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| OUTLINE PROPOSAL TEMPLATE – ARTES C&G |
| PROJECT NAME – Company name |
| Date: ……  Reference: …… |

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| --- |
| [Author]  [Pick the date] |

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| --- |
| [Author]  [Pick the date] |

**OUTLINE PROPOSAL TEMPLATE - ARTES C&G**

Ver. 2.0

**Notes:**

1. To prepare this Outline Proposal, please take into consideration the basic information about the ARTES C&G programme element provided on the ARTES web site: <https://artes.esa.int/news/evolution-artes-3-4-and-5>
2. An ARTES C&G outline proposal for a development activity shall comprise the following two elements:
   1. A document describing the Product Development Plan and the proposed associated activity(ies) (this template, duly completed as appropriate).
   2. One or more supporting spreadsheet documents (“Financial Forecast Workbooks”) that provide the financial analysis elements of your business plan.

Financial Forecast Workbook templates can be downloaded at <https://artes.esa.int/documents>. Please select the template that is most appropriate for your proposed activity (“Space Segment and System”, or “Ground Segment and Applications”)

1. Formal authorisation from the National Delegation(s) of the companies involved is required for the proposed activity at the time of submission of the Full Proposal. Therefore, the bidder is advised to begin discussions with the relevant National Delegate(s) prior to submitting the outline proposal.
2. To initiate the outline proposal review process, the completed documents must be sent to the following email address: [artes‑cg@esa.int](mailto:artescg@esa.int). An outline proposal will be informally reviewed by the Agency, but only if both elements are provided simultaneously. It is preferable that you provide the completed spreadsheet file(s) in Excel format. However, you may include the financial analyses as PDF attachments to your proposal document.
3. Please ensure that the submitted versions of the two elements are mutually consistent. Failure to do so may lead to feedback delay.
4. The content of this template should be copied into your own corporate template for the purposes of preparing your outline proposal. Please note that the document can bear company-internal protective markings, but to avoid confusion with formal and internationally agreed markings for “Classified Information”, the following terminology shall be avoided:

* Restricted (or Restreint)
* Confidential (or Confidentiel)
* Secret
* Top Secret

1. Parts highlighted in yellow in this template should be modified as appropriate for your proposed activity.
2. Text in blue and in a smaller font size (example) is for guidance and can be removed from the completed outline proposal document.
3. In Section 1 (“Overview of the Proposed Activity”) and Section 2 (“Business Plan”) of this document, please refer to the relevant tables of the attached financial forecast workbook(s), providing supplementary information as necessary to substantiate the assumptions behind the commercial forecasts. Each financial forecast workbook includes guidance on how it should be used.
4. For the reader’s convenience, you may wish to include the relevant tables of the completed Financial Forecast Workbook in this document. If so, the following procedure is suggested, to be followed once you have finalised the content of the spreadsheet file (business plan assumptions and calculations):
   1. Select and copy the cells in the spreadsheet that constitute the table to be included in this document.
   2. Paste the cell data copied from the spreadsheet using the following option (to avoid formatting issues): “Paste Special… Picture (Enhanced Metafile)”.

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# Overview of the Proposed Activity

## Company Information

|  |  |  |  |
| --- | --- | --- | --- |
| **Company Details** |  | **Contact Point** |  |
| Company Name: | ……… | Name: | ……… |
| Address: | ……… | Function: | ……… |
| Country: | ……… | Telephone: | ……… |
| SME Status: | yes/no | E-Mail: | ……… |

Key company information follows: ………

Indicate the company size, turnover and structure and provide an overview of the product portfolio.

## Activity Scope and Schedule

*Please indicate, in the table below, the development phase(s) (Definition, Technology, Product and Demonstration), for which financial support is being requested in the present proposal. Include/remove table rows as appropriate. Please also indicate, by placing an “X” in the relevant table cell(s), which Domain(s) (Space Segment, Ground Segment, Application and/or System) are being addressed in each development phase.*

*Please remember to complete Section 4 of this template if you are requesting support for a Space Segment Demonstration Phase (Atlas).*

This proposal addresses the following development phases and segments:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Development Phase** | **Space Segment** | **Ground Segment** | **Application** | **System** |
| Definition Phase | X | X | X | X |
| Technology Phase | X | X | X | X |
| Product Phase | X | X | X | X |
| Demonstration Phase | X | X | X | X |

Please indicate the intended start date and the estimated project duration.

|  |  |  |
| --- | --- | --- |
| Activity Planning: | Intended Start Date: | Month Year |
|  | Intended Duration (months): | Xx |

To assist ESA in making sure resources are available to review the full proposal in a timely manner please provide the date you are targeting to be in a position to submit the full proposal. The full proposal should not be submitted prior to receiving approval from ESA to submit a full proposal and the date given below will be used by ESA for planning purposes only.

