aeronautical Meteorological Services (MET) <p>Croatia Control is a member of COOPANS Consortium consisting of 5 Air Navigation Service Providers: Austro Control (ACG/COOPANS), Croatia Control (CCL/COOPANS), Irish Aviation Authority (IAA/COOPANS), Naviar/COOPANS and LFV/COOPANS. Cooperation between COOPANS partners goes beyond SESAR – partners has for a long time worked together with Thales under a common framework agreement in a joint program based on the incremental development of a common ATM platform. The overarching goal for COOPANS is to enable each individual ANSP to achieve financial savings through cost, resource, and competence sharing and to meet the EU objective of harmonizing ATM systems. This work is now expanded to Research & Innovation by the establishment of the COOPANS Consortium.</p> <p>CCL/COOPANS has many years of experience, both in the delivery of Air Traffic Services, design of concepts and in development, validation and implementation of</p>	

	Air Traffic Management tools. CCL/COOPANS is certified ISO 9001, ISO 14001 and BS OHSAS 18001.
Previous experience	CCL/COOPANS has many years of experience in ATM, ATFCM and ASM, as well in operational use of CPDLC, Mode S and automated system coordination tools in cross border FRA operations which are now an integrated part of the ATM-system Topsky and previously in EUROCAT-E. CCL/COOPANS has participated in SESAR 2020 Wave 1 as a member of COOPANS Consortium in the following projects, solutions or VLDs: PJ.01-01 PJ.04-02 PJ.05-02 PJ.05-03 PJ.06-01 PJ.09-02 PJ.10-02A PJ.10-02B PJ.10-05 PJ.15-09 PJ.16-03 PJ.16-04 PJ.18.02 PJ.18.04 PJ.18-06 PJ.19-CI02 PJ.19-CI05 PJ.20 PJ.24
Entity Profile matching the task	Not applicable, CCL/COOPANS will not initially participate directly in this action
Contribution	CCL/COOPANS will provide support to participating COOPANS members if required.

4.1.1.26 UDARAS EITLIOCHTA NA HEIREANN THE IRISH AVIATION AUTHORITY

Organisation	26 IAA/COOPANS	Service Provider
Description	<p>IAA/COOPANS is a state-owned limited liability company</p> <p>Locations: The headquarter is located in Dublin and subdivisions are located in Shannon and Cork</p> <p>Divisions: Two main divisions - Operations and Strategy, Technology and Training supported by corporate services. Furthermore, Irish Aviation Authority has a Safety Regulation Directorate, as Irish Aviation Authority oversees and regulates the implementation of standards for the Irish civil aviation industry.</p> <p>Governance structure: Irish Aviation Authority has a Board of Directors having responsibility for the corporate governance.</p> <p>Irish Aviation Authority (IAA/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), Naviar/COOPANS and LFV/COOPANS. Cooperation between COOPANS partners goes beyond SESAR – partners has for a long time worked together with Thales under a common framework agreement in a joint program based on the incremental development of a common ATM platform. The overarching goal for COOPANS is to enable each individual ANSP to achieve financial savings through cost, resource, and competence sharing and to meet the EU objective of harmonizing ATM systems. This work is now expanded to Research & Innovation by the establishment of the COOPANS Consortium.</p> <p>Irish Aviation Authority (IAA/COOPANS) has many years of experience, both in the delivery of Air Traffic Services; design of concepts and in development, validation and implementation of Air Traffic Management tools.</p> <p>The enterprise is certified ISO 9001.</p>	
Previous experience	<p>Irish Aviation Authority (IAA/COOPANS) has participated in SESAR via NORACON consortium in the following WPs:</p> <p>WP5 TMA Operations (5.3, 5.6.1, 5.6.4, 5.6.7, 5.9), WP6 Airport Operations (6.7.1), WP 10 En-Route & Approach ATM Systems (10.2.1, 10.3.8, 10.10.3), WP 16 R&D Transversal Areas (16.4.3, 16.6.1), WP C Master Plan Maintenance (C3)</p> <p>IAA/COOPANS has participated in SESAR 2020 Wave 1 in the following projects:</p> <p>PJ.10, PJ.16, PJ.17, PJ.25 and PJ.27</p>	
Entity Profile matching the task	No third parties involved, IAA/COOPANS will not initially participate directly in this action	
Contribution	Support to participating COOPANS members if required.	

4.1.1.27 NAVIAIR

Organisation	27 Naviar/COOPANS	Service Provider
Description	<p>Naviar is a 100% state owned company originating in “Statens Luftfartsvæsen” founded in 1938. Headquarter is located in Copenhagen (TWR/APP/En-route) and subdivisions are located in Roskilde, Billund, Århus, Rønne and Ålborg (TWR/APP) and in Vagar & Nuuk (FIS/FIC).</p> <p>Naviar has three main divisions - Operations, Technical Maintenance and ATM Projects & Engineering supported by Corporate Services.</p>	

	<p>Naviar 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) and Naviar. Cooperation between COOPANS partners goes beyond SESAR – partners has for a long time worked together with Thales under a common framework agreement in a joint program based on the incremental development of a common ATM platform.</p> <p>The overarching goal for COOPANS is to enable each individual ANSP to achieve financial savings through cost, resource, and competence sharing and to meet the EU objective of harmonizing ATM systems. This work is now expanded to Research & Innovation by the establishment of the COOPANS Consortium.</p> <p>Naviar has many years of experience, both in the delivery of Air Traffic Services; design of concepts and in development, validation and implementation of Air Traffic Management tools. The company is certified ISO 9001.</p>
Previous experience	<p>SESAR 1 experience: Naviar has participated in SESAR via NORACON consortium in the following WPs:</p> <ul style="list-style-type: none"> • WP00 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 <p>SESAR 2020 experience: Naviar as participated and contributed in several projects during Wave 1</p> <ul style="list-style-type: none"> • PJ.01-01 E-AMAN - Extended Arrival Management with overlapping AMAN operations and interaction with DCB • PJ.06-01 Free Route - Optimized traffic management to enable Free Routing in high and very high complexity environments • PJ.10-02A Separation Management - Improved Performance in the Provision of Separation • PJ.10-02B Separation Management - Advanced Separation Management • PJ.14-02-02 Future Satellite Communications Data Link • PJ.14-04-01 Surveillance Performance Monitoring (Task 1) • PJ.14-04-03 New use and evolution of Cooperative and Non-Cooperative Surveillance (Task 3) • PJ.15-9 Common Services, Virtual Centre data centre service • PJ.16-3 CWP Controller productivity - Workstation, Service Interface Definition & Virtual Centre Concept • PJ.16-4 CWP Virtual Centre concept - Solution Workstation, Controller Productivity (Advanced Speech Recognition)

	<ul style="list-style-type: none"> • PJ.18-2 Trajectory Management Process • PJ.18-6 Performance Based Trajectory Prediction • PJ.19 CI1/WP2 ATM Operations (SESAR CONOPS) • PJ.20 Master Plan Maintenance • PJ.25 E-AMAN VLD • PJ.27 Flight Object Interoperability VLD • PJ.31 Initial Trajectory Information Sharing VLD
Entity Profile matching the task	No third parties involved, Naviar will not initially participate directly in this action
Contribution	Support to participating COOPANS members if required

4.1.1.28 ATOS BELGIUM

Organisation	28	ATOS (FSP)	Ground Industry
Description	<p>Atos Belgium is a company within Atos SE (Societas Europaea) group. Atos is a leader in digital services with 2014 pro forma annual revenue of €10 billion and 86,000 employees in 66 countries. Serving a global client base, the Group provides Consulting & Systems Integration services, Managed Services, Cloud operations, Big Data & Security solutions, as well as transactional services. Throughout Europe, more than 300 Atos ATM experts provide solutions and architecture support to Air Navigation Service Providers, Airports, Airlines and EUROCONTROL Network Manager. Atos Belgium is member of the Frequentis SESAR Partners consortium together with the companies HUNGAROCNTRM MAGYAR LEGIFORGALMI SZOLGALAT ZARTKORUEN MUKODO RESZVENYTARSASAG and Frequentis AG and was founded in 2014 for the main purpose of joining SESAR2020 activities. Frequentis SESAR Partners is member of the SESAR Joint Undertaking. The consortium is comprised of companies having a variety of complementary capabilities. Having former SESAR1 experience within its framework, an ANSP whose expertise will result in early feedback loops during certain projects, and the wide range IT, data management and security expertise of the consortium forming entities, Frequentis SESAR Partners believes in the high added value of its participation in SESAR2020 efforts.</p>		
Previous experience	Not applicable.		
Entity Profile matching the task	Not applicable, ATOS (FSP) initially will not participate directly in this action.		
Contribution	Support to participating FSP members if required		

4.1.1.29 AIRTEL ATN LIMITED

Organisation	29	AIRTEL	Ground Industry
Description	<p>AIRTEL ATN LTD is a part of North European ATM Industry Group (NATMIG) Consortium. NATMIG is a member of SESAR 1. The NATMIG consortium consists of Airtel ATN (SME - Ireland), Saab AB (multinational industrial concern - Sweden) and SINTEF AS (non-profit research organisation - Norway).</p> <p>AIRTEL ATN LTD is an SME which has an extensive line of ATN & FANS data link products and technology used in 35 countries worldwide. Its operational systems include ATN/OSI routers deployed on more than 2,500 aircraft. Its ground systems include Air/Ground Data Link Servers deployed in several European Countries and Air/Ground routers used in VDL Mode-2 networks. It provides data link test and monitoring equipment. It has developed experimental version of future data link systems such as ATN/IPS, SATCOM and AeroMACS.</p> <p>AIRTEL ATN LTD is providing Test and Monitoring equipment to the FAA DCIS program. It has extended its research collaboration to include organisations in China. It is also providing Data Link networking equipment in collaboration with Russian companies.</p> <p>AIRTEL ATN LTD also provides Data Link test services and products in support of Aircraft Data Link certification for ACARS, FANS and ATN/OSI, in particular EU Data Link and US DCIS aircraft testing.</p>		
Previous experience	Not applicable.		
Entity Profile matching the task	Not applicable, AIRTEL initially will not participate directly in this action.		
Contribution	Support to participating NATMIG members if required		

4.1.1.30 SINTEF AS

Organisation	30	SINTEF	Ground Industry
Description	<p>SINTEF is a part of North European ATM Industry Group (NATMIG) Consortium. The NATMIG consortium consists of Airtel ATN (SME - Ireland), Saab AB (multinational industrial concern - Sweden) and SINTEF AS (non-profit research organisation - Norway).</p> <p>SINTEF (http://www.sintef.no/) is the largest independent research organisation in Scandinavia and is a non-profit research organisation. We employ 2000 people most of whom are located in Trondheim and Oslo (Norway). More than 90% of our annual turnover derives from contract research for industry and the public sector in Norway and internationally, and we receive minimal state funding (around 6%). Contract research carried out by SINTEF covers all scientific and technical areas, and ranges from basic research through applied research to commercialisation of results into new products and business ideas, for both the domestic and international markets. Although SINTEF DIGITAL has gained competence in state-of-the-art ATM research for several decades, the increased focus through the SESAR 1 (32 projects) and SESAR 2020 involvement has substantially improved our</p>		

	<p>technology and aligned it further to the needs of the aviation industry and airspace users. The activity in SESAR has also increased SINTEF's aeronautical research portfolio outside SESAR. SINTEF is a multidisciplinary research organisation, and can still bring added value to the ATM domain through our state-of-the-art research in other domains like Oil & Gas, Space, Health & Medicine, Constructions, Energy, Marine, Railway, Roads, Harbours, and Resilience etc.</p> <p>The SINTEF contribution to SESAR is focused around optimisation, (traffic sequencing, routing, taxiing, dynamic airspace, A-CDM), Human Computer Interface, system architecture and development, Digitalisation, Automation, 3D modelling, Safety, Resilience, Cyber Security and navigation (GBAS).</p>
Previous experience	Not applicable.
Entity Profile matching the task	Not applicable, SINTEF initially will not participate directly in this action.
Contribution	Support to participating NATMIG members if required

4.1.2 Main profiles/CV

Project Manager, WP01 and 04 leader

Ermanno Girardelli graduated in 1987 in Computer Science from the University of Turin. He was hired as junior researcher at the Artificial Intelligence Laboratory of Aeritalia where he participated to the development of several “expert systems” in various areas: e.g. mission planning for military aircraft, manufacturing, diagnostics. From June 2002 to September 2005 he was project coordinator of a FP5 initiative (GRD1-2001-40133 “AUTAS – Automating FMECA for Aircraft Systems”). Then he participated to the proposal writing and to the management of several research initiatives at National and European level, some of which were relevant to Remote Piloted Aircraft, like MIDCAS (“Mid-Air Collision Avoidance Systems”), SMAT-F1 (“Advanced Environmental Monitoring System”) and MEDALE (“Mediterranean ATM Live Exercise”). In 2010 he joined the SESAR programme management group of Alenia Aermacchi and since 2013 he is programme manager for the SESAR activities. Today, he is fully involved in Wave1 and Wave2 activities. He was the representative of Alenia (today Leonardo Aircraft Division) at the Programme Control Group of SESAR 1 and he is now the alternate representative at the DMSC in SESAR2020. He has an extensive experience in the management of research projects both at National and European level, in all the phases of the project and he has the skills necessary to deliver the project results within the constraints of time and available funds.

WP02 Leader

Bill Booth has been awarded an MBA, a BSc in Computer Science, and is a Chartered Engineer. He is the Chairman of EUROCAE WG-75 for Traffic Alert and Collision Avoidance.

Bill joined EUROCONTROL in 2007 where has been Project Coordinator for SESAR Wave 1 PJ11, has worked on the management team of the ASAS Thematic Network and was ENB Coordinator for the Trajectory Management work in SESAR1. He was previously employed by QinetiQ ATM group as a scientist in the UK and has over 25 years experience in ATM. He has worked on many European Commission Projects, often as Co-ordinator (e.g. Project EMERTA) as well as in a technical role (e.g. ACASA). He has also been responsible for EUROCONTROL projects in future use of data-links, ATM architecture and ATM strategy work where he has presented to joint FAA/European meetings. Prior to joining QinetiQ, Bill was a Senior Analyst in

charge of team responsible for large scale simulations for the UK and European evaluation of TCAS (collision avoidance). After qualification, his initial professional scientific role was in novel radar signal processing techniques which involved extensive field trials including low-level helicopter trials.

Sub-WP03.01 Leader

Cedric D'Silva has 30 years of experience in the aeronautics industry. He graduated from Ecole Nationale de l'Aviation Civile Toulouse France in 1989 with an aeronautical engineering master's degree, holding a preceding computer engineering & electronics degree and a private pilot licence. After working with Trans Europe Airlines on aircraft operations, in 1989 he joined former SEXTANT now Thales AVS in several positions : R&D, avionics functions / systems design. In his early career he performed R&D on cockpits, European framework projects and held a lead engineer role on FANS-A used in trials (Bourget demonstration, ADS-Europe) later developed to a production avionics standard. He then moved to a project management role (joint French-US consortium) developing a certified ATN (Aeronautical Telecommunications Network) router. In recent years he holds a senior role as a CNS-ATM technical expert and manager, has experience in the complex ATM environment and has used the experience and knowledge in both technical and operational domains through the SESAR definition phase, SESAR 1 and SESAR 2 Wave 1 particularly on the airborne trajectory and interactions with ATC, as well as in international standardisation (EUROCAE/RTCA WG78 and WG76 groups).

WP03 Leader and sub-WP03.02 leader

Alessandro Manzo graduated in 2007 in Computer Engineering. He spent one year as contract researcher at CINI consortium working on research projects in Java Technologies in the context of ATM solution, in cooperation with the SICTA consortium (ENAV Group) where was employed by the end of 2007 as Air Traffic Management Engineer/ Researcher. He was involved since the beginning in R&D activities for national and international programs, as System Engineering and Project Manager. In 2008 he started a collaboration with SELEX SI (now LEONARDO) for the Coflight Project and the participation to the EUROCAE WG-81 for the standardisation of the Flight Object (ED-133). In 2009-10 he was involved in other international projects as system engineer (e.g. SWIM-SUIT, EAEA – enterprise architecture for the European aviation), and next he joined the SESAR program as PJ03.03.01 Manager (Interoperability of Simulation Platforms). He had experience in several related to ATM and transversal domains. In 2012 he started working in the ATM Cyber Security emerging domain. He has skills in requirements development, performance analysis, use cases development, Real Time Simulations. In addition, he got experience in project management and participated to project management courses. In 2017 he moved to Techno Sky s.r.l (ENAV Group) still working on behalf of ENAV for International Strategies Dept. In the last four years he got a specialization on RPAS/Drone domain, working on dedicated projects like as: UITras (funded by Italian Minister of Economic Development) and recently leading the SESAR Solution PJ10-05 “IFR RPAS Operations. Conscientious person, knowledge in the aeronautic and drone domains and a wide knowledge in the IT concepts and managing transition towards the digital transformation. Capability to manage complex activity in a complex environment as well as the good knowledge of SESAR framework will be key-experience to be exploited in such proposed role.

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

4.2.1 Linked to Leonardo – Company 1

Objective	
Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	N
Does the participant envisage that part of its work is performed by linked third parties	Y
<p>For this project Leonardo plans to involve Telespazio in activities related to satellite communication and satellite navigation.</p> <p>Telespazio, a joint venture between Leonardo (67%) and Thales (33%), is one of the world's leading players in satellite services. The company, headquartered in Rome (Italy), employs approximately 2500 people.</p> <p>Telespazio relies on an international network of space centres and teleports and operates worldwide through many subsidiaries. In particular, it is present: in France with Telespazio France; in Germany with Telespazio VEGA Deutschland, GAF and Spaceopal (a joint venture in which the German space agency DLR holds a 50% interest); in the United Kingdom with Telespazio VEGA United Kingdom; in Spain with Telespazio Iberica and in Romania with Rartel. Telespazio has consolidated its presence in South America with Telespazio Brasil and Telespazio Argentina. In Italy, the company is also present through e-GEOS (in which the Italian Space Agency holds a 20% interest).</p> <p>Telespazio is a leading company in sectors that are becoming increasingly important to public institutions, business operators and consumers. Its activities range from the design and development of space systems to the management of launch services and in-orbit satellite control, from Earth observation services, integrated communications, satellite navigation and localization, to scientific programmes.</p> <p>Telespazio relies on a wealth of experience of the highest level, stemming from technological expertise acquired over 50 years of business practice. The Company's experience is also drawn from the management of space infrastructure - including the Fucino Space Centre, the world's largest civilian teleport - as well as from its involvement in major space programmes, including: Galileo, EGNOS, Copernicus, COSMO-SkyMed, SICRAL and Göktürk.</p> <p>The company now covers the whole space market value chain through its lines of business: Satellite Communications, Geo Information, Satellite Systems and Operations.</p> <p>Telespazio responds to new demands in the satellite services market with innovative ideas, offering new solutions, implementing international projects. Today more than ever, Telespazio is a true innovator, transforming what were once just possibilities into real services available to an increasingly audience worldwide.</p> <p>Relevant skills/experience/technologies:</p> <p>DeSIRE II DeSIRE II, Second Element of the ESA EDA RPAS Demonstration Roadmap, aims at developing and demonstrating services based on a Remotely Piloted Aircraft (RPA) flying in Beyond Radio Line of Sight (BRLOS). The project objectives are to support the regulatory process within the European context, with focus on BRLOS operations under Instrument Flight Rules (IFR) using satellite communications (L and Ka bands).</p> <p>SESAR2020 In the framework of SESAR 2020 Telespazio acts as Linked Third Party of Leonardo and takes part to</p>	

the activities related to the Projects PJ03a, PJ10 e PJ14.	
In the framework of this project, Telespazio will leverage on the experience gathered in previous projects (SESAR2020, SESAR 1, DeSIRE 2, etc.) in order to contribute as follows for Satellite Communication and Navigation aspects.	
The contribution to PJ13 solution 117 aims to carry out the development and validation activities related to satellite navigation and communication in support of the main objective, which is the integration of RPAS in Instrumental Flight Rules (IFR) systems. More specifically, the key aspects under investigation are:	
<ul style="list-style-type: none"> - detect and avoid - command and control - contingency procedures in case of loss of communication or navigation. 	
The contribution will primarily address the development of a simulator of satellite channels tailored to the evaluation of the performance of communication links in BRLOS (Beyond Radio Line of Sight) for RPAS.	
The work will leverage on the existing simulator developed by Telespazio for the characterization of atmospheric effects (rain, clouds, scintillation) in L and Ka-bands. The simulator has been used in the frame of the DESIRE2 projects. The validation activities have included the collection of almost a year of atmospheric attenuation at 20GHz which will be used in the scope of Sesar to fine-tune the simulator model in Ka-band.	
The current work aims at extending the simulator, introducing other effects like pointing errors and multipath effects due to the structure of the RPA and to the terrain.	
Does the participant envisage the use of contributions in kind provided by third parties (Articles 11 and 12 of the General Model Grant Agreement)	N
N/A	
Does the participant envisage that part of the work is performed by International Partners (Article 14a of the General Model Grant Agreement)?	N
N/A	

4.2.2 Linked to Airbus – Company 2

Objective	
Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	N
N/A	
Does the participant envisage that part of its work is performed by linked third parties	Y
For the present proposal, Airbus Operations SAS and Airbus Defence and Space SAS are linked third parties of Airbus SAS, as declared in the Airbus Proposal for Membership Accession -REF. SJU/LC/0122-CFP.	
Airbus Operations SAS	

Airbus Operations SAS designs and manufactures aircraft, aircraft parts, systems, equipment and derivative products, and provides services in the field of aeronautics. Airbus Operations SAS Engineering is operated in one major design office in Toulouse. It gathers top-level competencies such as integrator architecture, general design, integration tests and systems, propulsion, structural design and computation.

The Toulouse Design Office has dealt with systems design and development for many years and acquired a large expertise in this area.

Airbus Operations SAS will support the technical developments of Collision Avoidance aspects (OSDs, input to standards such as EUROCAE ...) whereas Airbus SAS will concentrate on programme management and transversal ATM engineering contributions.

Airbus Defence and Space GmbH (Airbus DS)

Airbus DS is developing concepts for State Airspace Users and civil- military cooperation. Airbus DS works closely together with EUROCONTROL CMAC to elaborate and harmonize the activities and deliverable content.

Airbus D&S will also contribute to Solutions 111, 115 and 117 (assessment of the OSD, technical specification). Therefore Airbus D&S will review the validation cycles of the overall system performance.

It has to be noticed that the effort of the Beneficiary AIRBUS is below the effort of its Linked Third Party Airbus DS. It results from the fact that the Beneficiary (AIRBUS) is dedicated to civil commercial aircraft while for this Work Package, the activity has to be performed by division dealing with military operations as well.

Does the participant envisage the use of contributions in kind provided by third parties (Articles 11 and 12 of the General Model Grant Agreement)	N
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In kind contribution are not foreseen.

Does the participant envisage that part of the work is performed by International Partners (Article 14a of the General Model Grant Agreement)?	N
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There will be no legal entity established in a non-associated third country which is not eligible for funding under Article 10 of the Rules for Participation Regulation No 1290/2013.

4.2.3 Linked to NLR – Company 3

No third parties involved.

4.2.4 Linked to ON (B4) – Company 4

No third parties involved.

4.2.5 Linked to PANSA (B4) – Company 5

Objective

Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	N
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N/A	
Does the participant envisage that part of its work is performed by linked third parties	Y
<p>Poznan Supercomputing and Networking Centre (PSNC) was established in 1993 as a research laboratory of the Polish Academy of Sciences and is responsible for the development and management of the national optical research network, high-performance computing and various e-Science services and applications for scientific, public and private institutions. The national optical network infrastructure called PIONIER is based on dedicated fibres connecting more than 700 research campuses and universities around Poland. PSNC has several active computer science research and development groups working on a variety of aspects including: innovative and large scale HPC applications, scalable services, digital media services, mobile user support technologies, digital libraries, storage management, tools for high-speed optical networks and QoS management. More than 300 PSNC experts are capable of bringing unique IT capabilities to the research and e-Science communities based on many experiences in the 5th, 6th and 7th Framework Programs and recently in Horizon 2020. Additionally, PSNC has established recently a set of dedicated technological laboratories to conduct R&D activities in the area of optical and wireless networking, Internet of Things and High Performance Computing. PSNC is taking part in research projects connected with advanced networking technologies, such as ROAM - using Orbital Angular Momentum for data transmission. PSNC often takes partner role as a system validation and performance analyst. PSNC has also invested in a remote research laboratory located at the local airport which will be used to design, test and validate new scenarios and use-cases based on ATM scenarios and requirements, including real use cases involving a range of different drones and advanced networking and remote communication facilities.</p> <p>Publications:</p> <ul style="list-style-type: none"> • "The Orbital Angular Momentum of Light for Ultra-High Capacity Data Centers" Mirco Scaffardi; Muhamad N. Malik; Jiangbo Zhu; Gernot Goeger; Ning Zhang; Charalambos Klitis; Yabin Ye; Piotr Rydlichowski; Veronica Toccafondo; Martin Lavery; Nicola Andriolli; Siyuan Yu; Marc Sorel; Antonella Bogoni, 2018 20th International Conference on Transparent Optical Networks (ICTON). • "The Orbital Angular Momentum of Light for Next Generation Optical Switches" M. Scaffardi(1), M.N. Malik(2), N. Zhang(3), P. Rydlichowski(4), V. Toccafondo(1), C. Klitis(3), M. P. J. Lavery(3), J. Zhu(5), X. Cai(6), S. Yu(5), G. Preve(1), M. Sorel(3), A. Bogoni(1,2), 2018 44th European Conference on Optical Communication (ECOC 2018). • "Field Test of High-Speed Quantum-safe Optical Communication", ETSI-IQC Quantum-Safe Cryptography Workshop. <p>An active participation in the design and development of high-speed interconnects, fiber-based research and education networks allows PSNC today to be a key member of pan-European GEANT optical network connecting 34 countries through 30 national networks (NRENs). PSNC is also participating in the biggest scientific experiments offering the access to large scale computing, data management and archiving services. Additionally, PSNC has been engaged in European initiative of building high performance computing e- Infrastructure - PRACE Research Infrastructure provisioning of permanent future Petaflops supercomputing installations involving reconfigurable hardware accelerators. Currently PSNC maintains around 2 Petaflop computing and 40 PB of storage facilities. PSNC is also taking an active role in EUDAT contributing with the development of sustainable data storage, archiving and backup services. PSNC was participating in multiple national and international projects under</p>	

<p>5th, 6th, 7th and Horizon 2020 Programme, such as ATRIUM, SEQUIN, 6NET, MUPBED, GN2 JRA1, GN2 JRA3, GN2 SA3). It was also a coordinator of pan-European projects such as GridLab, PORTA OPTICA STUDY and PHOSPHORUS and took an active part in many other EU projects such as HPC-Europe/II, OMII-Europe, EGEE/II, ACGT, InteliGrid, QosCosGrid or MAPPER.</p> <p>PSNC will support PANSA (B4) in developing SESAR 2020 Solution #117 on analysis, monitoring and validation of various concepts based on existing and future technologies/networks, FTS and RTS simulations. PCSN will contribute to PANSA's works in WP03.02 in the technical development of communication link ATC-the RPAS pilot for the purpose of execution planned validation exercises. PCSN will support PANSA in the following activities:</p> <ul style="list-style-type: none"> • concept definition, • technical specification, • validation plan development, • execution of FTS and participation in RTS to be conducted by PANSA, • validation results evaluation and validation report <p>in the scope related to their development works.</p>	
Does the participant envisage the use of contributions in kind provided by third parties (Articles 11 and 12 of the General Model Grant Agreement)	N
N/A	
Does the participant envisage that part of the work is performed by International Partners (Article 14a of the General Model Grant Agreement)?	N
N/A	

4.2.6 Linked to LFV/COOPANS – Company 6

No third parties involved.

4.2.7 Linked to Dassault Aviation– Company 7

No third parties involved.

4.2.8 Linked to DSNA – Company 8

Objective	
Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	Y
<p>DSNA has in house expert engineers for En-Route and TMA traffic management. They have the ability to develop new concepts and define specifications for new ATM tools. But, in order to fulfil its prospective studies, DSNA needs additional expertise. In PJ.13 DSNA will subcontract activities for a total of €332.500. subcontracted activities will encompass: platform maintenance and configuration in preparation of demonstration exercises (Task 3.01.04), data preparation and collect of the data steaming from the validations (Task 3.01.06), support to the analysis of the results through specific tooling (Task 3.01.07 and task 3.01.08). DSNA subcontract allows DSNA/DTI to buy these necessary required studies/services. This subcontract is a framework for placing specific purchase orders and</p>	

has been attributed in accordance to the French “Code des Marchés Public”.	
Does the participant envisage that part of its work is performed by linked third parties	Y
ENAC and SAFRAN will work with DSN as linked third parties in PJ.13	
<p>ENAC</p> <p>ENAC is a public high school placed under the authority of the French Transport Ministry. ENAC trains engineers in electronics, computer and air transport. It also trains pilots, air traffic controllers and technical experts for maintenance and supervision. ENAC have five departments for research and education: air transport, air traffic control, humanities and social sciences, electronics, mathematics and computer science. The ENAC's laboratories are or have been involved in many research projects at the national and European level (ex. ATM-FUSION / ICONUS and the SESAR JU RPAS demonstrators ODREA and TEMPAERIS). ENAC is involved in SESAR Wave1 PJ10.05.</p> <p>ENAC will be involved in both solution 115 and 117, mainly in ground-ground communication means (VIRTUAL VHF) for communication between remote pilots and ATCOs and in navigation means (accuracy and backup). ENAC will support DSN for the contribution and validation of the PJ13 deliverables.</p> <p>SAFRAN</p> <p>SAFRAN, high-tech company is a world leader in solutions and services in optronics, avionics, electronics and critical software for the civilian and military markets. In addition to the development and support of tactical (Sperver) and long endurance (Patroller) RPAS, SAFRAN is a direct contributor to NATO or EDA projects (e.g MiDCAS) in the domain of insertion of RPA in non-segregated airspace and is a leading member of EUROCAE WG73. SAFRAN participated to the ODREA SESAR JU RPAS demonstrator and is involved in SESAR Wave1 PJ10.05 and PJ11.A2.</p> <p>In solutions 115 and 117, SAFRAN will contribute to a demonstration campaign with the Patroller equipped with ACAS Xu and to RTS simulations (SAFRAN RPS will be integrated as hardware in the loop). In solution 111, SAFRAN will provide behaviors for both cooperative and non-cooperative sensors. SAFRAN will support DSN for the definition, the analysis and the validation of the different exercises.</p>	
Does the participant envisage the use of contributions in kind provided by third parties (Articles 11 and 12 of the General Model Grant Agreement)	N
N/A	
Does the participant envisage that part of the work is performed by International Partners (Article 14a of the General Model Grant Agreement)?	N
N/A	

4.2.9 Linked to ENAIRE – Company 9

Objective

Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	N
N/A	
Does the participant envisage that part of its work is performed by linked third parties	Y
<p>CRIDA</p> <p>CRIDA A.I.E. (Reference Center for Research, Development and Innovation in ATM) is a non-profit joint venture between ENAIRE, The Polytechnic University of Madrid and Ineco. CRIDA's mission is to improve the performance of the Spanish ATM management system. As an integral part of the global system, CRIDA intends to increase the safety, capacity, environmental and economic impact of ATM through ideas and R&D+i projects. CRIDA's investigative priorities revolve around three main lines in which CRIDA leverages its proven experience and solid international reputation:</p> <ul style="list-style-type: none"> • System monitoring and diagnostics to identify problems and their causes. This continuous system observation is realized through systematic performance quantification; • Analysis and validation of R&D+i solutions, viability studies and quantification of the benefits in terms of system performance improvements; • Collaboration in the development and subsequent deployment of those solution alternatives that provide the best system benefit. <p>CRIDA will contribute to the PJ13 (Solutions 115 and 117) with a validation exercise (Fast Time Simulation), in which several scenarios will be considered to manage conflict detection and resolution based in general and specific ATC instructions, clearances and tools complying with separation minima and operational procedures. Also contingency situations will be included. The objective of the FTS is to validate RPAS procedures and RPAS technical capabilities with regards to performance, safety and ATC workload KPAs.</p> <p>Moreover, CRIDA will participate in the elaboration of the following deliverables: Validation Plan (VALP) V2, Validation Report (VALR) V2 and Initial Validation Plan V3 defining the validation roadmap for phase V3.</p> <p>INECO</p> <p>INECO (Ingeniería y Economía del Transporte, S.M.E., M.P. S.A.) is an engineering and consulting Public Entity 45,85% owned by ENAIRE, focused on the transport sector in general, and also in the air transport field in particular, including ATM and airport operations and management.</p> <p>INECO will support ENAIRE in the definition and execution of the validation activities to be performed, mainly in the framework of solution 117. High expertise on Fast Time Simulation Technique owned by INECO will help in the measurement of some relevant Performance Indicators. Additionally, INECO will contribute in the development of the concept.</p> <p>ISDEFE</p> <p>Isdefe (Ingeniería de Sistemas para la Defensa de España, S.A., S.M.E, M.P.) is a state-owned company that offers consulting and engineering services for Spanish public administration and public international agencies, addressing the definition, implementation,</p>	

operation, evolution and regulation of CNS/ATM aspects. Isdefe is (and of course has been) providing support to ENAIRE in a wide range of areas and projects. It is here worth to mention its support for more than 25 years now in the development, verification, validation and deployment of the Spanish ATC system. Isdefe also provides support to ENAIRE in the field of airports systems, as well as in the RPAS area supporting the integration of RPAS in non-segregated airspace, through R&D activities.

Isdefe will contribute to the development of de Safety, Performance and Operational Requirements in the definition of separation minima for accommodation and integration of RPAS in class A, B, C airspace as well as in the definition of non-standard procedures, acting as focal point for ENAIRE in the OSED/SPR/INTEROP for V2. Moreover, Isdefe will contribute to the ENAIRE's validation exercise in the validation plan and report.

Does the participant envisage the use of contributions in kind provided by third parties (Articles 11 and 12 of the General Model Grant Agreement)	Y
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Several companies have been collaborating by means of third party in kind contribution with ENAIRE for long time, and a close collaboration exists in this sense. This has been the habitual practice in SESAR1 and in SESAR 2020 Wave 1 activities and the results have become optimal in terms of efficiency and mutual collaboration.

The use of this in kind contribution is identified as a key factor for the proper development of the activities under this project. The complementarity of the know-how and expertise profile obtained by this form of collaboration is necessary to achieve the targets with the expected level of quality.

This contribution corresponds to the one referred to in Art. 11 of the AMGA (in-kind contributions against payment), in turn corresponding to category "A.3- seconded persons" of the Annex 2 of the Grant Agreement, and currently is estimated to amount to around 21.500 € (direct costs) for the work developed on ENAIRE's premises (since there is no specific place in Annex 2 to indicate these costs).

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

4.2.10 Linked to ENAV – Company 10

Objective

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

Does the participant envisage that part of its work is performed by linked third parties	Y
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ENAV contribution in the project is complemented by the following LTPs: CIRA, Deep Blue, IDS AIRNAV, and Techno Sky.

CIRA

Centro Italiano Ricerche Aerospaziali (CIRA) was created in 1984 to manage PRORA, the Italian Aerospace Research Program, and uphold Italy's leadership in the fields of Aeronautics and Space. It has both public and private shareholders. CIRA is involved in advanced aeronautical and space research which ranges from the study of revolutionary air and space craft to innovative systems to reduce environmental impact, increase flight safety, make surveillance more effective, developing and verifying in its own labs systems to re-enter the atmosphere from space. CIRA plays its role directly or partnering with small and large companies at a domestic, European or global level, and with bodies and institutions from NASA to the European Space Agency, from the European Commission to the Chinese Aerospace Academy.

Its contribution to the project will come from different departments all belonging to the On Board Systems and ATM division which produces almost 15% of CIRA's annual revenues (8/50 M€), through projects aimed at developing and validating a TRL with up to 6 innovative technologies in the field of on board avionics systems for both manned and unmanned vehicles. Specific research activities are devoted to the development of avionics systems technologies tailored for the full integration of the RPAS and GA vehicles within the future civil ATM system (SESAR)

Currently the On-board Systems and ATM division includes 20 graduated engineers and runs about 5 engineering master theses and PhDs per year.

Moreover, CIRA is currently participating in SESAR 2020 Wave 1 as ENAV LTP by supporting ENAV work in Wave1 projects PJ02, PJ10 and PJ22.

CIRA will support the Real-Time man in the loop simulations foreseen in the PJ.13-W2-117 solution, through its RPAS real-time HW and pilot in the loop simulation facility.

The CIRA RPAS RT simulator is already operative and has been successfully used in several previous research projects, including the SESAR RAID project (<http://raid-sjuproject.eu/> 2015-2016), aimed to validate procedures for Airborne Assisted Separation between RPAS and Manned Aircraft in cruise condition.

Obviously, besides the execution of the RT simulations as required by the PJ.13-W2-117 solution, the proposed CIRA contribution includes also the necessary customization of the existing RPAS simulation facility, aimed to fulfill operational and integration specific requirements of the PJ.13 W2-117 solution.

Deep Blue

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

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

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

- Evaluation and validation of air traffic and aviation concepts and systems;

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

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

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

In continuity with Wave 1 work in the frame of PJ.10-05, Deep Blue will complement ENAV developments and validation activities with focus on ATM performance assessment (SEC, SAF, HP and CBA). The performance assessment will be performed according to the SESAR guidelines and will be further supported by tailored methodologies and dedicated instruments to allow an integrated view of the concepts under investigations.

Deep Blue, as ENAV LTP, will support the validation of the integration of the RPAS into the current ATM environment. Particularly, aspects related to procedural means to safely integrate RPAS into ATM, human performance – especially in contingency situations – and training needs are expected to be investigated by applying dedicated methodologies and expertise.

IDS AIRNAV SRL

IDS AIRNAV SRL (IDS AIRNAV) is the company of the ENAV Group that serves the world of Air Traffic Management (ATM) and airports with Commercial Off-The-Shelf (COTS) solutions and software products aimed at supporting the transition from Aeronautical Information Services (AIS) to Aeronautical Information Management (AIM) in full compliancy with the ICAO and EUROCONTROL mandates for Aeronautical Data Quality (ADQ).

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

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

IDS AIRNAV, an high tech integrated solutions services company, is now recognised as a leading solution provider to Air Navigation Service Providers, Airports Authorities, aviation

agencies, Government and private entities that manage Air Traffic in both the civil and military markets.

In line with the Wave 1 work in the frame of PJ.10-05, IDS AIRNAV will continue supporting ENAV with its technical expertise and RPAS infrastructures to demonstrate how to integrate RPAS into non-segregated airspace in a multi-aircraft and manned flight environment.

IDS AIRNAV can contribute to RPAS solution in terms of:

- Operational concept definition;
- Analysis and development of methods/models for trajectory description;
- Operational validation of minimum performance requirements for RPAS IFR/VFR flights and separation criteria;
- Sensitivity of RPAS to severe conditions (e.g. weather) and assessment of contingency situations (e.g. data-link loss);
- RPAS Systems Engineering (Air and Ground Segment) and performances definition;
- Provision of RPAS Operational staff (remote pilots).

Moreover, IDS AIRNAV can contribute to ATC/RPAS simulation campaigns in terms of:

- Definition and design of the validation scenario (including traffic data and models);
- Validation of the model through comparison with real data;
- Simulation activities;
- Post processing and result data analysis/evaluation.

Finally, IDS AIRNAV can contribute to IFR procedures design and development in terms of:

- specific trajectories characterization, not defined in the existing B/MT format;
- flight preparation, requiring information management for flight planning, compatible with the ATM Network.

Techno Sky

Techno Sky S.r.l. (Techno Sky) is an ENAV Group Company having the responsibility for the management and maintenance of systems and equipment used for Air Navigation Services in Italy as well as for the support to the ATM operational innovation and for all the relevant ENAV Group R&D activities.

As ENAV's mission critical systems integrator, Techno Sky controls the full value chain, i.e. Research and Development, System Engineering, Design, ATM Software Development, Weather System Development,

Verification, Validation, Installation, Integration, Training, Logistics and Maintenance.

In 2017 Techno Sky extended its background of knowledge and expertise on R&D following the transfer of competences and experts coming from SICTA, the former ATM R&D branch of ENAV Group.

The acquisition of ATM R&D experts is showing the Techno Sky constant commitment and focus on technological innovation, as a key factor for its continuous improvement and increased competitiveness on the market.

In addition, by investing in the study and implementation of new and more effective products and applications, Techno Sky acts significantly within the value chain of the ENAV Group and contributes to the efficiency, regularity and safety of Air Traffic Management operations. Special care is devoted to the study of innovative systems to be used in the Company's core business. These studies and surveys are intended to improve innovative operational services supported by several simulators, platforms, tools and advanced methodologies.

Techno Sky, working in close cooperation with ENAV, has also gained an outstanding expertise in the development of innovative Air Traffic Management operations, in the

development and validation of new concepts and procedures for the continuous improvement of performances, in assisting the supply industry to design and engineer new systems to safely support the Air Traffic Controllers in their highly demanding tasks.

Techno Sky, as ENAV Linked Third Party, is involved in ENAV ATM strategic planning, technical co-operation and service provision programs with international organizations (e.g. SESAR Joint Undertaking, SESAR Deployment Manager, EUROCONTROL, European Commission, etc.) and foreign countries, aiming at contributing to the advancement of ATM technology and processes and at improving all the linked services.

Techno Sky participation is quite significant from an ENAV perspective considering it brings an important piece of transversal technical, operational and management expertise.

Moreover, Techno Sky is currently extensively contributing to SESAR 2020 Wave 1 Programme as ENAV LTP by complementing ENAV activities and expertise in 14 Wave 1 projects including Industrial Research, Transversal activities and Very Large Demonstrations.

Based on the considerations and skills depicted above, ENAV and Techno Sky, as part of the ENAV Group, can be considered as a single entity.

Techno Sky contribution to this project is intended to be provided in all activities where ENAV has expressed interest, with special emphasis on the operational validation of the concepts developed within the project solutions.

In detail, Techno Sky will complement the ENAV work in in PJ13 solution 117 by providing:

- support to the WP03 management activities;
- transversal contribution to the tasks for the concept, procedures and requirements definition; for structuring and organising ENAV validation activities; for executing and reporting related to ENAV validation as well as for the related analysis of the ATM performances.

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/A

Does the participant envisage that part of the work is performed by International Partners (Article 14a of the General Model Grant Agreement)?

N

N/A

4.2.11 Linked to EUROCONTROL – Company 11

Objective

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

EUROCONTROL will subcontract activities not within the core business of EUROCONTROL to fulfil their PJ13-W2 commitments. The following tasks are going to be subcontracted for a total of €1.310,000:

- Software development tasks for the necessary adaptations of EUROCONTROL modelling and validation platforms (ESCAPE real time simulator, CAFÉ and CAVEAT modelling platform as well as

<p>other fast time or modelling tools) that will support verification and validation (Task T02.2, T02.4; T02.30, T02.31, T02.12, T02.13, T02.14, T02.15, T02.17, T02.18, T02.19, T02.21, T02.22, T02.23, T03.02.4, T03.02.7).</p> <ul style="list-style-type: none"> • Specialised expertise support related to the validations: it includes for example expertise to prepare, run or report validations (Task T02.6, T02.61, T02.7, T03.02.3, T03.02.4, T03.02.18, T03.02.19, T03.02.23). • Operational expertise to support validation, workshops or concept definition such as pseudo-pilots, Air Traffic Controllers, Airspace Users (Task T02.6, T02.61, T02.7, T02.8, T02.10, T03.02.3, T03.02.4, T03.02.18, T03.02.19, T03.02.23). 	
<p>EUROCONTROL, as an international organisation, follows strict rules in terms of external assistance selection and procurement. These rules will be applied for the selection of the subcontracting parties in the framework of PJ13-W2.</p>	
Does the participant envisage that part of its work is performed by linked third parties	N
N/A	
Does the participant envisage the use of contributions in kind provided by third parties (Articles 11 and 12 of the General Model Grant Agreement)	N
N/A	
Does the participant envisage that part of the work is performed by International Partners (Article 14a of the General Model Grant Agreement)?	N
N/A	

4.2.12 Linked to FRQ (FSP) – Company 12

Objective	
Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	N
N/A	
Does the participant envisage that part of its work is performed by linked third parties	Y
<p>The affiliates / Linked 3rd parties to Frequentis AG, the Frequentis Romania S.R.L, Frequentis Czech Republic s.r.o. and Frequentis Comsoft GmbH are contributing to this action.</p> <p>The Frequentis Romania S.R.L. and Frequentis Czech Republic s.r.o. are integrated into the research and development process of Frequentis AG, hence its contribution is to be seen as a joint activity.</p> <p>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 projects in WP12 as well as in the AIM environment and will continue its contribution in the scope of related activities in SESAR 2020</p>	

<p>Frequentis Czech Republic s.r.o. is an affiliate of Frequentis AG and is specialised on software development, providing support for the mother company in the safety-critical domain of air traffic control. The company has contributed to SESAR projects in WP14 and will continue its contribution in according projects especially focussing on Aeronautical Information Management developments in SESAR 2020.</p> <p>Frequentis Comsoft GmbH is an affiliate of Frequentis AG, supporting its mother company in the safety-critical domains of air traffic control. The focus of Comsoft's contribution will be on the development and provision of certain modules required for the validation of integrated surface management.</p>	
Does the participant envisage the use of contributions in kind provided by third parties (Articles 11 and 12 of the General Model Grant Agreement)	N
N/A	
Does the participant envisage that part of the work is performed by International Partners (Article 14a of the General Model Grant Agreement)?	N
N/A	

4.2.13 Linked to HC (FSP) – Company 13

No third parties involved.

4.2.14 Linked to Honeywell – Company 14

Objective	
Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	N
Does the participant envisage that part of its work is performed by linked third parties	Y
<p>In project ERICA we will contribute via the Honeywell Aerospace SAS site located in Toulouse (France), together with its Linked Third Party Honeywell International, s.r.o., with sites in Prague and Brno (Czech Republic). These facilities are equipped with state of the art research and test laboratories enabling research, development, integration, verification and validation of various aircraft systems. Special subject matter expertise an specific experience with development of high-maturity level product and service prototypes will be provided by Honeywell International Inc. (USA). Honeywell possesses also its own fleet of test aircraft, which will support the project wherever needed, as they did ever since Honeywell became a Member of the SJU (SESAR Joint Undertaking) in 2007.</p>	
Does the participant envisage the use of contributions in kind provided by third parties (Articles 11 and 12 of the General Model Grant Agreement)	N

Honeywell does not envisage the use of such contributions at this point.	
Does the participant envisage that part of the work is performed by International Partners (Article 14a of the General Model Grant Agreement)?	N
Honeywell does not envisage the use of such contributions at this point.	

4.2.15 **Linked to INDRA – Company 15**

No third parties involved.

4.2.16 **Linked to SAAB– Company 16**

No third parties involved.

4.2.17 **Linked to NATS – Company 17**

No third parties involved.

4.2.18 **Linked to Thales AIR SYS – Company 18**

Objective	
Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	N
N/A	
Does the participant envisage that part of its work is performed by linked third parties	Y
<p><u>Third parties:</u></p> <p>THALES SIX GTS FRANCE SAS (THALES SIX) offers telecommunications equipment and information systems in France. It provides communications networks, satellite and mobile radio communication products, naval and infrastructure communication systems, airborne communication systems, navigation and identification systems for civil and military aircraft, command information systems, radio surveillance systems, and radio spectrum monitoring products.</p> <p>THALES ALENIA SPACE FRANCE (THALES AS) provides complete communications systems, space segment, satellites, Earth stations, payloads and major subsystems and equipment, on-board as well as on ground hardware and software. Thales Alenia Space has developed a wide heritage (at satellite, system and architecture levels), that can be used as a sound basis in the definition, development and operation of system component within aeronautical communications infrastructures (experts, industrial means, tools, test benches, demonstrators, algorithms...)</p> <p><u>Involvements:</u></p> <p>In PJ13, THALES SIX will bring particular expertise for the definition and evaluation of Detect And Avoid algorithm and provision of avionics supporting cooperative and non-cooperative sensors used for ACAS-X solution. THALES SIX has developed the first</p>	

European ACAS-X prototype ready for flight test.	
In PJ13, THALES AS will bring particular expertise for the evaluation of the interactions between RPS and RPA by providing simulation software for the C2 (Command and Control) Link via satellite to support both real time and fast time simulations. THALES AS has been leading the EUROCAE standardization activities on C2 Link systems and supports the French DGAC in the elaboration of Annex 10 Vol. VI on C2 Link Systems.	
Does the participant envisage the use of contributions in kind provided by third parties (Articles 11 and 12 of the General Model Grant Agreement)	N
N/A	
Does the participant envisage that part of the work is performed by International Partners (Article 14a of the General Model Grant Agreement)?	N
N/A	

4.2.19 Linked to Thales AVS – Company 19

Objective	
Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	Y
<p>In order to complement Thales AVS avionics expertise, Thales AVS will subcontract activities on specific RPAS skills for a total of €40.000 to fulfil PJ13 WP 3.01 (Solution 115 - IFR RPAS Accommodation in Airspace Class A to C) commitments. The subcontracted activities encompass:</p> <ul style="list-style-type: none"> - Contribution to the concept, system architecture and interfaces of the RPAS with ATC for communications and surrounding air-traffic (T03.01.1) - Contribute to validation scenarios preparation, methodology, typical RPAS flight paths, with key aspects from RPAS manufacturer perspective to measure/validate (T03.01.3). - Support for validation preparation and integration of all technological components (communications, air-traffic, Thales FMS in existing RPS on-ground) for the RPAS simulation (T03.01.4). - Support for final testing of the RPAS simulation with ATC (T03.01.4). - Support for validation with RPAS telepilots and collection of validation feedback during validation exercise (T03.01.6). 	
Does the participant envisage that part of its work is performed by linked third parties	Y
<p>1) THALES SIX GTS FRANCE SAS (THALES SIX) offers telecommunications equipment and information systems in France. It provides communications networks, satellite and mobile radio communication products, naval and infrastructure communication systems, airborne communication systems, navigation and identification systems for civil and military aircrafts, command information systems, radio surveillance systems, and radio spectrum monitoring products.</p>	

<u>Involvements:</u>	
Within PJ13, THALES SIX will contribute by bringing its expertise and knowledge, to support the definition of Detect & Avoid with regard to cooperative and non-cooperative sensors and also to provide some support for its standardization in the frame of SC147/WG75 and SC228.	
Does the participant envisage the use of contributions in kind provided by third parties (Articles 11 and 12 of the General Model Grant Agreement)	N
N/A	
Does the participant envisage that part of the work is performed by International Partners (Article 14a of the General Model Grant Agreement)?	N
N/A	

4.2.20 **Linked to DFS – Company 20**

No third parties involved.

4.2.21 **Linked to DLR – Company 21**

No third parties involved.

4.2.22 **Linked to ANS CR (B4) – Company 22**

No third parties involved.

4.2.23 **Linked to LPS SR (B4) – Company 23**

No third parties involved.

4.2.24 **Linked to ACG/COOPANS – Company 24**

No third parties involved.

4.2.25 **Linked to CCL/COOPANS – Company 25**

No third parties involved.

4.2.26 **Linked to IAA/COOPANS – Company 26**

No third parties involved.

4.2.27 Linked to Naviair/COOPANS – Company 27

No third parties involved.

4.2.28 Linked to ATOS (FSP) – Company 28

No third parties involved.

4.2.29 Linked to AIRTEL– Company 29

No third parties involved.

4.2.30 Linked to SINTEF– Company 30

No third parties involved.

5 Ethics and Security

5.1 Ethics

All participants of the ERICA 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 WP04 will ensure compliance with ethics. This means that WP04 will verify that all documents from the ERICA project are following European ethical rules and the ethical rules of the concerned country.

During project Kick-off Meeting, WP04 will conduct an information session in order to draw attention to, and inform partners of all relevant ethical issues.

In the following sub-section further explanation is given for the self-assessment presented in the Proposal Submission Forms “Ethics issue table”. This is to provide an overview about the potential ethical issues and handling relating to research activities in the ERICA project.

5.1.1 Humans

In the project experimental studies will be conducted to gain knowledge about human-machine interaction. For these experimental studies healthy adults (no vulnerable adults), like Pilots or Air Traffic Controllers, will be recruited on a voluntary basis. Participants of these studies will be clearly informed of the research goals, the methodology of data protection and possible adverse events in a presentation of the research project and in interviews at the beginning of the study. According to the declaration of Helsinki, subjects are free to leave any test at any time without giving any reason and without raising any disadvantages – the project thereby complies with standard protocols surrounding a participant having the right to withdraw from the study. This will be ensured by a written agreement between the experimenter and the test subject (see questionnaire below).

Moreover, in the context of the Ethics deliverables, the beneficiaries of the project will submit:

- the procedure and the criteria that will be used to identify and recruit the research participants;
- The informed consent procedures that will be implemented for the participation of humans;
- Templates of the informed consent/assent forms and information sheets.

Participant Agreement Form SESAR 2020 Validation/Demonstration activities

Full title of project/solution:

Full title of validation/demonstration activity and dates:

Name and contact details of project/solution leader:

**Please Initial
or
Tick Here**

I am aware of the main aspects of the Validation/Demonstration Plan for the above SESAR 2020 activity.	
I confirm that I have had the opportunity to ask questions.	
I understand that my participation is voluntary.	
I understand that my answers to any questionnaire related to human factors aspects (evaluation of workload, situational awareness, human machine interface usability...) will remain anonymous.	
Should I not wish to answer any particular question(s), I am free to decline.	
I give permission for members of the research team to have access to my anonymised responses. I understand that my name will not be linked with the research materials, and I will not be identified or identifiable in the outputs that result from the research without my agreement.	
I agree to take part in the above validation/demonstration activity.	

Name of Participant Date Signature

Name of Project/Solution Leader Date Signature

This form should be signed and dated by all parties after the participant receives a copy of the participant information sheet and any other written information provided to the participants. A copy of the signed and dated participant agreement form should be kept with the project's main documents which must be kept in a secure location.

Section: Humans		YES	NO	Information to be provided	Documents to be provided
Does your research involve human participants?		X		Confirmation about obtained Informed consent of the participants.	
If YES:	Are they volunteers for social or human sciences research?		X	Participants are not volunteers from the public but Projects/Members' employees.	
	Are they persons unable to give informed consent (including children/minors)?		X		
	Are they vulnerable individuals or groups?		X		
	Are they children/minors?		X		
	Are they patients?		X		
	Are they healthy volunteers for medical studies		X	Note: The project will use healthy volunteers, but in the project no medical studies are foreseen.	
Does your research also involve physical interventions on the study participants?			X		

5.1.2 Protection of Personal Data

In advance and during the study personal data will be acquired. This data will be protected regarding article 8 – protection of personal data – of the European Charter of Fundamental Rights and the Treaty on the Functioning of the European Union. Furthermore, a strategy and methodology based on the Data Protection Directive will be developed and implemented to ensure the integrity and security of data during the project.

During the recruitment of subjects for the study, some necessary personal information relevant to the study (e.g. experience of work, age, gender) will be stored electronically in computers on a hard drive. This data will not be stored in a cloud solution or portable hard drives or USB sticks. This data will be password protected and only accessible to authorised researchers.

During the study performance only necessary data will be acquired and stored electronically. This data will be password protected and only accessible to authorised researchers. All data will be stored in a strict anonymous way. Subjects are allocated a unique subject number instead of their first- or surname. The subject number will be assigned randomly at the beginning of the study. This procedure ensures that it will not be possible to somehow associate the data to individual persons.

Thus, the data will not be used to judge or assess the professional capabilities of the recruited subjects. The data is purely a means to investigate general cognitive processes.

Section: Protection of Personal Data		YES	NO	Information to be provided	Documents to be provided
Does your research involve personal data collection and/or processing?		X			Free and fully Informed consent sheets (see section 2) of the persons concerned (data subjects) will be obtained
If YES:	Does it involve the collection or processing of sensitive personal data (e.g. health, sexual lifestyle, ethnicity, political opinion, religious or philosophical conviction)?		X		
	Does it involve processing of genetic information?		X		
	Does it involve tracking or observation of participants (e.g. surveillance or localization data, and WAN data such as IP address, cookies, etc.)?		X		
Does your research involve further processing of previously collected personal data (secondary use) (including use of pre-existing data sets or sources, merging existing data sets, sharing data with non-EU member states)?			X		

Moreover, in the context of the Ethics deliverables, the beneficiaries of the project will:

- confirm compliance with GDPR and with respective national legal framework;
- confirm that it has appointed a Data Protection Officer (DPO) and the contact details of the DPO will be made available;
- explain how all of the data they intend to process is relevant and limited to the purposes of the research project;
- provide a description of the technical and organisational measures that will be implemented to safeguard the rights and freedoms of the data subjects/research participants.

5.1.3 Misuse

The ERICA project is part of the SESAR 2020 Programme and as such will be supervised by the SESAR Joint Undertaking and its members of the Administration Board. Several independent advisors are included in that body: e.g. Staff Representative, Airspace User, Military, and Scientific Community Representative. The SJU has or will expand on the development of a strategy on how to

deal with possible risks regarding misuse and possible consequences during the project execution inside of SESAR 2020.

In the case that ethical issues arise unexpectedly during the project, the project coordinator will contact the Commission immediately and provide detailed information on the issue and how the project team intend to handle it.

5.1.4 Other Ethics Issues

At this stage of the project proposal there are no other ethics issues that should be taken into consideration. In the case that other ethical issues arise unexpectedly during the project, the project coordinator will contact the Commission immediately and provide detailed information on the issue and how the project team intend to handle it.

5.1.5 Remarks on the “Exclusive Use on Civil Applications”

In the present document, several time it was suggested that the ambition of the project is to enable and coordinate the ATM integration and the safe use of civil and military RPAS into the European airspace A-C. This was done in answer to a specific request of the call itself, please refer to [2] in the description of solution PJ.13-W2-111 where the text states: “Both civilian and military airspace users should be considered by this solution. For the military airspace users, the research project must coordinate with EDA” and to the description of solution PJ.13-W2-115: “The research shall consider a limited set of military or civilian RPAS platforms and missions/flights, so as to be representative of the initial demand that can be anticipated in the 2021-2025 timeframe”.

This having said, the beneficiaries here declare that they will scrupulously adhere to what is present in the technical specifications of the project, with the aim of considering both the needs of civil and military users, whereas any development of military applications is excluded.

5.2 Security

Section: Security	YES	NO	Information to be provided	Documents to be provided
Are activities planned or results expected raising security issues?		X		
Are ‘EU-classified information’ as background or results foreseen?		X		

6 References

- [1] SJU, "Single Programming Document 2019-2021", December 12th, 2018.
- [2] SJU, "H2020-SESAR-2019-1 IR VLD Wave 2 Call Technical Specifications Ed.01.00.17", December 2018.
- [3] EC, "Roadmap for the integration of civil Remotely-Piloted Aircraft Systems into the European Aviation System", June 2013.
- [4] “European Roadmap for the safe integration of drones into all classes of airspace”, 2016.

- [5] EUROCONTROL, "E-OCVM Version 3.0 (European Operational Concept Validation Methodology)", 2010.
- [6] SJU, "European ATM Master Plan Level 3", 2017.
- [7] "European Drones Outlook Study - Unlocking the value for Europe", November 2016.
- [8] ICAO, "The Aviation System Block Upgrade", 2016.
- [9] ICAO, "ICAO Doc 10019: Manual on Remotely Piloted Aircraft Systems (RPAS)", 2015.
- [10] ICAO, "The Aviation Systems Block Upgrades", July 2016.
- [11] S. PJ19.02, "SESAR 2020 Concept Of Operations", 2017.

ESTIMATED BUDGET FOR THE ACTION

	Estimated eligible ¹ costs (per budget category)										JU contribution			Additional information		
	A. Direct personnel costs				B. Direct costs of subcontracting	[C. Direct costs of fin. support]	D. Other direct costs		E. Indirect costs ²	Total costs	Reimbursement rate %	Maximum JU contribution ³	Maximum grant amount ⁴	Information for indirect costs	Information for auditors	Other information:
	A.1 Employees (or equivalent)		A.4 SME owners without salary				D.1 Travel	D.5 Costs of internally invoiced goods and services						Estimated costs of in-kind contributions not used on premises	Declaration of costs under Point D.4	Estimated costs of beneficiaries/ linked third parties not receiving JU funding/ international partners
	A.2 Natural persons under direct contract		A.5 Beneficiaries that are natural persons without salary				D.2 Equipment									
A.3 Seconded persons				D.3 Other goods and services												
	[A.6 Personnel for providing access to research infrastructure]						[D.4 Costs of large research infrastructure]									
Form of costs ⁶	Actual	Unit ⁷	Unit ⁸		Actual	Actual	Actual	Unit ⁹	Flat-rate ¹⁰							
									25%							
	a	Total b	No hours	Total c	d	[e]	f	Total g	h = 0,25 x (a +b+c+f+g +[i1] ¹³ + [i2] ¹³ -n)	j = a+b+c+d +[e]/+f+g+h +[i1]/+[i2]	k	l	m	n	Yes/No	
1. LEONARDO	2 506 518.33	0.00	0.00	0.00	0.00	0.00	423 637.00	0.00	732 538.83	3 662 694.16	70.00	2 563 885.91	1 654 514.63	0.00	No	n/a
- TPZ	82 158.67	0.00	0.00	0.00	0.00	0.00	8 000.00	0.00	22 539.67	112 698.34	70.00	78 888.84	50 908.17	0.00	No	n/a
Total beneficiary	2 588 677.00	0.00			0.00	0.00	431 637.00	0.00	755 078.50	3 775 392.50		2 642 774.75	1 705 422.80	n/a	n/a	0.00
2. AIRBUS SAS	0.00	63 000.00	0.00	0.00	0.00	0.00	4 000.00	0.00	16 750.00	83 750.00	70.00	58 625.00	37 831.61	0.00	No	n/a
- AI OP SAS	0.00	161 000.00	0.00	0.00	0.00	0.00	9 000.00	0.00	42 500.00	212 500.00	70.00	148 750.00	95 990.64	0.00	No	n/a
- AI D&S GMBH	0.00	339 000.00	0.00	0.00	0.00	0.00	21 000.00	0.00	90 000.00	450 000.00	70.00	315 000.00	203 274.30	0.00	No	n/a
Total beneficiary	0.00	563 000.00			0.00	0.00	34 000.00	0.00	149 250.00	746 250.00		522 375.00	337 096.55	n/a	n/a	0.00
3. NLR	62 571.43	0.00	0.00	0.00	0.00	0.00	6 000.00	0.00	17 142.86	85 714.29	70.00	60 000.00	38 718.91	0.00	No	n/a
4. ON (B4)	139 150.00	0.00	0.00	0.00	0.00	0.00	20 850.00	0.00	40 000.00	200 000.00	70.00	140 000.00	90 344.13	0.00	No	n/a
5. PANSAS (B4)	117 367.09	0.00	0.00	0.00	0.00	0.00	16 118.00	0.00	33 371.27	166 856.36	70.00	116 799.45	75 372.46	0.00	No	n/a
- PSNC	126 270.90	0.00	0.00	0.00	0.00	0.00	18 000.00	0.00	36 067.73	180 338.63	70.00	126 237.04	81 462.68	0.00	No	n/a
Total beneficiary	243 637.99	0.00			0.00	0.00	34 118.00	0.00	69 439.00	347 194.99		243 036.49	156 835.14	n/a	n/a	0.00
6. LFV/COOPANS	150 400.00	0.00	0.00	0.00	0.00	0.00	24 766.86	0.00	43 791.71	218 958.57	70.00	153 271.00	98 908.11	0.00	No	n/a
7. DAV	255 000.00	0.00	0.00	0.00	0.00	0.00	7 800.00	0.00	65 700.00	328 500.00	70.00	229 950.00	148 390.24	0.00	No	n/a
8. DSNAS	527 866.67	0.00	0.00	0.00	332 500.00	0.00	0.00	0.00	131 966.67	992 333.34	70.00	694 633.34	448 257.47	0.00	No	n/a
- ENAC	165 000.00	0.00	0.00	0.00	0.00	0.00	15 000.00	0.00	45 000.00	225 000.00	70.00	157 500.00	101 637.16	0.00	No	n/a
- SAFRAN	462 933.33	0.00	0.00	0.00	0.00	0.00	41 200.00	0.00	126 033.33	630 166.66	70.00	441 116.66	284 659.30	0.00	No	n/a
Total beneficiary	1 155 800.00	0.00			332 500.00	0.00	56 200.00	0.00	303 000.00	1 847 500.00		1 293 250.00	834 553.93	n/a	n/a	0.00
9. ENAIRE	94 968.00	0.00	0.00	0.00	0.00	0.00	5 000.00	0.00	24 992.00	124 960.00	70.00	87 472.00	56 447.01	0.00	No	n/a
- CRIDA	137 480.00	0.00	0.00	0.00	0.00	0.00	11 000.00	0.00	37 120.00	185 600.00	70.00	129 920.00	83 839.35	0.00	No	n/a
- INECO	68 400.00	0.00	0.00	0.00	0.00	0.00	2 552.00	0.00	17 738.00	88 690.00	70.00	62 083.00	40 063.11	0.00	No	n/a
- ISDEFE	131 200.00	0.00	0.00	0.00	0.00	0.00	8 000.00	0.00	34 800.00	174 000.00	70.00	121 800.00	78 599.40	0.00	No	n/a
Total beneficiary	432 048.00	0.00			0.00	0.00	26 552.00	0.00	114 650.00	573 250.00		401 275.00	258 948.87	n/a	n/a	0.00
10. ENAV	135 502.00	0.00	0.00	0.00	0.00	0.00	15 056.00	0.00	37 639.50	188 197.50	70.00	131 738.25	85 012.70	0.00	No	n/a
- TECHNO SKY	115 200.00	0.00	0.00	0.00	0.00	0.00	12 800.00	0.00	32 000.00	160 000.00	70.00	112 000.00	72 275.31	0.00	No	n/a
- IDS AIRNAV	57 600.00	0.00	0.00	0.00	0.00	0.00	6 400.00	0.00	16 000.00	80 000.00	70.00	56 000.00	36 137.65	0.00	No	n/a
- CIRA	138 100.00	0.00	0.00	0.00	0.00	0.00	10 700.00	0.00	37 200.00	186 000.00	70.00	130 200.00	84 020.04	0.00	No	n/a
- DEEP BLUE	28 800.00	0.00	0.00	0.00	0.00	0.00	3 200.00	0.00	8 000.00	40 000.00	70.00	28 000.00	18 068.83	0.00	No	n/a
Total beneficiary	475 202.00	0.00	0.00	0.00	0.00	0.00	48 156.00	0.00	130 839.50	654 197.50		457 938.25	295 514.53	n/a	n/a	0.00
11. EUROCONTROL ¹⁴	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	9 732 733.75
12. FRQ (FSP)	146 673.70	0.00	0.00	0.00	0.00	0.00	60 000.00	0.00	51 668.43	258 342.13	70.00	180 839.49	116 698.48	0.00	No	n/a
- FRQ RO	15 897.98	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3 974.50	19 872.48	70.00	13 910.74	8 976.81	0.00	No	n/a

ESTIMATED BUDGET FOR THE ACTION

	Estimated eligible ¹ costs (per budget category)										JU contribution			Additional information		
	A. Direct personnel costs				B. Direct costs of subcontracting	[C. Direct costs of fin. support]	D. Other direct costs		E. Indirect costs ²	Total costs	Reimbursement rate %	Maximum JU contribution ³	Maximum grant amount ⁴	Information for indirect costs	Information for auditors	Other information:
	A.1 Employees (or equivalent)		A.4 SME owners without salary				D.1 Travel	D.5 Costs of internally invoiced goods and services						Estimated costs of in-kind contributions not used on premises	Declaration of costs under Point D.4	Estimated costs of beneficiaries/ linked third parties not receiving JU funding/ international partners
Form of costs ⁶	Actual	Unit ⁷	Unit ⁸		Actual	Actual	Actual	Unit ⁹	Flat-rate ¹⁰							
	a	Total b	No hours	Total c	d	[e]	f	Total g	h = 0,25 x (a +b+c+f+g +[i1] ¹³ + [i2] ¹³ -n)	j = a+b+c+d +[e]+f+g+h +[i1]+[i2]	k	l	m	n	Yes/No	
- FRQ CZ	259 667.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	64 916.85	324 584.23	70.00	227 208.96	146 621.40	0.00	No	n/a
- FCO	45 193.93	0.00	0.00	0.00	0.00	0.00	2 500.00	0.00	11 923.48	59 617.41	70.00	41 732.19	26 930.42	0.00	No	n/a
Total beneficiary	467 432.99	0.00			0.00	0.00	62 500.00	0.00	132 483.26	662 416.25		463 691.38	299 227.11	n/a	n/a	0.00
13. HC (FSP)	95 697.00	0.00	0.00	0.00	0.00	0.00	23 400.00	0.00	29 774.25	148 871.25	70.00	104 209.88	67 248.22	0.00	No	n/a
14. Honeywell SAS	0.00	70 832.53	0.00	0.00	0.00	0.00	0.00	0.00	17 708.13	88 540.66	70.00	61 978.46	39 995.64	0.00	No	n/a
- HIsro	0.00	628 299.91	0.00	0.00	0.00	0.00	42 031.23	0.00	167 582.79	837 913.93	70.00	586 539.75	378 503.03	0.00	No	n/a
- HInc	0.00	228 914.33	0.00	0.00	0.00	0.00	0.00	0.00	57 228.58	286 142.91	70.00	200 300.04	129 256.69	0.00	No	n/a
Total beneficiary	0.00	928 046.77	0.00	0.00	0.00	0.00	42 031.23	0.00	242 519.50	1 212 597.50		848 818.25	547 755.36	n/a	n/a	0.00
15. INDRA	752 356.00	0.00	0.00	0.00	0.00	0.00	39 598.00	0.00	197 988.50	989 942.50	70.00	692 959.75	447 177.48	0.00	No	n/a
16. SAAB	1 267 150.00	0.00	0.00	0.00	0.00	0.00	389 364.29	0.00	414 128.57	2 070 642.86	70.00	1 449 450.00	935 352.16	0.00	No	n/a
17. NATS	133 427.00	0.00	0.00	0.00	0.00	0.00	38 573.00	0.00	43 000.00	215 000.00	70.00	150 500.00	97 119.94	0.00	No	n/a
18. THALES AIR SYS	11 416.95	0.00	0.00	0.00	0.00	0.00	1 000.00	0.00	3 104.24	15 521.19	70.00	10 864.83	7 011.24	0.00	No	n/a
- THALES SIX	1 498 114.00	0.00	0.00	0.00	0.00	0.00	167 500.00	0.00	416 403.50	2 082 017.50	70.00	1 457 412.25	940 490.32	0.00	No	n/a
- TAS-FRANCE	167 511.05	0.00	0.00	0.00	0.00	0.00	19 000.00	0.00	46 627.76	233 138.81	70.00	163 197.17	105 313.62	0.00	No	n/a
Total beneficiary	1 677 042.00	0.00			0.00	0.00	187 500.00	0.00	466 135.50	2 330 677.50		1 631 474.25	1 052 815.18	n/a	n/a	0.00
19. THALES AVS	1 406 660.00	0.00	0.00	0.00	40 000.00	0.00	37 785.00	0.00	361 111.25	1 845 556.25	70.00	1 291 889.38	833 675.89	0.00	No	n/a
- THALES SIX	400 440.00	0.00	0.00	0.00	0.00	0.00	26 500.00	0.00	106 735.00	533 675.00	70.00	373 572.50	241 072.02	0.00	No	n/a
Total beneficiary	1 807 100.00	0.00			40 000.00	0.00	64 285.00	0.00	467 846.25	2 379 231.25		1 665 461.88	1 074 747.91	n/a	n/a	0.00
20. DFS ¹⁴	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	40 700.00
21. DLR ¹⁴	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.00
22. ANS CR (B4) ¹⁴	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.00
23. LPS SR (B4) ¹⁴	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.00
24. ACG/ COOPANS ¹⁴	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.00
25. CCL/ COOPANS ¹⁴	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.00
26. IAA/ COOPANS ¹⁴	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.00
27. Naviair/ COOPANS ¹⁴	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.00
28. ATOS (FSP) ¹⁴	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.00
29. AIRTEL ¹⁴	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.00
30. SINTEF ¹⁴	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.00
Total consortium	11 702 691.41	1 491 046.77		0.00	372 500.00	0.00	1 537 331.38	0.00	3 682 767.40	18 786 336.96		13 150 435.88	8 486 176.57			9 773 433.75

ESTIMATED BUDGET FOR THE ACTION

¹ See Article 6 for the eligibility conditions.

² Indirect costs already covered by an operating grant (received under any EU or Euratom funding programme; see Article 6.5.(b)) are ineligible under the GA. Therefore, a beneficiary/linked third party that receives an operating grant during the action's duration cannot declare indirect costs for the year(s)/reporting period(s) covered by the operating grant, unless it can demonstrate that the operating grant does not cover any costs of the action (see Article 6.2.E).

³ This is the theoretical amount of JU contribution that the system calculates automatically (by multiplying all the budgeted costs by the reimbursement rate). This theoretical amount is capped by the 'maximum grant amount' (that the JU decided to grant for the action) (see Article 5.1).

⁴ The 'maximum grant amount' is the maximum grant amount decided by the JU. 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 the beneficiary's usual accounting practice.

⁸ See Annex 2a 'Additional information on the estimated budget' for the details (costs per hour (hourly rate)).

⁹ Unit and costs per unit : calculated according to the beneficiary's usual accounting practices.

¹⁰ 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).

¹¹ See Annex 2a 'Additional information on the estimated budget' for the details (units, costs per unit).

¹² See Annex 2a 'Additional information on the estimated budget' for the details (units, costs per unit, estimated number of units, etc).

¹³ Only specific unit costs that do not include indirect costs.

¹⁴ See Article 9 for beneficiaries not receiving JU funding.

¹⁵ Only for linked third parties that receive JU funding.

ANNEX 2a

ADDITIONAL INFORMATION ON THE ESTIMATED BUDGET

- Instructions and footnotes in blue will not appear in the text generated by the IT system (since they are internal instructions only).
- For options [in square brackets]: the applicable option will be chosen by the IT system. Options not chosen will automatically not appear.
- For fields in [grey in square brackets] (even if they are part of an option as specified in the previous item): IT system will enter the appropriate data.

⚠ Transitory period: Until SyGMA fully supports Annex 2a, you must prepare it manually (using this template by choosing and deleting the options/entering the appropriate data).
For the 'unit cost tables': either fill them out manually or use currently existing tables from Annex 1 or the proposal.
The document can then be uploaded in SyGMA and attached to the grant agreement.

Unit cost for SME owners/natural beneficiaries without salary

1. Costs for a [SME owner]/[beneficiary that is a natural person] not receiving a salary

Units: hours worked on the action

Amount per unit ('hourly rate'): calculated according to the following formula:

{the monthly living allowance for researchers in MSCA-IF actions / 143 hours}
multiplied by
{country-specific correction coefficient of the country where the beneficiary is established}

The monthly living allowance and the country-specific correction coefficients are set out in the Work Programme (section 3 MSCA) in force at the time of the call:

- for calls *before* Work Programme 2018-2020:
 - for the monthly living allowance: **EUR 4 650**
 - for the country-specific correction coefficients: see Work Programme 2014-2015 and Work Programme 2016-2017 (available on the [Participant Portal Reference Documents](#) page)
- for calls *under* Work Programme 2018-2020:
 - for the monthly living allowance: **EUR 4 880**
 - for the country-specific correction coefficients: see Work Programme 2018-2020 (available on the [Participant Portal Reference Documents](#) page)

[additional OPTION for beneficiaries/linked third parties that have opted to use the unit cost (in the proposal/with an amendment): For the following beneficiaries/linked third parties, the amounts per unit (hourly rate) are fixed as follows:

- beneficiary/linked third party [short name]: EUR [insert amount]
 - beneficiary/linked third party [short name]: EUR [insert amount]
- [same for other beneficiaries/linked third parties, if necessary]]

Estimated number of units: see Annex 2

Energy efficiency measures unit cost

2. Costs for energy efficiency measures in buildings

Unit: m² of eligible ‘conditioned’ (i.e. built or refurbished) floor area

Amount per unit*: see (for each beneficiary/linked third party and BEST table) the ‘unit cost table’ attached

* Amount calculated as follows:
{EUR 0.1 x estimated total kWh saved per m² per year x 10}

Estimated number of units: see (for each beneficiary/linked third party and BEST table) the ‘unit cost table’ attached

Unit cost table (energy efficiency measures unit cost)¹

Short name beneficiary/linked third party	BEST No	Amount per unit	Estimated No of units	Total unit cost (cost per unit x estimated no of units)

¹ Data from the ‘building energy specification table (BEST)’ that is part of the proposal and Annex 1.

Research infrastructure unit cost

3. Access costs for providing trans-national access to research infrastructure

Units²: see (for each access provider and installation) the ‘unit cost table’ attached

Amount per unit^{*}: see (for each access provider and installation) the ‘unit cost table’ attached

* Amount calculated as follows:

$$\frac{\text{average annual total access cost to the installation (over past two years}^3\text{)}}{\text{average annual total quantity of access to the installation (over past two years}^4\text{)}}$$

Estimated number of units: see (for each access provider and installation) the ‘unit cost table’ attached

Unit cost table (access to research infrastructure unit cost)⁵

Short name access provider	Short name infrastru cture	Installation		Unit of access	Amount per unit	Estimated No of units	Total unit cost (cost per unit x estimated no of units)
		No	Short name				

Clinical studies unit cost

4. Costs for clinical studies

Units: patients/subjects that participate in the clinical study

Amount per unit^{*}: see (for each sequence (if any), clinical study and beneficiary/linked third party) the ‘unit cost table’ attached

* Amount calculated, for the cost components of each task, as follows:

For **personnel costs**:

For personnel costs of doctors: ‘average hourly cost for doctors’, i.e.:

{certified or auditable total personnel costs for doctors for year N-1

{ 1720 * number of full-time-equivalent for doctors for year N-1 }

multiplied by

estimated number of hours to be worked by doctors for the task (per participant)}

For personnel costs of other medical personnel: ‘average hourly cost for other medical personnel’, i.e.:

{certified or auditable total personnel costs for other medical personnel for year N-1

{ 1720 * number of full-time-equivalent for other medical personnel for year N-1 }

² Unit of access (e.g. beam hours, weeks of access, sample analysis) fixed by the access provider in proposal.

³ In exceptional and duly justified cases, the Commission/Agency may agree to a different reference period.

⁴ In exceptional and duly justified cases, the Commission/Agency may agree to a different reference period.

⁵ Data from the ‘table on estimated costs/quantity of access to be provided’ that is part of the proposal and Annex 1.

H2020 Templates: Annex 2a (Additional information on the estimated budget)

multiplied by
estimated number of hours to be worked by other medical personnel for the task (per participant)}

For personnel costs of technical personnel: 'average hourly cost for technical personnel', i.e.:

$$\frac{\{\text{certified or auditable total personnel costs for technical personnel for year N-1}\}}{\{1720 * \text{number of full-time-equivalent for technical personnel for year N-1}\}}$$

multiplied by
estimated number of hours to be worked by technical personnel for the task (per participant)}

'total personnel costs' means actual salaries + actual social security contributions + actual taxes and other costs included in the remuneration, provided they arise from national law or the employment contract/equivalent appointing act

For **consumables**:

For each cost item: 'average price of the consumable', i.e.:

$$\frac{\{\{\text{certified or auditable total costs of purchase of the consumable in year N-1}\}}{\text{total number of items purchased in year N-1}\}}$$

multiplied by
estimated number of items to be used for the task (per participant)}

'total costs of purchase of the consumable' means total value of the supply contracts (including related duties, taxes and charges such as non-deductible VAT) concluded by the beneficiary for the consumable delivered in year N-1, provided the contracts were awarded according to the principle of best value- for-money and without any conflict of interests

For **medical equipment**:

For each cost item: 'average cost of depreciation and directly related services per unit of use', i.e.:

$$\frac{\{\{\text{certified or auditable total depreciation costs in year N-1} + \text{certified or auditable total costs of purchase of services in year N-1 for the category of equipment concerned}\}}{\text{total capacity in year N-1}}$$

multiplied by
estimated number of units of use of the equipment for the task (per participant)}

'total depreciation costs' means total depreciation allowances as recorded in the beneficiary's accounts of year N-1 for the category of equipment concerned, provided the equipment was purchased according to the principle of best value for money and without any conflict of interests + total costs of renting or leasing contracts (including related duties, taxes and charges such as non-deductible VAT) in year N-1 for the category of equipment concerned, provided they do not exceed the depreciation costs of similar equipment and do not include finance fees

For **services**:

For each cost item: 'average cost of the service per study participant', i.e.:

$$\frac{\{\text{certified or auditable total costs of purchase of the service in year N-1}\}}{\text{total number of patients or subjects included in the clinical studies for which the service was delivered in year N-1}\}}$$

'total costs of purchase of the service' means total value of the contracts concluded by the beneficiary (including related duties, taxes and charges such as non-deductible VAT) for the specific service delivered in year N-1 for the conduct of clinical studies, provided the contracts were awarded according to the principle of best value for money and without any conflict of interests

For **indirect costs**:

$$\{\{\{\text{cost component 'personnel costs'} + \text{cost component 'consumables'} + \text{cost component 'medical equipment'}\}\}$$

minus

$$\{\text{costs of in-kind contributions provided by third parties which are not used on the beneficiary's premises} + \text{costs of providing financial support to third parties (if any)}\}$$

multiplied by

$$25\% \}$$

H2020 Templates: Annex 2a (Additional information on the estimated budget)

The estimation of the resources to be used must be done on the basis of the study protocol and must be the same for all beneficiaries/linked third parties/third parties involved.

The year N-1 to be used is the last closed financial year at the time of submission of the grant application.

Estimated number of units: see (for each clinical study and beneficiary/linked third party) the 'unit cost table' attached

Unit cost table: clinical studies unit cost⁶

Task, Direct cost categories	Resource per patient	Costs year N-1 Beneficiary 1 [short name]	Costs year N-1 Linked third party 1a [short name]	Costs year N-1 Beneficiary 2 [short name]	Costs year N-1 Linked third party 2a [short name]	Costs year N-1 Third party giving in-kind contributions 1 [short name]
Sequence No. 1						
Task No. 1 Blood sample						
(a) Personnel costs: - Doctors	n/a					
- Other Medical Personnel	Phlebotomy (nurse), 10 minutes	8,33 EUR	11,59 EUR	10,30 EUR	11,00 EUR	9,49 EUR
- Technical Personnel	Sample Processing (lab technician), 15 minutes	9,51 EUR	15,68 EUR	14,60 EUR	15,23 EUR	10,78 EUR
(b) Costs of consumables:	Syringe	XX EUR	XX EUR	XX EUR	XX EUR	XX EUR
	Cannula	XX EUR	XX EUR	XX EUR	XX EUR	XX EUR
	Blood container	XX EUR	XX EUR	XX EUR	XX EUR	XX EUR
(c) Costs of medical equipment:	Use of -80° deep freezer, 60 days	XX EUR	XX EUR	XX EUR	XX EUR	XX EUR
	Use of centrifuge, 15 minutes	XX EUR	XX EUR	XX EUR	XX EUR	XX EUR
(d) Costs of services	Cleaning of XXX	XX EUR	XX EUR	XX EUR	XX EUR	XX EUR
(e) Indirect costs (25% flat-rate)		XX EUR	XX EUR	XX EUR	XX EUR	XX EUR
Task No. 2						
...						
Amount per unit (unit cost sequence 1):		XX EUR	XX EUR	XX EUR	XX EUR	XX EUR
Sequence No. 2						
Task No. 1						

⁶ Same table as in proposal and Annex 1.

H2020 Templates: Annex 2a (Additional information on the estimated budget)

XXX						
(a) Personnel costs:						
- Doctors	XXX	XX EUR	XX EUR	XX EUR	XX EUR	XX EUR
- Other Medical Personnel	XXX	XX EUR	XX EUR	XX EUR	XX EUR	XX EUR
- Technical Personnel	XXX	XX EUR	XX EUR	XX EUR	XX EUR	XX EUR
(b) Costs of consumables:	XXX	XX EUR	XX EUR	XX EUR	XX EUR	XX EUR
	XXX	XX EUR	XX EUR	XX EUR	XX EUR	XX EUR
	XXX	XX EUR	XX EUR	XX EUR	XX EUR	XX EUR
(c) Costs of medical equipment:	XXX	XX EUR	XX EUR	XX EUR	XX EUR	XX EUR
	XXX	XX EUR	XX EUR	XX EUR	XX EUR	XX EUR
(d) Costs of services	XXX	XX EUR	XX EUR	XX EUR	XX EUR	XX EUR
(e) Indirect costs (25% flat-rate)		XX EUR	XX EUR	XX EUR	XX EUR	XX EUR
Task No. 2						
...						
Amount per unit (unit cost sequence 2):		XX EUR	XX EUR	XX EUR	XX EUR	XX EUR
...						
Amount per unit (unit cost entire study):		XX EUR	XX EUR	XX EUR	XX EUR	XX EUR

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

AIRBUS (AIRBUS SAS), established in 2 ROND POINT EMILE DEWOITINE, BLAGNAC 31700, France, VAT number: FR89383474814, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('2')

in Grant Agreement No 874474 ('the Agreement')

between LEONARDO - SOCIETA PER AZIONI **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

for the action entitled 'Enable RPAS Insertion in Controlled Airspace (PJ13 - W2 ERICA)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

STICHTING NATIONAAL LUCHT- EN RUIMTEVAARTLABORATORIUM (NLR), established in Anthony Fokkerweg 2, AMSTERDAM 1059CM, Netherlands, VAT number: NL002760551B01, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('3')

in Grant Agreement No 874474 ('the Agreement')

between LEONARDO - SOCIETA PER AZIONI **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

for the action entitled 'Enable RPAS Insertion in Controlled Airspace (PJ13 - W2 ERICA)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

VALSTYBES IMONE ORO NAVIGACIJA (ON (B4)), established in RODUNIOS KEL 2, VILNIAUS 02188, Lithuania, VAT number: LT100604610, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('4')

in Grant Agreement No 874474 ('the Agreement')

between LEONARDO - SOCIETA PER AZIONI **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

for the action entitled 'Enable RPAS Insertion in Controlled Airspace (PJ13 - W2 ERICA)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

POLSKA AGENCJA ZEGLUGI POWIETRZNEJ (PANSa (B4)), established in UL. WIEZOWA 8, WARSZAWA 02 147, Poland, VAT number: PL5222838321, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('5')

in Grant Agreement No 874474 ('the Agreement')

between LEONARDO - SOCIETA PER AZIONI **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

for the action entitled 'Enable RPAS Insertion in Controlled Airspace (PJ13 - W2 ERICA)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

LUFTFARTSVERKET (LFV/COOPANS), established in HOSPITALSGATAN 30, NORRKOPING 602 27, Sweden, VAT number: SE202100079501, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('6')

in Grant Agreement No 874474 ('the Agreement')

between LEONARDO - SOCIETA PER AZIONI **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

for the action entitled 'Enable RPAS Insertion in Controlled Airspace (PJ13 - W2 ERICA)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

DASSAULT AVIATION (DAV), established in 9 ROND POINT CHAMPS-ELYSEES-MARCEL DASSAULT, PARIS 75008, France, VAT number: FR73712042456, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('7')

in Grant Agreement No 874474 ('the Agreement')

between LEONARDO - SOCIETA PER AZIONI **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

for the action entitled 'Enable RPAS Insertion in Controlled Airspace (PJ13 - W2 ERICA)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

DIRECTION DES SERVICES DE LA NAVIGATION AERIENNE (DSNA), established in 50 RUE HENRY FARMAN, PARIS 75720, France, VAT number: FR29120064019, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('8')

in Grant Agreement No 874474 ('the Agreement')

between LEONARDO - SOCIETA PER AZIONI **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

for the action entitled 'Enable RPAS Insertion in Controlled Airspace (PJ13 - W2 ERICA)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

ENAIRE (ENAIRE), established in AVENIDA DE ARAGON S/N BLOQUE 330, PORTAL 2 PARQUE EMPRESARIAL LAS MERCEDES, MADRID 28022, Spain, VAT number: ESQ2822001J, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('9')

in Grant Agreement No 874474 ('the Agreement')

between LEONARDO - SOCIETA PER AZIONI **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

for the action entitled 'Enable RPAS Insertion in Controlled Airspace (PJ13 - W2 ERICA)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

ENAV SPA (ENAV), established in VIA SALARIA 716, ROMA 00138, Italy, VAT number: IT02152021008, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('10')

in Grant Agreement No 874474 ('the Agreement')

between LEONARDO - SOCIETA PER AZIONI **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

for the action entitled 'Enable RPAS Insertion in Controlled Airspace (PJ13 - W2 ERICA)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

EUROCONTROL - EUROPEAN ORGANISATION FOR THE SAFETY OF AIR NAVIGATION (EUROCONTROL), established in Rue de la Fusée 96, BRUXELLES 1130, Belgium, VAT number: not applicable, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('11')

in Grant Agreement No 874474 ('the Agreement')

between LEONARDO - SOCIETA PER AZIONI **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

for the action entitled 'Enable RPAS Insertion in Controlled Airspace (PJ13 - W2 ERICA)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

FREQUENTIS AG (FRQ (FSP)), established in Innovationsstrasse 1, WIEN 1100, Austria, VAT number: ATU14715600, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('12')

in Grant Agreement No 874474 ('the Agreement')

between LEONARDO - SOCIETA PER AZIONI **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

for the action entitled 'Enable RPAS Insertion in Controlled Airspace (PJ13 - W2 ERICA)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

HUNGAROCONTROL MAGYAR LEGIFORGALMISZOLGALAT ZARTKORUEN MUKODO RESZVENYTARSASAG (HC (FSP)), established in IGLO UTCA 33 35, BUDAPEST 1185, Hungary, VAT number: HU13851325, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('13')

in Grant Agreement No 874474 ('the Agreement')

between LEONARDO - SOCIETA PER AZIONI and the Single European Sky ATM Research Joint Undertaking ('the JU'),

for the action entitled 'Enable RPAS Insertion in Controlled Airspace (PJ13 - W2 ERICA)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

HONEYWELL AEROSPACE (Honeywell SAS), established in 4 AVENUE SAINT GRANIER, TOULOUSE 31300, France, VAT number: FR92340797919, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('14')

in Grant Agreement No 874474 ('the Agreement')

between LEONARDO - SOCIETA PER AZIONI **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

for the action entitled 'Enable RPAS Insertion in Controlled Airspace (PJ13 - W2 ERICA)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

INDRA SISTEMAS SA (INDRA), established in AVENIDA DE BRUSELAS 35, ALCOBENDAS MADRID 28108, Spain, VAT number: ESA28599033, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('15')

in Grant Agreement No 874474 ('the Agreement')

between LEONARDO - SOCIETA PER AZIONI **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

for the action entitled 'Enable RPAS Insertion in Controlled Airspace (PJ13 - W2 ERICA)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

SAAB AKTIEBOLAG (SAAB), established in ., LINKOPING 581 88, Sweden, VAT number: SE556036079301, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('16')

in Grant Agreement No 874474 ('the Agreement')

between LEONARDO - SOCIETA PER AZIONI **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

for the action entitled 'Enable RPAS Insertion in Controlled Airspace (PJ13 - W2 ERICA)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

NATS (EN ROUTE) PUBLIC LIMITED COMPANY (NATS), established in 4000 PARKWAY WHITELEY, FAREHAM PO15 7FL, United Kingdom, VAT number: GB440379456, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('17')

in Grant Agreement No 874474 ('the Agreement')

between LEONARDO - SOCIETA PER AZIONI **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

for the action entitled 'Enable RPAS Insertion in Controlled Airspace (PJ13 - W2 ERICA)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

THALES LAS FRANCE SAS (THALES AIR SYS), established in AVENUE GAY LUSSAC 2, ELANCOURT 78990, France, VAT number: FR15319159877, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('18')

in Grant Agreement No 874474 ('the Agreement')

between LEONARDO - SOCIETA PER AZIONI **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

for the action entitled 'Enable RPAS Insertion in Controlled Airspace (PJ13 - W2 ERICA)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

THALES AVS FRANCE SAS (THALES AVS), established in 75-77 AVENUE MARCEL DASSAULT, MERIGNAC 33700, France, VAT number: FR65612039495, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('19')

in Grant Agreement No 874474 ('the Agreement')

between LEONARDO - SOCIETA PER AZIONI **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

for the action entitled 'Enable RPAS Insertion in Controlled Airspace (PJ13 - W2 ERICA)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

DFS DEUTSCHE FLUGSICHERUNG GMBH (DFS), established in AM DFS CAMPUS 10, LANGEN 63225, Germany, VAT number: DE114110232, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('20')

in Grant Agreement No 874474 ('the Agreement')

between LEONARDO - SOCIETA PER AZIONI **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

for the action entitled 'Enable RPAS Insertion in Controlled Airspace (PJ13 - W2 ERICA)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

DEUTSCHES ZENTRUM FUER LUFT - UND RAUMFAHRT EV (DLR), established in Linder Hoehe, KOELN 51147, Germany, ('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 874474 ('the Agreement')

between LEONARDO - SOCIETA PER AZIONI **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

for the action entitled 'Enable RPAS Insertion in Controlled Airspace (PJ13 - W2 ERICA)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

RIZENI LETOVEHO PROVOZU CESKE REPUBLIKY STATNI PODNIK (ANS CR (B4)), established in JENEC NAVIGACNI 787, JENEC 252 61, Czechia, VAT number: CZ699004742, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('22')

in Grant Agreement No 874474 ('the Agreement')

between LEONARDO - SOCIETA PER AZIONI **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

for the action entitled 'Enable RPAS Insertion in Controlled Airspace (PJ13 - W2 ERICA)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

LETOVE PREVADZKOVE SLUZBY SLOVENSKEJ REPUBLIKY, STATNY PODNIK (LPS SR (B4)), established in IVANSKA CESTA 93, BRATISLAVA 823 07, Slovakia, VAT number: SK2020244699, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('23')

in Grant Agreement No 874474 ('the Agreement')

between LEONARDO - SOCIETA PER AZIONI **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

for the action entitled 'Enable RPAS Insertion in Controlled Airspace (PJ13 - W2 ERICA)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

AUSTRO CONTROL OSTERREICHISCHE GESELLSCHAFT FUR ZIVILLUFTFAHRT MBH (ACG/COOPANS), established in WAGRAMER STRASSE 19, WIEN 1220, Austria, VAT number: ATU37259408, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('24')

in Grant Agreement No 874474 ('the Agreement')

between LEONARDO - SOCIETA PER AZIONI **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

for the action entitled 'Enable RPAS Insertion in Controlled Airspace (PJ13 - W2 ERICA)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

CROATIA CONTROL, CROATIAN AIR NAVIGATION SERVICES LTD (CCL/COOPANS), established in RUDOLFA FIZIRA 2, VELIKA GORICA 10410, Croatia, VAT number: HR33052761319, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('25')

in Grant Agreement No 874474 ('the Agreement')

between LEONARDO - SOCIETA PER AZIONI and the Single European Sky ATM Research Joint Undertaking ('the JU'),

for the action entitled 'Enable RPAS Insertion in Controlled Airspace (PJ13 - W2 ERICA)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

UDARAS EITLIOCHTA NA HEIREANN THE IRISH AVIATION AUTHORITY (IAA/ COOPANS), established in D'OLIER STREET 11-12 THE TIMES BUILDING, DUBLIN D02 T449, Ireland, VAT number: IE8211082B, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('26')

in Grant Agreement No 874474 ('the Agreement')

between LEONARDO - SOCIETA PER AZIONI **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

for the action entitled 'Enable RPAS Insertion in Controlled Airspace (PJ13 - W2 ERICA)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

NAVIAIR (Naviair/COOPANS), established in NAVIAIR ALLE 1, KASTRUP 2770, Denmark, VAT number: DK26059763, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('27')

in Grant Agreement No 874474 ('the Agreement')

between LEONARDO - SOCIETA PER AZIONI **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

for the action entitled 'Enable RPAS Insertion in Controlled Airspace (PJ13 - W2 ERICA)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

ATOS BELGIUM (ATOS (FSP)), established in DA VINCILAAN 5, ZAVENTEM 1930, Belgium, VAT number: BE0401848135, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('28')

in Grant Agreement No 874474 ('the Agreement')

between LEONARDO - SOCIETA PER AZIONI **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

for the action entitled 'Enable RPAS Insertion in Controlled Airspace (PJ13 - W2 ERICA)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

AIRTEL ATN LIMITED (AIRTEL), established in 2 HARBOUR SQUARE CROFTON ROAD, DUN LOAGHAIRE DUBLIN A96D6R0, Ireland, VAT number: IE8287698U, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('29')

in Grant Agreement No 874474 ('the Agreement')

between LEONARDO - SOCIETA PER AZIONI **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

for the action entitled 'Enable RPAS Insertion in Controlled Airspace (PJ13 - W2 ERICA)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

SINTEF AS (SINTEF), established in STRINDVEGEN 4, TRONDHEIM 7034, Norway, VAT number: NO919303808MVA, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('30')

in Grant Agreement No 874474 ('the Agreement')

between LEONARDO - SOCIETA PER AZIONI **and** the Single European Sky ATM Research Joint Undertaking ('the JU'),

for the action entitled 'Enable RPAS Insertion in Controlled Airspace (PJ13 - W2 ERICA)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3a

**DECLARATION ON JOINT AND SEVERAL LIABILITY OF
LINKED THIRD PARTIES**

AIRBUS OPERATIONS SAS (AI OP SAS), established in ROUTE DE BAYONNE 316, TOULOUSE 31060, France, VAT number: FR13420916918, ('the linked third party'), represented for the purpose of signing this Declaration on joint and several liability by its legal representative(s) [forename and surname, function of the legal representative(s) of the linked third party],

linked to beneficiary No 2 **AIRBUS (AIRBUS SAS)**, established in 2 ROND POINT EMILE DEWOITINE, BLAGNAC 31700, France, VAT number: FR89383474814, ('the beneficiary'),

hereby accepts joint and several liability with the beneficiary

for any amount owed to the JU by the beneficiary under Grant Agreement No 874474 (PJ13 - W2 ERICA), up to the maximum JU contribution indicated, for the linked third party, in the estimated budget (see Annex 2).

The linked third party irrevocably and unconditionally agrees to pay amounts requested under this Declaration to the JU, immediately and at first demand.

For the linked third party
[forename/surname/function]

Done in English at [place], on [date]

**DECLARATION ON JOINT AND SEVERAL LIABILITY OF
LINKED THIRD PARTIES**

AIRBUS DEFENCE AND SPACE GMBH (AI D&S GMBH), established in WILLY-
MESSERSCHMITT-STRASSE 1, TAUFKIRCHEN 82024, Germany, VAT number: DE167015661,
(‘the linked third party’), represented for the purpose of signing this Declaration on joint and several
liability by its legal representative(s) [forename and surname, function of the legal representative(s)
of the linked third party],

linked to beneficiary No 2 **AIRBUS (AIRBUS SAS)**, established in 2 ROND POINT EMILE
DEWOITINE, BLAGNAC 31700, France, VAT number: FR89383474814, (‘the beneficiary’),

hereby accepts joint and several liability with the beneficiary

for any amount owed to the JU by the beneficiary under Grant Agreement No 874474 (PJ13 - W2
ERICA), up to the maximum JU contribution indicated, for the linked third party, in the estimated
budget (see Annex 2).

The linked third party irrevocably and unconditionally agrees to pay amounts requested under this
Declaration to the JU, immediately and at first demand.

For the linked third party
[forename/surname/function]

Done in English at [place], on [date]

**DECLARATION ON JOINT AND SEVERAL LIABILITY OF
LINKED THIRD PARTIES**

INSTYTUT CHEMII BIOORGANICZNEJ POLSKIEJ AKADEMII NAUK (PSNC), established in NOSKOWSKIEGO 12-14, POZNAN 61 704, Poland, VAT number: PL7770002062, ('the linked third party'), represented for the purpose of signing this Declaration on joint and several liability by its legal representative(s) [forename and surname, function of the legal representative(s) of the linked third party],

linked to beneficiary No 5 **POLSKA AGENCJA ZEGLUGI POWIETRZNEJ (PANSa (B4))**, established in UL. WIEZOWA 8, WARSZAWA 02 147, Poland, VAT number: PL5222838321, ('the beneficiary'),

hereby accepts joint and several liability with the beneficiary

for any amount owed to the JU by the beneficiary under Grant Agreement No 874474 (PJ13 - W2 ERICA), up to the maximum JU contribution indicated, for the linked third party, in the estimated budget (see Annex 2).

The linked third party irrevocably and unconditionally agrees to pay amounts requested under this Declaration to the JU, immediately and at first demand.

For the linked third party
[forename/surname/function]

Done in English at [place], on [date]

ANNEX 3a

**DECLARATION ON JOINT AND SEVERAL LIABILITY OF
LINKED THIRD PARTIES**

SAFRAN ELECTRONICS & DEFENSE (SAFRAN), established in 18-20 QUAI DU POINT DU JOUR, BOULOGNE-BILLANCOURT 92100, France, VAT number: FR39480107911, ('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 8 **DIRECTION DES SERVICES DE LA NAVIGATION AERIENNE (DSNA)**, established in 50 RUE HENRY FARMAN, PARIS 75720, France, VAT number: FR29120064019, ('the beneficiary'),

hereby accepts joint and several liability with the beneficiary

for any amount owed to the JU by the beneficiary under Grant Agreement No 874474 (PJ13 - W2 ERICA), up to the maximum JU contribution indicated, for the linked third party, in the estimated budget (see Annex 2).

The linked third party irrevocably and unconditionally agrees to pay amounts requested under this Declaration to the JU, immediately and at first demand.

For the linked third party
[forename/surname/function]

Done in English at [place], on [date]

ANNEX 3a

**DECLARATION ON JOINT AND SEVERAL LIABILITY OF
LINKED THIRD PARTIES**

INGENIERIA DE SISTEMAS PARA LA DEFENSA DE ESPANA SA-SME MP (ISDEFE), established in CALLE BEATRIZ DE BOBADILLA 3, MADRID 28040, Spain, VAT number: ESA78085719, ('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 9 **ENAIRE (ENAIRE)**, established in AVENIDA DE ARAGON S/N BLOQUE 330, PORTAL 2 PARQUE EMPRESARIAL LAS MERCEDES, MADRID 28022, Spain, VAT number: ESQ2822001J, ('the beneficiary'),

hereby accepts joint and several liability with the beneficiary

for any amount owed to the JU by the beneficiary under Grant Agreement No 874474 (PJ13 - W2 ERICA), up to the maximum JU contribution indicated, for the linked third party, in the estimated budget (see Annex 2).

The linked third party irrevocably and unconditionally agrees to pay amounts requested under this Declaration to the JU, immediately and at first demand.

For the linked third party
[forename/surname/function]

Done in English at [place], on [date]

ANNEX 3a

**DECLARATION ON JOINT AND SEVERAL LIABILITY OF
LINKED THIRD PARTIES**

INGENIERIA Y ECONOMIA DEL TRANSPORTE SME MP SA (INECO), established in PASEO DE LA HABANA 138, MADRID 28036, Spain, VAT number: ESA28220168, ('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 9 **ENAIRE (ENAIRE)**, established in AVENIDA DE ARAGON S/N BLOQUE 330, PORTAL 2 PARQUE EMPRESARIAL LAS MERCEDES, MADRID 28022, Spain, VAT number: ESQ2822001J, ('the beneficiary'),

hereby accepts joint and several liability with the beneficiary

for any amount owed to the JU by the beneficiary under Grant Agreement No 874474 (PJ13 - W2 ERICA), up to the maximum JU contribution indicated, for the linked third party, in the estimated budget (see Annex 2).

The linked third party irrevocably and unconditionally agrees to pay amounts requested under this Declaration to the JU, immediately and at first demand.

For the linked third party
[forename/surname/function]

Done in English at [place], on [date]

**DECLARATION ON JOINT AND SEVERAL LIABILITY OF
LINKED THIRD PARTIES**

CENTRO DE REFERENCIA INVESTIGACION DESARROLLO E INNOVACION ATM, A.I.E. (CRIDA), established in AVDA DE ARAGON 402 4 EDIFICIO ALLENDE, MADRID 28022, Spain, VAT number: ESV85383578, ('the linked third party'), represented for the purpose of signing this Declaration on joint and several liability by its legal representative(s) [forename and surname, function of the legal representative(s) of the linked third party],

linked to beneficiary No 9 **ENAIRE (ENAIRE)**, established in AVENIDA DE ARAGON S/N BLOQUE 330, PORTAL 2 PARQUE EMPRESARIAL LAS MERCEDES, MADRID 28022, Spain, VAT number: ESQ2822001J, ('the beneficiary'),

hereby accepts joint and several liability with the beneficiary

for any amount owed to the JU by the beneficiary under Grant Agreement No 874474 (PJ13 - W2 ERICA), up to the maximum JU contribution indicated, for the linked third party, in the estimated budget (see Annex 2).

The linked third party irrevocably and unconditionally agrees to pay amounts requested under this Declaration to the JU, immediately and at first demand.

For the linked third party
[forename/surname/function]

Done in English at [place], on [date]

**DECLARATION ON JOINT AND SEVERAL LIABILITY OF
LINKED THIRD PARTIES**

CENTRO ITALIANO RICERCHE AEROSPAZIALI SCPA (CIRA), established in Via Maiorise 1, CAPUA - CASERTA 81043, Italy, VAT number: IT01908170614, ('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 10 **ENAV SPA (ENAV)**, established in VIA SALARIA 716, ROMA 00138, Italy, VAT number: IT02152021008, ('the beneficiary'),

hereby accepts joint and several liability with the beneficiary

for any amount owed to the JU by the beneficiary under Grant Agreement No 874474 (PJ13 - W2 ERICA), up to the maximum JU contribution indicated, for the linked third party, in the estimated budget (see Annex 2).

The linked third party irrevocably and unconditionally agrees to pay amounts requested under this Declaration to the JU, immediately and at first demand.

For the linked third party
[forename/surname/function]

Done in English at [place], on [date]

**DECLARATION ON JOINT AND SEVERAL LIABILITY OF
LINKED THIRD PARTIES**

TECHNO SKY S.R.L. (TECHNO SKY), established in VIA DEL CASALE CAVALLARI 200, ROMA 00156, Italy, VAT number: IT08428031002, ('the linked third party'), represented for the purpose of signing this Declaration on joint and several liability by its legal representative(s) [forename and surname, function of the legal representative(s) of the linked third party],

linked to beneficiary No 10 **ENAV SPA (ENAV)**, established in VIA SALARIA 716, ROMA 00138, Italy, VAT number: IT02152021008, ('the beneficiary'),

hereby accepts joint and several liability with the beneficiary

for any amount owed to the JU by the beneficiary under Grant Agreement No 874474 (PJ13 - W2 ERICA), up to the maximum JU contribution indicated, for the linked third party, in the estimated budget (see Annex 2).

The linked third party irrevocably and unconditionally agrees to pay amounts requested under this Declaration to the JU, immediately and at first demand.

For the linked third party
[forename/surname/function]

Done in English at [place], on [date]

**DECLARATION ON JOINT AND SEVERAL LIABILITY OF
LINKED THIRD PARTIES**

FREQUENTIS CZECH REPUBLIC SRO (FRQ CZ), established in VYSKOCILOVA 1461 2A MICHLE, PRAHA 4 14000, Czechia, VAT number: CZ29053285, ('the linked third party'), represented for the purpose of signing this Declaration on joint and several liability by its legal representative(s) [forename and surname, function of the legal representative(s) of the linked third party],

linked to beneficiary No 12 **FREQUENTIS AG (FRQ (FSP))**, established in Innovationsstrasse 1, WIEN 1100, Austria, VAT number: ATU14715600, ('the beneficiary'),

hereby accepts joint and several liability with the beneficiary

for any amount owed to the JU by the beneficiary under Grant Agreement No 874474 (PJ13 - W2 ERICA), up to the maximum JU contribution indicated, for the linked third party, in the estimated budget (see Annex 2).

The linked third party irrevocably and unconditionally agrees to pay amounts requested under this Declaration to the JU, immediately and at first demand.

For the linked third party
[forename/surname/function]

Done in English at [place], on [date]

**DECLARATION ON JOINT AND SEVERAL LIABILITY OF
LINKED THIRD PARTIES**

HONEYWELL INTERNATIONAL SRO (HIsro), established in V PARKU CHODOV 2325/16, PRAHA 148 00, Czechia, VAT number: CZ27617793, ('the linked third party'), represented for the purpose of signing this Declaration on joint and several liability by its legal representative(s) [forename and surname, function of the legal representative(s) of the linked third party],

linked to beneficiary No 14 **HONEYWELL AEROSPACE (Honeywell SAS)**, established in 4 AVENUE SAINT GRANIER, TOULOUSE 31300, France, VAT number: FR92340797919, ('the beneficiary'),

hereby accepts joint and several liability with the beneficiary

for any amount owed to the JU by the beneficiary under Grant Agreement No 874474 (PJ13 - W2 ERICA), up to the maximum JU contribution indicated, for the linked third party, in the estimated budget (see Annex 2).

The linked third party irrevocably and unconditionally agrees to pay amounts requested under this Declaration to the JU, immediately and at first demand.

For the linked third party
[forename/surname/function]

Done in English at [place], on [date]

**DECLARATION ON JOINT AND SEVERAL LIABILITY OF
LINKED THIRD PARTIES**

HONEYWELL INTERNATIONAL INC (Hinc), established in CENTERVILLE 2711, Wilmington 19808, United States, ('the linked third party'), represented for the purpose of signing this Declaration on joint and several liability by its legal representative(s) [forename and surname, function of the legal representative(s) of the linked third party],

linked to beneficiary No 14 **HONEYWELL AEROSPACE (Honeywell SAS)**, established in 4 AVENUE SAINT GRANIER, TOULOUSE 31300, France, VAT number: FR92340797919, ('the beneficiary'),

hereby accepts joint and several liability with the beneficiary

for any amount owed to the JU by the beneficiary under Grant Agreement No 874474 (PJ13 - W2 ERICA), up to the maximum JU contribution indicated, for the linked third party, in the estimated budget (see Annex 2).

The linked third party irrevocably and unconditionally agrees to pay amounts requested under this Declaration to the JU, immediately and at first demand.

For the linked third party
[forename/surname/function]

Done in English at [place], on [date]

ANNEX 3a

**DECLARATION ON JOINT AND SEVERAL LIABILITY OF
LINKED THIRD PARTIES**

THALES SIX GTS FRANCE SAS (THALES SIX), established in AVENUE DES LOUVRESSES 4, GENNEVILLIERS 92230, France, VAT number: FR01383470937, ('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 18 **THALES LAS FRANCE SAS (THALES AIR SYS)**, established in AVENUE GAY LUSSAC 2, ELANCOURT 78990, France, VAT number: FR15319159877, ('the beneficiary'),

hereby accepts joint and several liability with the beneficiary

for any amount owed to the JU by the beneficiary under Grant Agreement No 874474 (PJ13 - W2 ERICA), up to the maximum JU contribution indicated, for the linked third party, in the estimated budget (see Annex 2).

The linked third party irrevocably and unconditionally agrees to pay amounts requested under this Declaration to the JU, immediately and at first demand.

For the linked third party
[forename/surname/function]

Done in English at [place], on [date]

**DECLARATION ON JOINT AND SEVERAL LIABILITY OF
LINKED THIRD PARTIES**

THALES ALENIA SPACE FRANCE SAS (TAS-FRANCE), established in AVENUE JEAN FRANCOIS CHAMPOLLION 26, TOULOUSE 31100, France, VAT number: FR62414725101, ('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 18 **THALES LAS FRANCE SAS (THALES AIR SYS)**, established in AVENUE GAY LUSSAC 2, ELANCOURT 78990, France, VAT number: FR15319159877, ('the beneficiary'),

hereby accepts joint and several liability with the beneficiary

for any amount owed to the JU by the beneficiary under Grant Agreement No 874474 (PJ13 - W2 ERICA), up to the maximum JU contribution indicated, for the linked third party, in the estimated budget (see Annex 2).

The linked third party irrevocably and unconditionally agrees to pay amounts requested under this Declaration to the JU, immediately and at first demand.

For the linked third party
[forename/surname/function]

Done in English at [place], on [date]

FINANCIAL STATEMENT FOR [BENEFICIARY [name]/ LINKED THIRD PARTY [name]] FOR REPORTING PERIOD [reporting period]

	Eligible 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	Reimburse ment 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	[C.1 Financial support]	[C.2 Prizes]	D.1 Travel	[D.4 Costs of large research infrastructure]	D.5 Costs of internally invoiced goods and services	[F.1 Costs of ...]	[F.2 Costs of ...]		Receipts of the action, to be reported in the last reporting period, according to Article 5.3.3				Costs of in-kind contributions not used on premises	
Form of costs ⁴		Actual	Unit	Unit	Actual	Actual	Actual	Actual	Unit	Flat-rate ⁵	Unit	[Unit][Lump sum]							
										25%									
	a	Total b	No hours	Total c	d	[e]	f	[g]	Total h	i=0,25 x (a+b+c+f+[g] + h+ [j 1] ⁶ +[j2] ⁶ -p)	No units	Total [j1]	Total [j2]	k = a+b+c+d+[e] +f+ [g] +h+ i + [j1] +[j2]	l	m	n	o	p
[short name beneficiary/linked third party]																			

The beneficiary/linked third party hereby confirms that:
The information provided is complete, reliable and true.
The costs declared are eligible (see Article 6).
The costs can be substantiated by adequate records and supporting documentation that will be produced upon request or in the context of checks, reviews, audits and investigations (see Articles 17, 18 and 22).
For the last reporting period: that all the receipts have been declared (see Article 5.3.3).

📌 Please declare all eligible costs, even if they exceed the amounts indicated in the estimated budget (see Annex 2). Only amounts that were declared in your individual financial statements can be taken into account lateron, in order to replace other costs that are found to be ineligible.

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 indirect costs unless you can demonstrate that the operating grant does not cover any costs of the action.

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 be less,

⁴ See Article 5 for the forms of costs

⁵ Flat rate : 25% of eligible direct costs, from which are excluded: direct costs of subcontracting, costs of in-kind contributions not used on premises, direct costs of financial support, and unit costs declared under budget category F if they include indirect costs (see Article 6.2.E)

⁶ Only specific unit costs that do not include indirect costs

ANNEX 5

MODEL FOR THE CERTIFICATE ON THE FINANCIAL STATEMENTS

- For options [*in italics in square brackets*]: choose the applicable option. Options not chosen should be deleted.
- For fields in [grey in square brackets]: enter the appropriate data

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TERMS OF REFERENCE FOR AN INDEPENDENT REPORT OF FACTUAL FINDINGS ON COSTS DECLARED UNDER A GRANT AGREEMENT FINANCED UNDER THE HORIZON 2020 RESEARCH FRAMEWORK PROGRAMME

INDEPENDENT REPORT OF FACTUAL FINDINGS ON COSTS DECLARED UNDER A GRANT AGREEMENT FINANCED UNDER THE HORIZON 2020 RESEARCH FRAMEWORK PROGRAMME

Terms of Reference for an Independent Report of Factual Findings on costs declared under a Grant Agreement financed by [Clean Sky 2] [Bio Based Industries][ECSEL][Fuel Cells and Hydrogen 2][Innovative Medicines Initiative 2][Single European Sky Air Traffic Management Research (SESAR)][Shift2Rail] JU under the Horizon 2020 Research and Innovation Framework Programme

This document sets out the ‘**Terms of Reference (ToR)**’ under which

[OPTION 1: *[insert name of the beneficiary]* (*‘the Beneficiary’*)] [OPTION 2: *[insert name of the linked third party]* (*‘the Linked Third Party’*), third party linked to the Beneficiary *[insert name of the beneficiary]* (*‘the Beneficiary’*)]

agrees to engage

[insert legal name of the auditor] (*‘the Auditor’*)

to produce an independent report of factual findings (*‘the Report’*) concerning the Financial Statement(s)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 European Commission (*‘the Commission’*).

The Agreement has been concluded under the Horizon 2020 Research and Innovation Framework Programme (H2020) between the Beneficiary and the *[Clean Sky 2][Bio Based Industries][ECSEL][Fuel Cells and Hydrogen 2][Innovative Medicines Initiative 2][Single European Sky Air Traffic Management Research (SESAR)][Shift2Rail]* Joint Undertaking (*“the JU”*).

The JU is mentioned as a signatory of the Agreement with the Beneficiary only. The JU is not a party to this engagement.

1.1 Subject of the engagement

The coordinator must submit to the JU the final report within 60 days following the end of the last reporting period which should include, amongst other documents, a CFS for each beneficiary and for each linked third party that requests a total contribution of EUR 325 000 or more, as reimbursement of actual costs and unit costs calculated on the basis of its usual cost accounting practices (see Article 20.4 of the Agreement). The CFS must cover all reporting periods of the beneficiary or linked third party indicated above.

The Beneficiary must submit to the coordinator the CFS for itself and for its linked third party(ies), if the CFS must be included in the final report according to Article 20.4 of the Agreement.

The CFS is composed of two separate documents:

- The Terms of Reference (*‘the ToR’*) to be signed by the *[Beneficiary]* *[Linked Third Party]* and the Auditor;

¹ By which costs under the Agreement are declared (see template ‘Model Financial Statements’ in Annex 4 to the Grant Agreement).

- The Auditor's Independent Report of Factual Findings ('the Report') to be issued on the Auditor's letterhead, dated, stamped and signed by the Auditor (or the competent public officer) which includes the agreed-upon procedures ('the Procedures') to be performed by the Auditor, and the standard factual findings ('the Findings') to be confirmed by the Auditor.

If the CFS must be included in the final report according to Article 20.4 of the Agreement, the request for payment of the balance relating to the Agreement cannot be made without the CFS. However, the payment for reimbursement of costs covered by the CFS does not preclude the JU, the Commission, the European Anti-Fraud Office and the European Court of Auditors from carrying out checks, reviews, audits and investigations in accordance with Article 22 of the Agreement.

1.2 Responsibilities

The *[Beneficiary]* *[Linked Third Party]*:

- must draw up the Financial Statement(s) for the action financed by the Agreement in compliance with the obligations under the Agreement. The Financial Statement(s) must be drawn up according to the *[Beneficiary's]* *[Linked Third Party's]* accounting and book-keeping system and the underlying accounts and records;
- must send the Financial Statement(s) to the Auditor;
- is responsible and liable for the accuracy of the Financial Statement(s);
- is responsible for the completeness and accuracy of the information provided to enable the Auditor to carry out the Procedures. It must provide the Auditor with a written representation letter supporting these statements. The written representation letter must state the period covered by the statements and must be dated;
- accepts that the Auditor cannot carry out the Procedures unless it is given full access to the *[Beneficiary's]* *[Linked Third Party's]* staff and accounting as well as any other relevant records and documentation.

The Auditor:

- *[Option 1 by default: is qualified to carry out statutory audits of accounting documents in accordance with Directive 2006/43/EC of the European Parliament and of the Council of 17 May 2006 on statutory audits of annual accounts and consolidated accounts, amending Council Directives 78/660/EEC and 83/349/EEC and repealing Council Directive 84/253/EEC or similar national regulations].*
- *[Option 2 if the Beneficiary or Linked Third Party has an independent Public Officer: is a competent and independent Public Officer for which the relevant national authorities have established the legal capacity to audit the Beneficiary].*
- *[Option 3 if the Beneficiary or Linked Third Party is an international organisation: is an [internal] [external] auditor in accordance with the internal financial regulations and procedures of the international organisation].*

The Auditor:

- must be independent from the Beneficiary *[and the Linked Third Party]*, in particular, it must not have been involved in preparing the *[Beneficiary's]* *[Linked Third Party's]* Financial Statement(s);
- must plan work so that the Procedures may be carried out and the Findings may be assessed;
- must adhere to the Procedures laid down and the compulsory report format;
- must carry out the engagement in accordance with this ToR;
- must document matters which are important to support the Report;
- must base its Report on the evidence gathered;
- must submit the Report to the *[Beneficiary]* *[Linked Third Party]*.

The Commission sets out the Procedures to be carried out by the Auditor. The Auditor is not responsible for their suitability or pertinence. As this engagement is not an assurance engagement, the Auditor does not provide an audit opinion or a statement of assurance.

1.3 Applicable Standards

The Auditor must comply with these Terms of Reference and with²:

- the International Standard on Related Services ('ISRS') 4400 *Engagements to perform Agreed-upon Procedures regarding Financial Information* as issued by the International Auditing and Assurance Standards Board (IAASB);
- the *Code of Ethics for Professional Accountants* issued by the International Ethics Standards Board for Accountants (IESBA). Although ISRS 4400 states that independence is not a requirement for engagements to carry out agreed-upon procedures, the JU requires that the Auditor also complies with the Code's independence requirements.

The Auditor's Report must state that there is no conflict of interests in establishing this Report between the Auditor and the Beneficiary *[and the Linked Third Party]*, and must specify - if the service is invoiced - the total fee paid to the Auditor for providing the Report.

1.4 Reporting

The Report must be written in the language of the Agreement (see Article 20.7).

Under Article 22 of the Agreement, the JU, the Commission, the European Anti-Fraud Office and the Court of Auditors have the right to audit any work that is carried out under the action and for which costs are declared from the European Union budget. This includes work related to this engagement. The Auditor must provide access to all working papers (e.g. recalculation of hourly rates, verification of the time declared for the action) related to this assignment if the JU, the Commission, the European Anti-Fraud Office or the European Court of Auditors requests them.

1.5 Timing

The Report must be provided by [dd Month yyyy].

1.6 Other terms

[The [Beneficiary] [Linked Third Party] and the Auditor can use this section to agree other specific terms, such as the Auditor's fees, liability, applicable law, etc. Those specific terms must not contradict the terms specified above.]

[legal name of the Auditor]	[legal name of the [Beneficiary][Linked Third Party]]
[name & function of authorised representative]	[name & function of authorised representative]
[dd Month yyyy]	[dd Month yyyy]
Signature of the Auditor	Signature of the [Beneficiary][Linked Third Party]

² Supreme Audit Institutions applying INTOSAI-standards may carry out the Procedures according to the corresponding International Standards of Supreme Audit Institutions and code of ethics issued by INTOSAI instead of the International Standard on Related Services ('ISRS') 4400 and the Code of Ethics for Professional Accountants issued by the IAASB and the IESBA.

**Independent Report of Factual Findings on costs declared
under a grant agreement financed by the [Clean Sky 2] [Bio Based Industries][ECSEL][Fuel
Cells and Hydrogen 2][Innovative Medicines Initiative 2][Single European Sky Air Traffic
Management Research (SESAR)][Shift2Rail] JU under the Horizon 2020 Research and
Innovation Framework Programme**

(To be printed on the Auditor's letterhead)

To
[name of contact person(s)], [Position]
[[Beneficiary's] [Linked Third Party's] name]
[Address]
[dd Month yyyy]

Dear [Name of contact person(s)],

As agreed under the terms of reference dated [dd Month yyyy]

with [OPTION 1: [insert name of the beneficiary] ('the Beneficiary')] [OPTION 2: [insert name of
the linked third party] ('the Linked Third Party'), third party linked to the Beneficiary [insert name of
the beneficiary] ('the Beneficiary')],

we

[name of the auditor] ('the Auditor'),
established at
[full address/city/state/province/country],
represented by
[name and function of an authorised representative],

have carried out the procedures agreed with you regarding the costs declared in the Financial
Statement(s)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 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

³ By which the Beneficiary declares costs under the Agreement (see template 'Model Financial Statement' in
Annex 4 to the Agreement).



Our engagement was carried out in accordance with the terms of reference ('the ToR') appended to this Report. The Report includes the agreed-upon procedures ('the Procedures') carried out and the standard factual findings ('the Findings') examined.

The Procedures were carried out solely to assist the JU in evaluating whether the [Beneficiary's] [Linked Third Party's] costs in the accompanying Financial Statement(s) were declared in accordance with the Agreement. The JU draws its own conclusions from the Report and any additional information it may require.

The scope of the Procedures was defined by the European Commission ('the Commission'). Therefore, the Auditor is not responsible for their suitability or pertinence. Since the Procedures carried out constitute neither an audit nor a review made in accordance with International Standards on Auditing or International Standards on Review Engagements, the Auditor does not give a statement of assurance on the Financial Statements.

Had the Auditor carried out additional procedures or an audit of the [Beneficiary's] [Linked Third Party's] Financial Statements in accordance with International Standards on Auditing or International Standards on Review Engagements, other matters might have come to its attention and would have been included in the Report.

Not applicable Findings

We examined the Financial Statement(s) stated above and considered the following Findings not applicable:

Explanation (to be removed from the Report):

If a Finding was not applicable, it must be marked as 'N.A.' ('Not applicable') in the corresponding row on the right-hand column of the table and means that the Finding did not have to be corroborated by the Auditor and the related Procedure(s) did not have to be carried out.

The reasons of the non-application of a certain Finding must be obvious i.e.

- i) if no cost was declared under a certain category then the related Finding(s) and Procedure(s) are not applicable;*
- ii) if the condition set to apply certain Procedure(s) are not met the related Finding(s) and those Procedure(s) are not applicable. For instance, for 'beneficiaries with accounts established in a currency other than euro' the Procedure and Finding related to 'beneficiaries with accounts established in euro' are not applicable. Similarly, if no additional remuneration is paid, the related Finding(s) and Procedure(s) for additional remuneration are not applicable.*

List here all Findings considered not applicable for the present engagement and explain the reasons of the non-applicability.

....

Exceptions

Apart from the exceptions listed below, the [Beneficiary] [Linked Third Party] provided the Auditor all the documentation and accounting information needed by the Auditor to carry out the requested Procedures and evaluate the Findings.

Explanation (to be removed from the Report):

- If the Auditor was not able to successfully complete a procedure requested, it must be marked as 'E' ('Exception') in the corresponding row on the right-hand column of the table. The reason such as the inability to reconcile key information or the unavailability of data that prevents the Auditor from carrying out the Procedure must be indicated below.*
- If the Auditor cannot corroborate a standard finding after having carried out the corresponding procedure, it must also be marked as 'E' ('Exception') and, where possible, the reasons why the Finding was not fulfilled and its possible impact must be explained here below.*

List here any exceptions and add any information on the cause and possible consequences of each exception, if known. If the exception is quantifiable, include the corresponding amount.

....

Example (to be removed from the Report):

1. *The Beneficiary was unable to substantiate the Finding number 1 on ... because*
2. *Finding number 30 was not fulfilled because the methodology used by the Beneficiary to calculate unit costs was different from the one approved by the Commission. The differences were as follows: ...*
3. *After carrying out the agreed procedures to confirm the Finding number 31, the Auditor found a difference of _____ EUR. The difference can be explained by ...*

Further Remarks

In addition to reporting on the results of the specific procedures carried out, the Auditor would like to make the following general remarks:

Example (to be removed from the Report):

1. *Regarding Finding number 8 the conditions for additional remuneration were considered as fulfilled because ...*
2. *In order to be able to confirm the Finding number 15 we carried out the following additional procedures:*

Use of this Report

This Report may be used only for the purpose described in the above objective. It was prepared solely for the confidential use of the [Beneficiary] [Linked Third Party], the JU and the Commission, and only to be submitted to the JU in connection with the requirements set out in Article 20.4 of the Agreement. The Report may not be used by the [Beneficiary] [Linked Third Party], by the JU or the Commission for any other purpose, nor may it be distributed to any other parties. The JU or the Commission may only disclose the Report to authorised parties, in particular to the European Anti-Fraud Office (OLAF) and the European Court of Auditors.

This Report relates only to the Financial Statement(s) submitted to the JU by the [Beneficiary] [Linked Third Party] for the Agreement. Therefore, it does not extend to any other of the [Beneficiary's] [Linked Third Party's] Financial Statement(s).

There was no conflict of interest⁴ between the Auditor and the Beneficiary [and Linked Third Party] in establishing this Report. The total fee paid to the Auditor for providing the Report was EUR [] (including EUR [] of deductible VAT).

We look forward to discussing our Report with you and would be pleased to provide any further information or assistance.

[legal name of the Auditor]

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.

Grant Agreement number: [insert number] [insert acronym] [insert call identifier]  Associated with document Ref. Ares(2019)7194021 - 21/11/2019

[name and function of an authorised representative]

[dd Month yyyy]

Signature of the Auditor

Agreed-upon procedures to be performed and standard factual findings to be confirmed by the Auditor

The European Commission ('the Commission') reserves the right to i) provide the auditor with additional guidance regarding the procedures to be followed or the facts to be ascertained and the way in which to present them (this may include sample coverage and findings) or to ii) change the procedures, by notifying the Beneficiary in writing. The procedures carried out by the auditor to confirm the standard factual finding are listed in the table below.

If this certificate relates to a Linked Third Party, any reference here below to 'the Beneficiary' is to be considered as a reference to 'the Linked Third Party'.

The 'result' column has three different options: 'C', 'E' and 'N.A.':

- 'C' stands for 'confirmed' and means that the auditor can confirm the 'standard factual finding' and, therefore, there is no exception to be reported.
- 'E' stands for 'exception' and means that the Auditor carried out the procedures but cannot confirm the 'standard factual finding', or that the Auditor was not able to carry out a specific procedure (e.g. because it was impossible to reconcile key information or data were unavailable),
- 'N.A.' stands for 'not applicable' and means that the Finding did not have to be examined by the Auditor and the related Procedure(s) did not have to be carried out. The reasons of the non-application of a certain Finding must be obvious i.e. i) if no cost was declared under a certain category then the related Finding(s) and Procedure(s) are not applicable; ii) if the condition set to apply certain Procedure(s) are not met then the related Finding(s) and Procedure(s) are not applicable. For instance, for 'beneficiaries with accounts established in a currency other than the euro' the Procedure related to 'beneficiaries with accounts established in euro' is not applicable. Similarly, if no additional remuneration is paid, the related Finding(s) and Procedure(s) for additional remuneration are not applicable.

Ref	Procedures	Standard factual finding	Result (C / E / N.A.)
A	ACTUAL PERSONNEL COSTS AND UNIT COSTS CALCULATED BY THE BENEFICIARY IN ACCORDANCE WITH ITS USUAL COST ACCOUNTING PRACTICE		
	<p>The Auditor draws a sample of persons whose costs were declared in the Financial Statement(s) to carry out the procedures indicated in the consecutive points of this section A.</p> <p><i>(The sample should be selected randomly so that it is representative. Full coverage is required if there are fewer than 10 people (including employees, natural persons working under a direct contract and personnel seconded by a third party), otherwise the sample should have a minimum of 10 people, or 10% of the total, whichever number is the highest)</i></p> <p>The Auditor sampled [] people out of the total of [] people.</p>		

Ref	Procedures	Standard factual finding	Result (C / E / N.A.)
A.1	<p>PERSONNEL COSTS</p> <p><u>For the persons included in the sample and working under an employment contract or equivalent act (general procedures for individual actual personnel costs and personnel costs declared as unit costs)</u></p> <p>To confirm standard factual findings 1-5 listed in the next column, the Auditor reviewed following information/documents provided by the Beneficiary:</p> <ul style="list-style-type: none"> ○ a list of the persons included in the sample indicating the period(s) during which they worked for the action, their position (classification or category) and type of contract; ○ the payslips of the employees included in the sample; ○ reconciliation of the personnel costs declared in the Financial Statement(s) with the accounting system (project accounting and general ledger) and payroll system; ○ information concerning the employment status and employment conditions of personnel included in the sample, in particular their employment contracts or equivalent; ○ the Beneficiary's usual policy regarding payroll matters (e.g. salary policy, overtime policy, variable pay); ○ applicable national law on taxes, labour and social security and ○ any other document that supports the personnel costs declared. <p>The Auditor also verified the eligibility of all components of the retribution (see Article 6 GA) and recalculated the personnel costs for employees included in the sample.</p>	1) The employees were i) directly hired by the Beneficiary in accordance with its national legislation, ii) under the Beneficiary's sole technical supervision and responsibility and iii) remunerated in accordance with the Beneficiary's usual practices.	
		2) Personnel costs were recorded in the Beneficiary's accounts/payroll system.	
		3) Costs were adequately supported and reconciled with the accounts and payroll records.	
		4) Personnel costs did not contain any ineligible elements.	
		5) There were no discrepancies between the personnel costs charged to the action and the costs recalculated by the Auditor.	
	<p><i>Further procedures if 'additional remuneration' is paid</i></p> <p>To confirm standard factual findings 6-9 listed in the next column, the Auditor:</p> <ul style="list-style-type: none"> ○ 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.)
	<p>obligations, the Beneficiary's usual policy on additional remuneration, criteria used for its calculation, the Beneficiary's usual remuneration practice for projects funded under national funding schemes ...);</p> <ul style="list-style-type: none"> recalculated the amount of additional remuneration eligible for the action based on the supporting documents received (full-time or part-time work, exclusive or non-exclusive dedication to the action, usual remuneration paid for projects funded by national schemes) to arrive at the applicable FTE/year and pro-rata rate (see data collected in the course of carrying out the procedures under A.2 'Productive hours' and A.4 'Time recording system'). <p><i>'ADDITIONAL REMUNERATION' MEANS ANY PART OF THE REMUNERATION WHICH EXCEEDS WHAT THE PERSON WOULD BE PAID FOR TIME WORKED IN PROJECTS FUNDED BY NATIONAL SCHEMES.</i></p> <p><i>IF ANY PART OF THE REMUNERATION PAID TO THE EMPLOYEE IS QUALIFIED AS "ADDITIONAL REMUNERATION" AND IS ELIGIBLE UNDER THE PROVISIONS OF ARTICLE 6.2.A.1, THIS CAN BE CHARGED AS ELIGIBLE COST TO THE ACTION UP TO THE FOLLOWING AMOUNT:</i></p> <p>(A) <i>IF THE PERSON WORKS FULL TIME AND EXCLUSIVELY ON THE ACTION DURING THE FULL YEAR: UP TO EUR 8 000/YEAR;</i></p> <p>(B) <i>IF THE PERSON WORKS EXCLUSIVELY ON THE ACTION BUT NOT FULL-TIME OR NOT FOR THE FULL YEAR: UP TO THE CORRESPONDING PRO-RATA AMOUNT OF EUR 8 000, OR</i></p> <p>(C) <i>IF THE PERSON DOES NOT WORK EXCLUSIVELY ON THE ACTION: UP TO A PRO-RATA AMOUNT CALCULATED IN ACCORDANCE TO ARTICLE 6.2.A.1.</i></p>	<p>7) The amount of additional remuneration paid corresponded to the Beneficiary's usual remuneration practices and was consistently paid whenever the same kind of work or expertise was required.</p>	
		<p>8) The criteria used to calculate the additional remuneration were objective and generally applied by the Beneficiary regardless of the source of funding used.</p>	
		<p>9) The amount of additional remuneration included in the personnel costs charged to the action was capped at EUR 8,000 per FTE/year (up to the equivalent pro-rata amount if the person did not work on the action full-time during the year or did not work exclusively on the action).</p>	
	<p><i>Additional procedures in case "unit costs calculated by the Beneficiary in accordance with its usual cost accounting practices" is applied:</i></p> <p>Apart from carrying out the procedures indicated above to confirm standard factual findings 1-5 and, if applicable, also 6-9, the Auditor carried out following procedures to confirm standard</p>	<p>10) The personnel costs included in the Financial Statement were calculated in accordance with the Beneficiary's usual cost accounting practice. This methodology was consistently</p>	

Ref	Procedures	Standard factual finding	Result (C / E / N.A.)
	<p>factual findings 10-13 listed in the next column:</p> <ul style="list-style-type: none"> obtained a description of the Beneficiary's usual cost accounting practice to calculate unit costs; reviewed whether the Beneficiary's usual cost accounting practice was applied for the Financial Statements subject of the present CFS; verified the employees included in the sample were charged under the correct category (in accordance with the criteria used by the Beneficiary to establish personnel categories) by reviewing the contract/HR-record or analytical accounting records; verified that there is no difference between the total amount of personnel costs used in calculating the cost per unit and the total amount of personnel costs recorded in the statutory accounts; verified whether actual personnel costs were adjusted on the basis of budgeted or estimated elements and, if so, verified whether those elements used are actually relevant for the calculation, objective and supported by documents. 	used in all H2020 actions.	
		11) The employees were charged under the correct category.	
		12) Total personnel costs used in calculating the unit costs were consistent with the expenses recorded in the statutory accounts.	
		13) Any estimated or budgeted element used by the Beneficiary in its unit-cost calculation were relevant for calculating personnel costs and corresponded to objective and verifiable information.	
	<p><u>For natural persons included in the sample and working with the Beneficiary under a direct contract other than an employment contract, such as consultants (no subcontractors).</u></p> <p>To confirm standard factual findings 14-17 listed in the next column the Auditor reviewed following information/documents provided by the Beneficiary:</p> <ul style="list-style-type: none"> the contracts, especially the cost, contract duration, work description, place of work, ownership of the results and reporting obligations to the Beneficiary; the employment conditions of staff in the same category to compare costs and; any other document that supports the costs declared and its registration (e.g. invoices, accounting records, etc.). 	14) The natural persons worked under conditions similar to those of an employee, in particular regarding the way the work is organised, the tasks that are performed and the premises where they are performed.	
		15) The results of work carried out belong to the Beneficiary, or, if not, the Beneficiary has obtained all necessary rights to fulfil its obligations as if those	

Ref	Procedures	Standard factual finding	Result (C / E / N.A.)
		results were generated by itself.	
		16) Their costs were not significantly different from those for staff who performed similar tasks under an employment contract with the Beneficiary.	
		17) The costs were supported by audit evidence and registered in the accounts.	
	<u>For personnel seconded by a third party and included in the sample (not subcontractors)</u> To confirm standard factual findings 18-21 listed in the next column, the Auditor reviewed following information/documents provided by the Beneficiary: <ul style="list-style-type: none"> ○ their secondment contract(s) notably regarding costs, duration, work description, place of work and ownership of the results; ○ if there is reimbursement by the Beneficiary to the third party for the resource made available (in-kind contribution against payment): any documentation that supports the costs declared (e.g. contract, invoice, bank payment, and proof of registration in its accounting/payroll, etc.) and reconciliation of the Financial Statement(s) with the accounting system (project accounting and general ledger) as well as any proof that the amount invoiced by the third party did not include any profit; ○ if there is no reimbursement by the Beneficiary to the third party for the resource made available (in-kind contribution free of charge): a proof of the actual cost borne by the Third Party for the resource made available free of charge to the Beneficiary such as a statement of costs incurred by the Third Party and proof of the registration in the Third Party's accounting/payroll; 	18) Seconded personnel reported to the Beneficiary and worked on the Beneficiary's premises (unless otherwise agreed with the Beneficiary).	
		19) The results of work carried out belong to the Beneficiary, or, if not, the Beneficiary has obtained all necessary rights to fulfil its obligations as if those results were generated by itself.	
		<i>If personnel is seconded against payment:</i> 20) The costs declared were supported with documentation and recorded in the Beneficiary's accounts. The	

Ref	Procedures	Standard factual finding	Result (C / E / N.A.)
	<ul style="list-style-type: none"> any other document that supports the costs declared (e.g. invoices, etc.). 	third party did not include any profit.	
		<i>If personnel is seconded free of charge:</i> 21) The costs declared did not exceed the third party's cost as recorded in the accounts of the third party and were supported with documentation.	
A.2	PRODUCTIVE HOURS To confirm standard factual findings 22-27 listed in the next column, the Auditor reviewed relevant documents, especially national legislation, labour agreements and contracts and time records of the persons included in the sample, to verify that: <ul style="list-style-type: none"> the annual productive hours applied were calculated in accordance with one of the methods described below, the full-time equivalent (FTEs) ratios for employees not working full-time were correctly calculated. If the Beneficiary applied method B, the auditor verified that the correctness in which the total number of hours worked was calculated and that the contracts specified the annual workable hours. If the Beneficiary applied method C, the auditor verified that the 'annual productive hours' applied when calculating the hourly rate were equivalent to at least 90 % of the 'standard annual workable hours'. The Auditor can only do this if the calculation of the standard annual workable	22) The Beneficiary applied method [<i>choose one option and delete the others</i>] [A: 1720 hours] [B: the 'total number of hours worked'] [C: 'standard annual productive hours' used correspond to usual accounting practices]	
		23) Productive hours were calculated annually.	
		24) For employees not working full-time the full-time equivalent (FTE) ratio was correctly applied.	

Ref	Procedures	Standard factual finding	Result (C / E / N.A.)
	<p>hours can be supported by records, such as national legislation, labour agreements, and contracts.</p> <p><i>BENEFICIARY'S PRODUCTIVE HOURS' FOR PERSONS WORKING FULL TIME SHALL BE ONE OF THE FOLLOWING METHODS:</i></p> <p><i>A. 1720 ANNUAL PRODUCTIVE HOURS (PRO-RATA FOR PERSONS NOT WORKING FULL-TIME)</i></p> <p><i>B. THE TOTAL NUMBER OF HOURS WORKED BY THE PERSON FOR THE BENEFICIARY IN THE YEAR (THIS METHOD IS ALSO REFERRED TO AS 'TOTAL NUMBER OF HOURS WORKED' IN THE NEXT COLUMN). THE CALCULATION OF THE TOTAL NUMBER OF HOURS WORKED WAS DONE AS FOLLOWS: ANNUAL WORKABLE HOURS OF THE PERSON ACCORDING TO THE EMPLOYMENT CONTRACT, APPLICABLE LABOUR AGREEMENT OR NATIONAL LAW PLUS OVERTIME WORKED MINUS ABSENCES (SUCH AS SICK LEAVE OR SPECIAL LEAVE).</i></p> <p><i>C. THE STANDARD NUMBER OF ANNUAL HOURS GENERALLY APPLIED BY THE BENEFICIARY FOR ITS PERSONNEL IN ACCORDANCE WITH ITS USUAL COST ACCOUNTING PRACTICES (THIS METHOD IS ALSO REFERRED TO AS 'STANDARD ANNUAL PRODUCTIVE HOURS' IN THE NEXT COLUMN). THIS NUMBER MUST BE AT LEAST 90% OF THE STANDARD ANNUAL WORKABLE HOURS.</i></p> <p><i>'ANNUAL WORKABLE HOURS' MEANS THE PERIOD DURING WHICH THE PERSONNEL MUST BE WORKING, AT THE EMPLOYER'S DISPOSAL AND CARRYING OUT HIS/HER ACTIVITY OR DUTIES UNDER THE EMPLOYMENT CONTRACT, APPLICABLE COLLECTIVE LABOUR AGREEMENT OR NATIONAL WORKING TIME LEGISLATION.</i></p>	<p><i>If the Beneficiary applied method B.</i></p> <p>25) The calculation of the number of 'annual workable hours', overtime and absences was verifiable based on the documents provided by the Beneficiary.</p> <p>25.1) The Beneficiary calculates the hourly rates per full financial year following procedure A.3 (method B is not allowed for beneficiaries calculating hourly rates per month).</p>	
		<p><i>If the Beneficiary applied method C.</i></p> <p>26) The calculation of the number of 'standard annual workable hours' was verifiable based on the documents provided by the Beneficiary.</p>	

Ref	Procedures	Standard factual finding	Result (C / E / N.A.)
		27) The 'annual productive hours' used for calculating the hourly rate were consistent with the usual cost accounting practices of the Beneficiary and were equivalent to at least 90 % of the 'annual workable hours'.	
A.3	<p>HOURLY PERSONNEL RATES</p> <p><u>I) For unit costs calculated in accordance to the Beneficiary's usual cost accounting practice (unit costs):</u></p> <p>If the Beneficiary has a "Certificate on Methodology to calculate unit costs " (CoMUC) approved by the Commission, the Beneficiary provides the Auditor with a description of the approved methodology and the Commission's letter of acceptance. The Auditor verified that the Beneficiary has indeed used the methodology approved. If so, no further verification is necessary.</p> <p>If the Beneficiary does not have a "Certificate on Methodology" (CoMUC) approved by the Commission, or if the methodology approved was not applied, then the Auditor:</p> <ul style="list-style-type: none"> ○ reviewed the documentation provided by the Beneficiary, including manuals and internal guidelines that explain how to calculate hourly rates; ○ recalculated the unit costs (hourly rates) of staff included in the sample following the results of the procedures carried out in A.1 and A.2. <p><u>II) For individual hourly rates:</u></p> <p>The Auditor:</p> <ul style="list-style-type: none"> ○ reviewed the documentation provided by the Beneficiary, including manuals and internal guidelines that explain how to calculate hourly rates; ○ recalculated the hourly rates of staff included in the sample (recalculation of all hourly 	<p>28) The Beneficiary applied [<i>choose one option and delete the other</i>]:</p> <p>[Option I: "Unit costs (hourly rates) were calculated in accordance with the Beneficiary's usual cost accounting practices"]</p> <p>[Option II: Individual hourly rates were applied]</p> <p><i>For option I concerning unit costs and if the Beneficiary applies the methodology approved by the Commission (CoMUC):</i></p> <p>29) The Beneficiary used the Commission-approved methodology to calculate hourly rates. It corresponded to the organisation's usual cost accounting practices and was applied consistently for all</p>	

Ref	Procedures	Standard factual finding	Result (C / E / N.A.)
	<p>rates if the Beneficiary uses annual rates, recalculation of three months selected randomly for every year and person if the Beneficiary uses monthly rates) following the results of the procedures carried out in A.1 and A.2;</p> <ul style="list-style-type: none"> ○ (only in case of monthly rates) confirmed that the time spent on parental leave is not deducted, and that, if parts of the basic remuneration are generated over a period longer than a month, the Beneficiary has included only the share which is generated in the month. <p><u>“UNIT COSTS CALCULATED BY THE BENEFICIARY IN ACCORDANCE WITH ITS USUAL COST ACCOUNTING PRACTICES”:</u> <i>IT IS CALCULATED BY DIVIDING THE TOTAL AMOUNT OF PERSONNEL COSTS OF THE CATEGORY TO WHICH THE EMPLOYEE BELONGS VERIFIED IN LINE WITH PROCEDURE A.1 BY THE NUMBER OF FTE AND THE ANNUAL TOTAL PRODUCTIVE HOURS OF THE SAME CATEGORY CALCULATED BY THE BENEFICIARY IN ACCORDANCE WITH PROCEDURE A.2.</i> <u>HOURLY RATE FOR INDIVIDUAL ACTUAL PERSONAL COSTS:</u> <i>IT IS CALCULATED FOLLOWING ONE OF THE TWO OPTIONS BELOW:</i></p> <p><i>A) [OPTION BY DEFAULT] BY DIVIDING THE ACTUAL ANNUAL AMOUNT OF PERSONNEL COSTS OF AN EMPLOYEE VERIFIED IN LINE WITH PROCEDURE A.1 BY THE NUMBER OF ANNUAL PRODUCTIVE HOURS VERIFIED IN LINE WITH PROCEDURE A.2 (FULL FINANCIAL YEAR HOURLY RATE);</i></p> <p><i>B) BY DIVIDING THE ACTUAL MONTHLY AMOUNT OF PERSONNEL COSTS OF AN EMPLOYEE VERIFIED IN LINE WITH PROCEDURE A.1 BY 1/12 OF THE NUMBER OF ANNUAL PRODUCTIVE HOURS VERIFIED IN LINE WITH PROCEDURE A.2.(MONTHLY HOURLY RATE).</i></p>	<p>activities irrespective of the source of funding.</p> <p><i>For option I concerning unit costs and if the Beneficiary applies a methodology not approved by the Commission:</i></p> <p>30) The unit costs re-calculated by the Auditor were the same as the rates applied by the Beneficiary.</p> <p><i>For option II concerning individual hourly rates:</i></p> <p>31) The individual rates re-calculated by the Auditor were the same as the rates applied by the Beneficiary.</p> <p>31.1) The Beneficiary used only one option (per full financial year or per month) throughout each financial year examined.</p> <p>31.2) The hourly rates do not include additional remuneration.</p>	

Ref	Procedures	Standard factual finding	Result (C / E / N.A.)
A.4	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: <ul style="list-style-type: none"> ○ description of the time recording system provided by the Beneficiary (registration, authorisation, processing in the HR-system); ○ its actual implementation; ○ time records were signed at least monthly by the employees (on paper or electronically) and authorised by the project manager or another manager; ○ the hours declared were worked within the project period; ○ there were no hours declared as worked for the action if HR-records showed absence due to holidays or sickness (further cross-checks with travels are carried out in B.1 below) ; ○ the hours charged to the action matched those in the time recording system. 	32) All persons recorded their time dedicated to the action on a daily/ weekly/ monthly basis using a paper/computer-based system. <i>(delete the answers that are not applicable)</i>	
		33) Their time-records were authorised at least monthly by the project manager or other superior.	
		34) Hours declared were worked within the project period and were consistent with the presences/absences recorded in HR-records.	
		35) There were no discrepancies between the number of hours charged to the action and the number of hours recorded.	
	<p><i>ONLY THE HOURS WORKED ON THE ACTION CAN BE CHARGED. ALL WORKING TIME TO BE CHARGED SHOULD BE RECORDED THROUGHOUT THE DURATION OF THE PROJECT, ADEQUATELY SUPPORTED BY EVIDENCE OF THEIR REALITY AND RELIABILITY (SEE SPECIFIC PROVISIONS BELOW FOR PERSONS WORKING EXCLUSIVELY FOR THE ACTION WITHOUT TIME RECORDS).</i></p> <p><u>If the persons are working exclusively for the action and without time records</u></p> <p>For the persons selected that worked exclusively for the action without time records, the Auditor verified evidence available demonstrating that they were in reality exclusively dedicated to the action and that the Beneficiary signed a declaration confirming that they have worked exclusively for the action.</p>	36) The exclusive dedication is supported by a declaration signed by the Beneficiary and by any other evidence gathered.	

Ref	Procedures	Standard factual finding	Result (C / E / N.A.)
B	COSTS OF SUBCONTRACTING		
B.1	<p>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).</p> <p>To confirm standard factual findings 37-41 listed in the next column, the Auditor reviewed the following for the items included in the sample:</p> <ul style="list-style-type: none"> ○ the use of subcontractors was foreseen in Annex 1; ○ subcontracting costs were declared in the subcontracting category of the Financial Statement; ○ supporting documents on the selection and award procedure were followed; ○ the Beneficiary ensured best value for money (key elements to appreciate the respect of this principle are the award of the subcontract to the bid offering best price-quality ratio, under conditions of transparency and equal treatment. In case an existing framework contract was used the Beneficiary ensured it was established on the basis of the principle of best value for money under conditions of transparency and equal treatment). <p>In particular,</p> <ol style="list-style-type: none"> i. if the Beneficiary acted as a contracting authority within the meaning of Directive 2004/18/EC (or 2014/24/EU) or of Directive 2004/17/EC (or 2014/25/EU), the Auditor verified that the applicable national law on public procurement was followed and that the subcontracting complied with the Terms and Conditions of the Agreement. ii. if the Beneficiary did not fall under the above-mentioned category the Auditor verified that the Beneficiary followed their usual procurement rules and respected the Terms and Conditions of the Agreement.. 	<p>37) The use of claimed subcontracting costs was foreseen in Annex 1 and costs were declared in the Financial Statements under the subcontracting category.</p> <p>38) There were documents of requests to different providers, different offers and assessment of the offers before selection of the provider in line with internal procedures and procurement rules. Subcontracts were awarded in accordance with the principle of best value for money.</p> <p><i>(When different offers were not collected the Auditor explains the reasons provided by the Beneficiary under the caption “Exceptions” of the Report. The JU will analyse this information to evaluate whether these costs might be accepted as eligible)</i></p> <p>39) The subcontracts were not awarded to other Beneficiaries</p>	

Ref	Procedures	Standard factual finding	Result (C / E / N.A.)
	<p>For the items included in the sample the Auditor also verified that:</p> <ul style="list-style-type: none"> ○ the subcontracts were not awarded to other Beneficiaries in the consortium; ○ there were signed agreements between the Beneficiary and the subcontractor; ○ there was evidence that the services were provided by subcontractor; 	of the consortium.	
		40) All subcontracts were supported by signed agreements between the Beneficiary and the subcontractor.	
		41) There was evidence that the services were provided by the subcontractors.	
C	COSTS OF PROVIDING FINANCIAL SUPPORT TO THIRD PARTIES		
C.1	<p>The Auditor obtained the detail/breakdown of the costs of providing financial support to third parties and sampled [] cost items selected randomly <i>(full coverage is required if there are fewer than 10 items, otherwise the sample should have a minimum of 10 item, or 10% of the total, whichever number is highest).</i></p> <p>The Auditor verified that the following minimum conditions were met:</p> <ul style="list-style-type: none"> a) the maximum amount of financial support for each third party did not exceed EUR 60 000, unless explicitly mentioned in Annex 1; b) the financial support to third parties was agreed in Annex 1 of the Agreement and the other provisions on financial support to third parties included in Annex 1 were respected. 	42) 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 <i>(full coverage is required if there are fewer than 10 items, otherwise the sample should have a minimum of 10 item, or 10% of the total, whichever number is the highest).</i> The Auditor inspected the sample and verified that: <ul style="list-style-type: none"> ○ travel and subsistence costs were consistent with the Beneficiary's usual policy for travel. In this context, the Beneficiary provided evidence of its normal policy for travel costs (e.g. use of first class tickets, reimbursement by the Beneficiary on the basis of actual costs, a lump sum or per diem) to enable the Auditor to compare the travel costs charged with this policy; ○ travel costs are correctly identified and allocated to the action (e.g. trips are directly linked to the action) by reviewing relevant supporting documents such as minutes of meetings, workshops or conferences, their registration in the correct project account, their consistency with time records or with the dates/duration of the workshop/conference; ○ no ineligible costs or excessive or reckless expenditure was declared (see Article 6.5 MGA). 	43) Costs were incurred, approved and reimbursed in line with the Beneficiary's usual policy for travels.	
		44) There was a link between the trip and the action.	
		45) The supporting documents were consistent with each other regarding subject of the trip, dates, duration and reconciled with time records and accounting.	
		46) No ineligible costs or excessive or reckless expenditure was declared.	
D.2	DEPRECIATION COSTS FOR EQUIPMENT, INFRASTRUCTURE OR OTHER ASSETS The Auditor sampled [] cost items selected randomly <i>(full coverage is required if there are fewer than 10 items, otherwise the sample should have a minimum of 10 item, or 10% of the total, whichever number is the highest).</i> For “equipment, infrastructure or other assets” [from now on called “asset(s)”] selected in the sample the Auditor verified that: <ul style="list-style-type: none"> ○ the assets were acquired in conformity with the Beneficiary's internal guidelines and procedures; ○ they were correctly allocated to the action (with supporting documents such as delivery 	47) Procurement rules, principles and guides were followed.	
		48) There was a link between the grant agreement and the asset charged to the action.	
		49) The asset charged to the action was traceable to the accounting records and the underlying documents.	

	<p>note invoice or any other proof demonstrating the link to the action)</p> <ul style="list-style-type: none"> ○ they were entered in the accounting system; ○ the extent to which the assets were used for the action (as a percentage) was supported by reliable documentation (e.g. usage overview table); <p>The Auditor recalculated the depreciation costs and verified that they were in line with the applicable rules in the Beneficiary's country and with the Beneficiary's usual accounting policy (e.g. depreciation calculated on the acquisition value).</p> <p>The Auditor verified that no ineligible costs such as deductible VAT, exchange rate losses, excessive or reckless expenditure were declared (see Article 6.5 GA).</p>	<p>50) The depreciation method used to charge the asset to the action was in line with the applicable rules of the Beneficiary's country and the Beneficiary's usual accounting policy.</p>	
		<p>51) The amount charged corresponded to the actual usage for the action.</p>	
		<p>52) No ineligible costs or excessive or reckless expenditure were declared.</p>	
D.3	<p>COSTS OF OTHER GOODS AND SERVICES</p> <p>The Auditor sampled [] cost items selected randomly (<i>full coverage is required if there are fewer than 10 items, otherwise the sample should have a minimum of 10 item, or 10% of the total, whichever number is highest</i>).</p> <p>For the purchase of goods, works or services included in the sample the Auditor verified that:</p> <ul style="list-style-type: none"> ○ the contracts did not cover tasks described in Annex 1; ○ they were correctly identified, allocated to the proper action, entered in the accounting system (traceable to underlying documents such as purchase orders, invoices and accounting); ○ the goods were not placed in the inventory of durable equipment; ○ the costs charged to the action were accounted in line with the Beneficiary's usual accounting practices; ○ no ineligible costs or excessive or reckless expenditure were declared (see Article 6 GA). <p>In addition, the Auditor verified that these goods and services were acquired in conformity with the Beneficiary's internal guidelines and procedures, in particular:</p> <ul style="list-style-type: none"> ○ if Beneficiary acted as a contracting authority within the meaning of Directive 	<p>53) Contracts for works or services did not cover tasks described in Annex 1.</p>	
		<p>54) Costs were allocated to the correct action and the goods were not placed in the inventory of durable equipment.</p>	
		<p>55) The costs were charged in line with the Beneficiary's accounting policy and were adequately supported.</p>	
		<p>56) No ineligible costs or excessive or reckless expenditure were declared. For internal invoices/charges only the cost element was charged, without any mark-ups.</p>	

	<p>2004/18/EC (or 2014/24/EU) or of Directive 2004/17/EC (or 2014/25/EU), the Auditor verified that the applicable national law on public procurement was followed and that the procurement contract complied with the Terms and Conditions of the Agreement.</p> <ul style="list-style-type: none"> ○ if the Beneficiary did not fall into the category above, the Auditor verified that the Beneficiary followed their usual procurement rules and respected the Terms and Conditions of the Agreement. <p>For the items included in the sample the Auditor also verified that:</p> <ul style="list-style-type: none"> ○ the Beneficiary ensured best value for money (key elements to appreciate the respect of this principle are the award of the contract to the bid offering best price-quality ratio, under conditions of transparency and equal treatment. In case an existing framework contract was used the Auditor also verified that the Beneficiary ensured it was established on the basis of the principle of best value for money under conditions of transparency and equal treatment); <p><i>SUCH GOODS AND SERVICES INCLUDE, FOR INSTANCE, CONSUMABLES AND SUPPLIES, DISSEMINATION (INCLUDING OPEN ACCESS), PROTECTION OF RESULTS, SPECIFIC EVALUATION OF THE ACTION IF IT IS REQUIRED BY THE AGREEMENT, CERTIFICATES ON THE FINANCIAL STATEMENTS IF THEY ARE REQUIRED BY THE AGREEMENT AND CERTIFICATES ON THE METHODOLOGY, TRANSLATIONS, REPRODUCTION.</i></p>	<p>57) Procurement rules, principles and guides were followed. There were documents of requests to different providers, different offers and assessment of the offers before selection of the provider in line with internal procedures and procurement rules. The purchases were made in accordance with the principle of best value for money.</p> <p><i>(When different offers were not collected the Auditor explains the reasons provided by the Beneficiary under the caption "Exceptions" of the Report. The JU will analyse this information to evaluate whether these costs might be accepted as eligible)</i></p>	
D.4	<p>AGGREGATED CAPITALISED AND OPERATING COSTS OF RESEARCH INFRASTRUCTURE</p> <p>The Auditor ensured the existence of a positive ex-ante assessment (issued by the EC Services) of the cost accounting methodology of the Beneficiary allowing it to apply the guidelines on direct costing for large research infrastructures in Horizon 2020.</p> <p><i>In the cases that a positive ex-ante assessment has been issued (see the standard factual findings 58-59 on the next column),</i></p>	<p>58) The costs declared as direct costs for Large Research Infrastructures (in the appropriate line of the Financial Statement) comply with the methodology described in the positive ex-ante assessment report.</p>	

	<p>The Auditor ensured that the beneficiary has applied consistently the methodology that is explained and approved in the positive ex ante assessment;</p> <p><i>In the cases that a positive ex-ante assessment has NOT been issued (see the standard factual findings 60 on the next column),</i></p> <p>The Auditor verified that no costs of Large Research Infrastructure have been charged as direct costs in any costs category;</p> <p><i>In the cases that a draft ex-ante assessment report has been issued with recommendation for further changes (see the standard factual findings 60 on the next column),</i></p> <ul style="list-style-type: none"> The Auditor followed the same procedure as above (when a positive ex-ante assessment has NOT yet been issued) and paid particular attention (testing reinforced) to the cost items for which the draft ex-ante assessment either rejected the inclusion as direct costs for Large Research Infrastructures or issued recommendations. 	59) Any difference between the methodology applied and the one positively assessed was extensively described and adjusted accordingly.	
		60) The direct costs declared were free from any indirect costs items related to the Large Research Infrastructure.	
D.5	<p>Costs of internally invoiced goods and services</p> <p>The Auditor sampled cost items selected randomly (<i>full coverage is required if there are fewer than 10 items, otherwise the sample should have a minimum of 10 item, or 10% of the total, whichever number is highest</i>).</p> <p>To confirm standard factual findings 61-65 listed in the next column, the Auditor:</p> <ul style="list-style-type: none"> obtained a description of the Beneficiary's usual cost accounting practice to calculate costs of internally invoiced goods and services (unit costs); reviewed whether the Beneficiary's usual cost accounting practice was applied for the Financial Statements subject of the present CFS; ensured that the methodology to calculate unit costs is being used in a consistent manner, based on objective criteria, regardless of the source of funding; verified that any ineligible items or any costs claimed under other budget categories, in particular indirect costs, have not been taken into account when calculating the costs of internally invoiced goods and services (see Article 6 GA); verified whether actual costs of internally invoiced goods and services were adjusted on 	<p>61) The costs of internally invoiced goods and services included in the Financial Statement were calculated in accordance with the Beneficiary's usual cost accounting practice.</p> <p>62) The cost accounting practices used to calculate the costs of internally invoiced goods and services were applied by the Beneficiary in a consistent manner based on objective criteria regardless of the source of funding.</p> <p>63) The unit cost is calculated using the actual costs for the good or service recorded in the Beneficiary's accounts, excluding any ineligible cost or</p>	

	<p>the basis of budgeted or estimated elements and, if so, verified whether those elements used are actually relevant for the calculation, and correspond to objective and verifiable information.</p> <ul style="list-style-type: none"> o verified that any costs of items which are not directly linked to the production of the invoiced goods or service (e.g. supporting services like cleaning, general accountancy, administrative support, etc. not directly used for production of the good or service) have not been taken into account when calculating the costs of internally invoiced goods and services. o verified that any costs of items used for calculating the costs internally invoiced goods and services are supported by audit evidence and registered in the accounts. o 	<p>costs included in other budget categories.</p> <p>64) The unit cost excludes any costs of items which are not directly linked to the production of the invoiced goods or service.</p> <p>65) The costs items used for calculating the actual costs of internally invoiced goods and services were relevant, reasonable and correspond to objective and verifiable information.</p>	
E	USE OF EXCHANGE RATES		
E.1	<p>a) For Beneficiaries with accounts established in a currency other than euros</p> <p>The Auditor sampled [] cost items selected randomly and verified that the exchange rates used for converting other currencies into euros were in accordance with the following rules established in the Agreement (<i>full coverage is required if there are fewer than 10 items, otherwise the sample should have a minimum of 10 item, or 10% of the total, whichever number is highest</i>):</p> <p><i>COSTS RECORDED IN THE ACCOUNTS IN A CURRENCY OTHER THAN EURO SHALL BE CONVERTED INTO EURO AT THE AVERAGE OF THE DAILY EXCHANGE RATES PUBLISHED IN THE C SERIES OF OFFICIAL JOURNAL OF THE EUROPEAN UNION (https://www.ecb.int/stats/exchange/eurofxref/html/index.en.html), DETERMINED OVER THE CORRESPONDING REPORTING PERIOD.</i></p> <p><i>IF NO DAILY EURO EXCHANGE RATE IS PUBLISHED IN THE OFFICIAL JOURNAL OF THE EUROPEAN UNION FOR THE CURRENCY IN QUESTION, CONVERSION SHALL BE MADE AT THE AVERAGE OF THE MONTHLY ACCOUNTING RATES ESTABLISHED BY THE COMMISSION AND PUBLISHED ON ITS WEBSITE (http://ec.europa.eu/budget/contracts_grants/info_contracts/inforeuro/inforeuro_en.cfm),</i></p>	<p>66) The exchange rates used to convert other currencies into Euros were in accordance with the rules established of the Grant Agreement and there was no difference in the final figures.</p>	

	<i>DETERMINED OVER THE CORRESPONDING REPORTING PERIOD.</i>		
	<p><u>b) For Beneficiaries with accounts established in euros</u></p> <p>The Auditor sampled [] cost items selected randomly and verified that the exchange rates used for converting other currencies into euros were in accordance with the following rules established in the Agreement (<i>full coverage is required if there are fewer than 10 items, otherwise the sample should have a minimum of 10 item, or 10% of the total, whichever number is highest</i>):</p> <p><i>COSTS INCURRED IN ANOTHER CURRENCY SHALL BE CONVERTED INTO EURO BY APPLYING THE BENEFICIARY'S USUAL ACCOUNTING PRACTICES.</i></p>	67) 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 UNDER THE HORIZON 2020 RESEARCH AND INNOVATION FRAMEWORK PROGRAMME

INDEPENDENT REPORT OF FACTUAL FINDINGS ON THE METHODOLOGY CONCERNING GRANT AGREEMENTS FINANCED UNDER THE HORIZON 2020 RESEARCH AND INNOVATION FRAMEWORK PROGRAMME

**Terms of reference for an audit engagement for a methodology certificate
in connection with one or more grant agreements financed
by [Clean Sky 2] [Bio Based Industries][ECSEL][Fuel Cells and Hydrogen 2][Innovative
Medicines Initiative 2][Single European Sky Air Traffic Management Research
(SESAR)][Shift2Rail] JU under the Horizon 2020 Research and Innovation Framework
Programme**

This document sets out the ‘**Terms of Reference (ToR)**’ under which

[OPTION 1: *[insert name of the beneficiary]* (*‘the Beneficiary’*)] [OPTION 2: *[insert name of the linked third party]* (*‘the Linked Third Party’*), third party linked to the Beneficiary *[insert name of the beneficiary]* (*‘the Beneficiary’*)]

agrees to engage

[insert legal name of the auditor] (*‘the Auditor’*)

to produce an independent report of factual findings (*‘the Report’*) concerning the *[Beneficiary’s]* *[Linked Third Party’s]* usual accounting practices for calculating and claiming direct personnel costs declared as unit costs (*‘the Methodology’*) in connection with grant agreements financed under the Horizon 2020 Research and Innovation Framework Programme.

The procedures to be carried out for the assessment of the methodology will be based on the grant agreement(s) detailed below:

[title and number of the grant agreement(s)] (*‘the Agreement(s)’*)

The Agreement(s) has(have) been concluded between the Beneficiary and the *[Clean Sky 2][Bio Based Industries][ECSEL][Fuel Cells and Hydrogen 2][Innovative Medicines Initiative 2][Single European Sky Air Traffic Management Research (SESAR)][Shift2Rail]* Joint Undertaking (*‘the JU’*).

The JU is mentioned as a signatory of the Agreement with the Beneficiary only. The JU is not a party to this engagement.

1.1 Subject of the engagement

According to Article 18.1.2 of the Agreement, beneficiaries *[and linked third parties]* that declare direct personnel costs as unit costs calculated in accordance with their usual cost accounting practices may submit to the JU, for approval by the European Commission (*‘the Commission’*), a certificate on the methodology (*‘CoMUC’*) stating that there are adequate records and documentation to prove that their cost accounting practices used comply with the conditions set out in Point A of Article 6.2.

The subject of this engagement is the CoMUC which is composed of two separate documents:

- the Terms of Reference (*‘the ToR’*) to be signed by the *[Beneficiary]* *[Linked Third Party]* and the Auditor;
- the Auditor’s Independent Report of Factual Findings (*‘the Report’*) issued on the Auditor’s letterhead, dated, stamped and signed by the Auditor which includes; the standard statements (*‘the Statements’*) evaluated and signed by the *[Beneficiary]* *[Linked Third Party]*, the agreed-upon procedures (*‘the Procedures’*) performed by the Auditor and the standard factual findings (*‘the Findings’*) assessed by the Auditor. The Statements, Procedures and Findings are summarised in the table that forms part of the Report.

The information provided through the Statements, the Procedures and the Findings will enable the Commission to draw conclusions regarding the existence of the *[Beneficiary's] [Linked Third Party's]* usual cost accounting practice and its suitability to ensure that direct personnel costs claimed on that basis comply with the provisions of the Agreement. The Commission draws its own conclusions from the Report and any additional information it may require.

1.2 Responsibilities

The parties to this agreement are the *[Beneficiary] [Linked Third Party]* and the Auditor.

The *[Beneficiary] [Linked Third Party]*:

- is responsible for preparing financial statements for the Agreement(s) ('the Financial Statements') in compliance with those Agreements;
- is responsible for providing the Financial Statement(s) to the Auditor and enabling the Auditor to reconcile them with the *[Beneficiary's] [Linked Third Party's]* accounting and bookkeeping system and the underlying accounts and records. The Financial Statement(s) will be used as a basis for the procedures which the Auditor will carry out under this ToR;
- is responsible for its Methodology and liable for the accuracy of the Financial Statement(s);
- is responsible for endorsing or refuting the Statements indicated under the heading 'Statements to be made by the Beneficiary/ Linked Third Party' in the first column of the table that forms part of the Report;
- must provide the Auditor with a signed and dated representation letter;
- accepts that the ability of the Auditor to carry out the Procedures effectively depends upon the *[Beneficiary] [Linked Third Party]* providing full and free access to the *[Beneficiary's] [Linked Third Party's]* staff and to its accounting and other relevant records.

The Auditor:

- *[Option 1 by default: is qualified to carry out statutory audits of accounting documents in accordance with Directive 2006/43/EC of the European Parliament and of the Council of 17 May 2006 on statutory audits of annual accounts and consolidated accounts, amending Council Directives 78/660/EEC and 83/349/EEC and repealing Council Directive 84/253/EEC or similar national regulations].*
- *[Option 2 if the Beneficiary or Linked Third Party has an independent Public Officer: is a competent and independent Public Officer for which the relevant national authorities have established the legal capacity to audit the Beneficiary].*
- *[Option 3 if the Beneficiary or Linked Third Party is an international organisation: is an [internal] [external] auditor in accordance with the internal financial regulations and procedures of the international organisation].*

The Auditor:

- must be independent from the Beneficiary *[and the Linked Third Party]*, in particular, it must not have been involved in preparing the Beneficiary's *[and Linked Third Party's]* Financial Statement(s);
- must plan work so that the Procedures may be carried out and the Findings may be assessed;
- must adhere to the Procedures laid down and the compulsory report format;
- must carry out the engagement in accordance with these ToR;
- must document matters which are important to support the Report;
- must base its Report on the evidence gathered;
- must submit the Report to the *[Beneficiary] [Linked Third Party]*.

The Commission sets out the Procedures to be carried out and the Findings to be endorsed by the Auditor. The Auditor is not responsible for their suitability or pertinence. As this engagement is not an assurance engagement the Auditor does not provide an audit opinion or a statement of assurance.

1.3 Applicable Standards

The Auditor must comply with these Terms of Reference and with¹:

- the International Standard on Related Services ('ISRS') 4400 *Engagements to perform Agreed-upon Procedures regarding Financial Information* as issued by the International Auditing and Assurance Standards Board (IAASB);
- the *Code of Ethics for Professional Accountants* issued by the International Ethics Standards Board for Accountants (IESBA). Although ISRS 4400 states that independence is not a requirement for engagements to carry out agreed-upon procedures, the Commission requires that the Auditor also complies with the Code's independence requirements.

The Auditor's Report must state that there was no conflict of interests in establishing this Report between the Auditor and the Beneficiary *[and the Linked Third Party]* that could have a bearing on the Report, and must specify – if the service is invoiced - the total fee paid to the Auditor for providing the Report.

1.4 Reporting

The Report must be written in the language of the Agreement (see Article 20.7 of the Agreement).

Under Article 22 of the Agreement, the JU, the Commission, the European Anti-Fraud Office and the Court of Auditors have the right to audit any work that is carried out under the action and for which costs are declared from the European Union budget. This includes work related to this engagement. The Auditor must provide access to all working papers related to this assignment if the JU, the Commission, the European Anti-Fraud Office or the European Court of Auditors requests them.

1.5 Timing

The Report must be provided by [dd Month yyyy].

1.6 Other Terms

[The [Beneficiary] [Linked Third Party] and the Auditor can use this section to agree other specific terms, such as the Auditor's fees, liability, applicable law, etc. Those specific terms must not contradict the terms specified above.]

[legal name of the Auditor]
[name & title of authorised representative]
[dd Month yyyy]
Signature of the Auditor

[legal name of the [Beneficiary] [Linked Third Party]]
[name & title of authorised representative]
[dd Month yyyy]
Signature of the [Beneficiary] [Linked Third Party]

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 *[Clean Sky 2] [Bio Based Industries][ECSEL][Fuel Cells and Hydrogen
2][Innovative Medicines Initiative 2][Single European Sky Air Traffic Management Research
(SESAR)][Shift2Rail] JU*
under the Horizon 2020 Research and Innovation Framework Programme**

(To be printed on letterhead paper of the auditor)

To

[name of contact person(s)], [Position]
[[Beneficiary's] [Linked Third Party's] name]
[Address]
[dd Month yyyy]

Dear [Name of contact person(s)],

As agreed under the terms of reference dated [dd Month yyyy]

with [OPTION 1: *[insert name of the beneficiary]* ('the Beneficiary')] [OPTION 2: *[insert name of the linked third party]* ('the Linked Third Party'), third party linked to the Beneficiary *[insert name of the beneficiary]* ('the Beneficiary')],

we

[name of the auditor] ('the Auditor'),

established at

[full address/city/state/province/country],

represented by

[name and function of an authorised representative],

have carried out the agreed-upon procedures ('the Procedures') and provide hereby our Independent Report of Factual Findings ('the Report'), concerning the *[Beneficiary's] [Linked Third Party's]* usual accounting practices for calculating and declaring direct personnel costs declared as unit costs ('the Methodology').

You requested certain procedures to be carried out in connection with the grant(s)

[title and number of the grant agreement(s)] ('the Agreement(s)').

The Report

Our engagement was carried out in accordance with the terms of reference ('the ToR') appended to this Report. The Report includes: the standard statements ('the Statements') made by the *[Beneficiary] [Linked Third Party]*, the agreed-upon procedures ('the Procedures') carried out and the standard factual findings ('the Findings') confirmed by us.

The engagement involved carrying out the Procedures and assessing the Findings and the documentation requested appended to this Report, the results of which the European Commission ('the Commission') uses to draw conclusions regarding the acceptability of the Methodology applied by the *[Beneficiary] [Linked Third Party]*.

The Report covers the methodology used from [dd Month yyyy]. In the event that the [Beneficiary] [Linked Third Party] changes this methodology, the Report will not be applicable to any Financial Statement¹ 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 Financial Statement in this context refers solely to Annex 4 of the Agreement by which the Beneficiary declares costs under the Agreement.

1. Brief description of the methodology for calculating personnel costs, productive hours and hourly rates;
2. Brief description of the time recording system in place;
3. An example of the time records used by the [Beneficiary] [Linked Third Party];
4. Description of any budgeted or estimated elements applied, together with an explanation as to why they are relevant for calculating the personnel costs and how they are based on objective and verifiable information;
5. A summary sheet with the hourly rate for direct personnel declared by the [Beneficiary] [Linked Third Party] and recalculated by the Auditor for each staff member included in the sample (the names do not need to be reported);
6. A comparative table summarising for each person selected in the sample a) the time claimed by the [Beneficiary] [Linked Third Party] in the Financial Statement(s) and b) the time according to the time record verified by the Auditor;
7. A copy of the letter of representation provided to the Auditor.

Use of this Report

This Report has been drawn up solely for the purpose given under Point 1.1 Reasons for the engagement.

The Report:

- is confidential and is intended to be submitted to the JU by the [Beneficiary] [Linked Third Party] in connection with Article 18.1.2 of the Agreement;
- may not be used by the [Beneficiary] [Linked Third Party], by the JU or by the Commission for any other purpose, nor distributed to any other parties;
- may be disclosed by the JU or by the Commission only to authorised parties, in particular the European Anti-Fraud Office (OLAF) and the European Court of Auditors.
- relates only to the usual cost accounting practices specified above and does not constitute a report on the Financial Statements of the [Beneficiary] [Linked Third Party].

No conflict of interest² 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

² A conflict of interest arises when the Auditor's objectivity to establish the certificate is compromised in fact or in appearance when the Auditor for instance:

- was involved in the preparation of the Financial Statements;
- stands to benefit directly should the certificate be accepted;
- has a close relationship with any person representing the beneficiary;
- is a director, trustee or partner of the beneficiary; or
- is in any other situation that compromises his or her independence or ability to establish the certificate impartially.

Statements to be made by the Beneficiary/Linked Third Party ('the Statements') and Procedures to be carried out by the Auditor ('the Procedures') and standard factual findings ('the Findings') to be confirmed by the Auditor

The European Commission ('the Commission') reserves the right to provide the auditor with guidance regarding the Statements to be made, the Procedures to be carried out or the Findings to be ascertained and the way in which to present them. The Commission reserves the right to vary the Statements, Procedures or Findings by written notification to the Beneficiary/Linked Third Party to adapt the procedures to changes in the grant agreement(s) or to any other circumstances.

If this methodology certificate relates to the Linked Third Party's usual accounting practices for calculating and claiming direct personnel costs declared as unit costs any reference here below to 'the Beneficiary' is to be considered as a reference to 'the Linked Third Party'.

<i>Please explain any discrepancies in the body of the Report.</i>	
Statements to be made by Beneficiary	Procedures to be carried out and Findings to be confirmed by the Auditor
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. <i>[Please describe the methodology your entity uses to calculate <u>personnel</u> costs, productive hours and hourly rates, present your description to the Auditor and annex it to this certificate]</i> <i>[If the statement of section "B. Description of the methodology" cannot be endorsed by the Beneficiary or there is no written methodology to calculate unit costs it should be listed here below and reported as exception by the Auditor in the main Report of Factual Findings: - ...]</i>	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	Procedure:

<i>Please explain any discrepancies in the body of the Report.</i>	
Statements to be made by Beneficiary	Procedures to be carried out and Findings to be confirmed by the Auditor
<u>General</u>	
IV. The unit costs (hourly rates) are limited to salaries including during parental leave, social security contributions, taxes and other costs included in the remuneration required under national law and the employment contract or equivalent appointing act;	<p><i>The Auditor draws a sample of employees to carry out the procedures indicated in this section C and the following sections D to F.</i> <i>[The Auditor has drawn a random sample of 10 employees assigned to Horizon 2020 action(s). If fewer than 10 employees are assigned to the Horizon 2020 action(s), the Auditor has selected all employees assigned to the Horizon 2020 action(s), complemented by other employees irrespective of their assignments until he has reached 10 employees.].</i> For this sample:</p> <ul style="list-style-type: none"> ✓ the Auditor reviewed all documents relating to personnel costs such as employment contracts, payslips, payroll policy (e.g. salary policy, overtime policy, variable pay policy), accounting and payroll records, applicable national tax, labour and social security law and any other documents corroborating the personnel costs claimed; ✓ in particular, the Auditor reviewed the employment contracts of the employees in the sample to verify that: <ul style="list-style-type: none"> i. they were employed directly by the Beneficiary in accordance with applicable national legislation; ii. they were working under the sole technical supervision and responsibility of the latter; iii. they were remunerated in accordance with the Beneficiary's usual practices; iv. they were allocated to the correct group/category/cost centre for the purposes of calculating the unit cost in line with the Beneficiary's usual cost accounting practices; ✓ the Auditor verified that any ineligible items or any costs claimed under other costs categories or costs covered by other types of grant or by other grants financed from the European Union budget have not been taken into account when calculating the personnel costs; ✓ the Auditor numerically reconciled the total amount of personnel costs used to calculate the unit cost with the total amount of personnel costs recorded in the statutory accounts and the payroll system. ✓ to the extent that actual personnel costs were adjusted on the basis of budgeted or estimated elements, the Auditor carefully examined those elements and checked the information source to confirm that they correspond to objective and verifiable information;
V. Employees are hired directly by the Beneficiary in accordance with national law, and work under its sole supervision and responsibility;	
VI. The Beneficiary remunerates its employees in accordance with its usual practices. This means that personnel costs are charged in line with the Beneficiary's usual payroll policy (e.g. salary policy, overtime policy, variable pay) and no special conditions exist for employees assigned to tasks relating to the European Union or Euratom, unless explicitly provided for in the grant agreement(s);	
VII. The Beneficiary allocates its employees to the relevant group/category/cost centre for the purpose of the unit cost calculation in line with the usual cost accounting practice;	
VIII. Personnel costs are based on the payroll system and accounting system.	
IX. Any exceptional adjustments of actual personnel costs resulted from relevant budgeted or estimated elements and were based on objective and verifiable information. <i>[Please describe the 'budgeted or estimated elements' and their relevance to personnel costs, and explain how they were reasonable and based on objective and verifiable information, present your explanation to the Auditor and annex it to this certificate].</i>	
X. Personnel costs claimed do not contain any of the following ineligible costs: costs related to return on capital; debt and debt service charges; provisions for future losses or debts; interest owed; doubtful debts; currency exchange losses; bank costs charged by the Beneficiary's bank for transfers from the JU; excessive or reckless expenditure; deductible VAT or costs incurred during suspension of the implementation of the action.	
XI. Personnel costs were not declared under another EU or Euratom grant (including grants awarded by a Member State and financed by the EU budget and grants awarded by bodies other than the JU for the purpose of implementing the EU or Euratom budget in the same period, unless the Beneficiary can demonstrate that the operating grant does not cover any costs of the action).	

<i>Please explain any discrepancies in the body of the Report.</i>	
Statements to be made by Beneficiary	Procedures to be carried out and Findings to be confirmed by the Auditor
<p><u>If additional remuneration as referred to in the grant agreement(s) is paid</u></p> <p>XII. The Beneficiary is a non-profit legal entity;</p> <p>XIII. The additional remuneration is part of the beneficiary's usual remuneration practices and paid consistently whenever the relevant work or expertise is required;</p> <p>XIV. The criteria used to calculate the additional remuneration are objective and generally applied regardless of the source of funding;</p> <p>XV. The additional remuneration included in the personnel costs used to calculate the hourly rates for the grant agreement(s) is capped at EUR 8 000 per full-time equivalent (reduced proportionately if the employee is not assigned exclusively to the action).</p> <p><i>[If certain statement(s) of section "C. Personnel costs" cannot be endorsed by the Beneficiary they should be listed here below and reported as exception by the Auditor in the main Report of Factual Findings:</i> - ...]</p>	<p>✓ if additional remuneration has been claimed, the Auditor verified that the Beneficiary was a non-profit legal entity, that the amount was capped at EUR 8 000 per full-time equivalent and that it was reduced proportionately for employees not assigned exclusively to the action(s).</p> <p>✓ the Auditor recalculated the personnel costs for the employees in the sample.</p> <p>Factual finding:</p> <ol style="list-style-type: none"> All the components of the remuneration that have been claimed as personnel costs are supported by underlying documentation. 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. Their employment contracts were in line with the Beneficiary's usual policy; 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.); The totals used to calculate the personnel unit costs are consistent with those registered in the payroll and accounting records; 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). Personnel costs contained no ineligible elements; Specific conditions for eligibility were fulfilled when additional remuneration was paid: a) the Beneficiary is registered in the grant agreements as a non-profit legal entity; b) it was paid according to objective criteria generally applied regardless of the source of funding used and c) remuneration was capped at EUR 8 000 per full-time equivalent (or up to up to the equivalent pro-rata amount if the person did not work on the action full-time during the year or did not work

<i>Please explain any discrepancies in the body of the Report.</i>	
Statements to be made by Beneficiary	Procedures to be carried out and Findings to be confirmed by the Auditor
	exclusively on the action).
<p>D. Productive hours</p> <p>XVI. The number of productive hours per full-time employee applied is <i>[delete as appropriate]</i>:</p> <p>A. 1720 productive hours per year for a person working full-time (corresponding pro-rata for persons not working full time).</p> <p>B. the total number of hours worked in the year by a person for the Beneficiary</p> <p>C. the standard number of annual hours generally applied by the beneficiary for its personnel in accordance with its usual cost accounting practices. This number must be at least 90% of the standard annual workable hours.</p> <p><u>If method B is applied</u></p> <p>XVII. The calculation of the total number of hours worked was done as follows: annual workable hours of the person according to the employment contract, applicable labour agreement or national law plus overtime worked minus absences (such as sick leave and special leave).</p> <p>XVIII. ‘Annual workable hours’ are hours during which the personnel must be working, at the employer’s disposal and carrying out his/her activity or duties under the employment contract, applicable collective labour agreement or national working time legislation.</p> <p>XIX. The contract (applicable collective labour agreement or national working time legislation) do specify the working time enabling to calculate the annual workable hours.</p> <p><u>If method C is applied</u></p> <p>XX. The standard number of productive hours per year is that of a full-time equivalent.</p> <p>XXI. The number of productive hours per year on which the hourly rate is based i) corresponds to the Beneficiary’s usual accounting practices; ii) is at least 90% of the standard number of workable (working) hours per year.</p>	<p>Procedure (same sample basis as for Section C: Personnel costs):</p> <ul style="list-style-type: none"> ✓ The Auditor verified that the number of productive hours applied is in accordance with method A, B or C. ✓ The Auditor checked that the number of productive hours per full-time employee is correct. ✓ If method B is applied the Auditor verified i) the manner in which the total number of hours worked was done and ii) that the contract specified the annual workable hours by inspecting all the relevant documents, national legislation, labour agreements and contracts. ✓ If method C is applied the Auditor reviewed the manner in which the standard number of working hours per year has been calculated by inspecting all the relevant documents, national legislation, labour agreements and contracts and verified that the number of productive hours per year used for these calculations was at least 90% of the standard number of working hours per year. <p>Factual finding:</p> <p><u>General</u></p> <p>12. The Beneficiary applied a number of productive hours consistent with method A, B or C detailed in the left-hand column.</p> <p>13. The number of productive hours per year per full-time employee was accurate.</p> <p><u>If method B is applied</u></p> <p>14. The number of ‘annual workable hours’, overtime and absences was verifiable based on the documents provided by the Beneficiary and the calculation of the total number of hours worked was accurate.</p> <p>15. The contract specified the working time enabling to calculate the annual workable hours.</p> <p><u>If method C is applied</u></p> <p>16. The calculation of the number of productive hours per year corresponded</p>

Please explain any discrepancies in the body of the Report.	
Statements to be made by Beneficiary	Procedures to be carried out and Findings to be confirmed by the Auditor
<p>XXII. Standard workable (working) hours are hours during which personnel are at the Beneficiary's disposal performing the duties described in the relevant employment contract, collective labour agreement or national labour legislation. The number of standard annual workable (working) hours that the Beneficiary claims is supported by labour contracts, national legislation and other documentary evidence.</p> <p><i>[If certain statement(s) of section "D. Productive hours" cannot be endorsed by the Beneficiary they should be listed here below and reported as exception by the Auditor: - ...]</i></p>	<p>to the usual costs accounting practice of the Beneficiary.</p> <p>17. The calculation of the standard number of workable (working) hours per year was corroborated by the documents presented by the Beneficiary.</p> <p>18. The number of productive hours per year used for the calculation of the hourly rate was at least 90 % of the number of workable (working) hours per year.</p>
<p>E. Hourly rates</p> <p>The hourly rates are correct because:</p> <p>XXIII. Hourly rates are correctly calculated since they result from dividing annual personnel costs by the productive hours of a given year and group (e.g. staff category or department or cost centre depending on the methodology applied) and they are in line with the statements made in section C. and D. above.</p> <p><i>[If the statement of section 'E. Hourly rates' cannot be endorsed by the Beneficiary they should be listed here below and reported as exception by the Auditor: - ...]</i></p>	<p>Procedure</p> <ul style="list-style-type: none"> ✓ The Auditor has obtained a list of all personnel rates calculated by the Beneficiary in accordance with the methodology used. ✓ The Auditor has obtained a list of all the relevant employees, based on which the personnel rate(s) are calculated. <p>For 10 employees selected at random (same sample basis as Section C: Personnel costs):</p> <ul style="list-style-type: none"> ✓ The Auditor recalculated the hourly rates. ✓ The Auditor verified that the methodology applied corresponds to the usual accounting practices of the organisation and is applied consistently for all activities of the organisation on the basis of objective criteria irrespective of the source of funding. <p>Factual finding:</p> <p>19. No differences arose from the recalculation of the hourly rate for the employees included in the sample.</p>
<p>F. Time recording</p> <p>XXIV. Time recording is in place for all persons with no exclusive dedication to one Horizon 2020 action. At least all hours worked in connection with the grant agreement(s) are registered on a daily/weekly/monthly basis <i>[delete as appropriate]</i> using a paper/computer-based system <i>[delete as appropriate]</i>;</p> <p>XXV. For persons exclusively assigned to one Horizon 2020 activity the Beneficiary has either signed a declaration to that effect or has put</p>	<p>Procedure</p> <ul style="list-style-type: none"> ✓ The Auditor reviewed the brief description, all relevant manuals and/or internal guidance describing the methodology used to record time. <p>The Auditor reviewed the time records of the random sample of 10 employees referred to under Section C: Personnel costs, and verified in particular:</p>

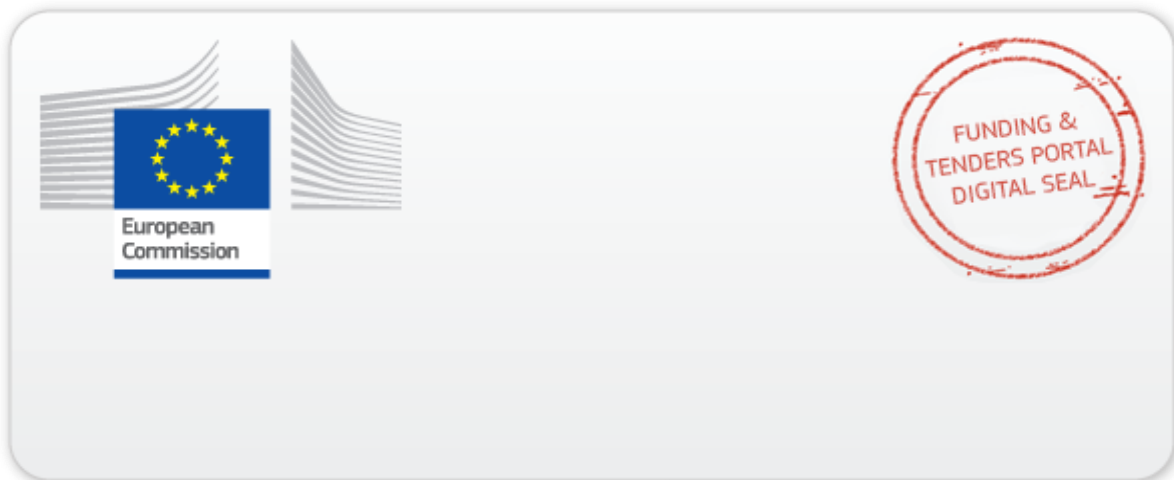
<i>Please explain any discrepancies in the body of the Report.</i>	
Statements to be made by Beneficiary	Procedures to be carried out and Findings to be confirmed by the Auditor
<p>arrangements in place to record their working time;</p> <p>XXVI. Records of time worked have been signed by the person concerned (on paper or electronically) and approved by the action manager or line manager at least monthly;</p> <p>XXVII. Measures are in place to prevent staff from:</p> <ul style="list-style-type: none"> i. recording the same hours twice, ii. recording working hours during absence periods (e.g. holidays, sick leave), iii. recording more than the number of productive hours per year used to calculate the hourly rates, and iv. recording hours worked outside the action period. <p>XXVIII. No working time was recorded outside the action period;</p> <p>XXIX. No more hours were claimed than the productive hours used to calculate the hourly personnel rates.</p> <p><i>[Please provide a brief description of the <u>time recording system</u> in place together with the measures applied to ensure its reliability to the Auditor and annex it to the present certificate¹].</i></p> <p><i>[If certain statement(s) of section “F. Time recording” cannot be endorsed by the Beneficiary they should be listed here below and reported as exception by the Auditor: - ...]</i></p>	<ul style="list-style-type: none"> ✓ that time records were available for all persons with not exclusive assignment to the action; ✓ that time records were available for persons working exclusively for a Horizon 2020 action, or, alternatively, that a declaration signed by the Beneficiary was available for them certifying that they were working exclusively for a Horizon 2020 action; ✓ that time records were signed and approved in due time and that all minimum requirements were fulfilled; ✓ that the persons worked for the action in the periods claimed; ✓ that no more hours were claimed than the productive hours used to calculate the hourly personnel rates; ✓ that internal controls were in place to prevent that time is recorded twice, during absences for holidays or sick leave; that more hours are claimed per person per year for Horizon 2020 actions than the number of productive hours per year used to calculate the hourly rates; that working time is recorded outside the action period; ✓ the Auditor cross-checked the information with human-resources records to verify consistency and to ensure that the internal controls have been effective. In addition, the Auditor has verified that no more hours were charged to Horizon 2020 actions per person per year than the number of productive hours per year used to calculate the hourly rates, and verified that no time worked outside the action period was charged to the action. <p>Factual finding:</p> <p>20. The brief description, manuals and/or internal guidance on time recording provided by the Beneficiary were consistent with management</p>

¹ The description of the time recording system must state among others information on the content of the time records, its coverage (full or action time-recording, for all personnel or only for personnel involved in H2020 actions), its degree of detail (whether there is a reference to the particular tasks accomplished), its form, periodicity of the time registration and authorisation (paper or a computer-based system; on a daily, weekly or monthly basis; signed and countersigned by whom), controls applied to prevent double-charging of time or ensure consistency with HR-records such as absences and travels as well as its information flow up to its use for the preparation of the Financial Statements.

<i>Please explain any discrepancies in the body of the Report.</i>	
Statements to be made by Beneficiary	Procedures to be carried out and Findings to be confirmed by the Auditor
	<p>reports/records and other documents reviewed and were generally applied by the Beneficiary to produce the financial statements.</p> <p>21. For the random sample time was recorded or, in the case of employees working exclusively for the action, either a signed declaration or time records were available;</p> <p>22. For the random sample the time records were signed by the employee and the action manager/line manager, at least monthly.</p> <p>23. Working time claimed for the action occurred in the periods claimed;</p> <p>24. No more hours were claimed than the number productive hours used to calculate the hourly personnel rates;</p> <p>25. There is proof that the Beneficiary has checked that working time has not been claimed twice, that it is consistent with absence records and the number of productive hours per year, and that no working time has been claimed outside the action period.</p> <p>26. Working time claimed is consistent with that on record at the human-resources department.</p>

[official name of the [Beneficiary] [Linked Third Party]]
[name and title of authorised representative]
[dd Month yyyy]
<Signature of the [Beneficiary] [Linked Third Party]>

[official name of the Auditor]
[name and title of authorised representative]
[dd Month yyyy]
<Signature of the Auditor>



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