The company is targeting to submit the full proposal on: Day/Month/Year

## Background and Motivation

Briefly explain the background and motivation for the proposed development.

The background and motivation for the proposed development is as follows: ……..

## Overall Planning and Cost Summary

Development phases that overlap in time are allowed. However, the Financial Forecast Workbook for the Ground Segment and Applications assumes that the commercial phase does not overlap with the development phases. In case of a different assumption, please provide any relevant information.

If appropriate, you may break down any development phase into separate work items.

The “Planning and Costing Summary” table of the attached financial forecast workbook provides an estimation of the cost and schedule for all development and follow up activities[[1]](#footnote-1) required before commercial exploitation.[[2]](#footnote-2)

Optionally, you may provide a copy of the table in this section, replacing the illustrative example given below.

A copy of this table is provided below.

Table 1.1 Planning and Costing Summary



## Cost and Price Breakdown

The following table presents the cost and requested ESA funding for each development phase included in this proposal.

Please note that your National Delegation may only support only one Development Phase at a time.

Please note that a copy of table 1.2 will be sent to all the relevant national delegates by ESA upon submission of the outline proposal if they are not in copy of the email containing the outline proposal.

Table .2 Cost and Price Breakdown

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Development Phase** | **Company/ Organisation** | **Country** | **Cost (k€)** | **Price (k€) (requested from ESA)** | **% Funding from ESA** | **National Delegation Support[[3]](#footnote-3)** |
| ……… | Prime | ……… | ……… | ……… | ……… | yes/no |
|  | Subcontractor 1 | ……… | ……… | ……… | ……… | yes/no |
|  | Subcontractor 2 | ……… | ……… | ……… | ……… | yes/no |
|  | ……… | ……… | ……… | ……… | ……… | yes/no |
| ……… | Prime | ……… | ……… | ……… | ……… | yes/no |
|  | Subcontractor 1 | ……… | ……… | ……… | ……… | yes/no |
|  | Subcontractor 2 | ……… | ……… | ……… | ……… | yes/no |
|  | ……… | ……… | ……… | ……… | ……… | yes/no |

## Expenditure Outside of the Countries of the Bidding Consortium

Expenditure above 50 k€ outside of the countries of the bidding consortium members (i.e. in other ESA Member States and/or outside of the ESA Member States) is/is not foreseen.

Include the text and complete the table below only if expenditure above 50 k€ is foreseen outside of the countries of the bidding consortium members.

The estimated expenditure is detailed in the table below.

Table .3 Estimated Expenditure Outside of the Bidding Consortium

|  |  |  |  |
| --- | --- | --- | --- |
| Destination of Expenditure | Total Expenditure | Country(ies) | Nature of Expenditure and Justification |
| Other ESA Member States | ……… k€ | ……… | ……… |
| Outside of the ESA Member States | ……… k€ | ……… | ……… |

## Deliverables

A list of all key deliverable items from the proposed development is given in the table below.

Table .4 Key Deliverable Items

|  |  |  |  |
| --- | --- | --- | --- |
| **Type** | **Deliverable Item** | **Phase(s)[[4]](#footnote-4)** | **Notes** |
| hardware/ software/……… | ……… | Technology | ……… |
| hardware/ software/……… | ……… | Product | ……… |
| ……… | ……… | ……… | ……… |

## Dependencies on Other Activities

The proposed activity is/is not a follow-up of a previous activity/previous activities.

Include the text and complete the table below only if the proposed activity is a follow-up of a previous activity or activities.

Further details are provided in the table below.

Table .5 Previous Activities Followed Up by the Proposed Activity

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Programme[[5]](#footnote-5)** | **Activity Name[[6]](#footnote-6)** | **Completion Date****[[7]](#footnote-7)** | **Brief Description** | **Outcome7** |
| ……… | ……… | ……… | ……… | ……… |
| ……… | ……… | ……… | ……… | ……… |
| ……… | ……… | ……… | ……… | ……… |

There are/are no dependencies between the proposed activity and other activities falling outside of the scope of the proposed activity.

Include the text and complete the table below only if there are dependencies between the proposed activity and other activities falling outside of the scope of the proposed activity.

Further details are provided in the table below.

Table .6 Dependencies Between the Proposed Activity and Other Activities

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Programme[[8]](#footnote-8)** | **Activity Name** | **Completion Date[[9]](#footnote-9)** | **Brief Description** | **Nature of the Dependency[[10]](#footnote-10)** |
| ……… | ……… | ……… | ……… | ……… |
| ……… | ……… | ……… | ……… | ……… |
| ……… | ……… | ……… | ……… | ……… |

## Confirmed Business Case

Include this section only if you intend to propose an activity having a “confirmed business case”.

A “confirmed business case” is one that satisfies the following conditions:

­ The Tenderer has received a commercial order from a customer for the product to be developed.

­ A positive return on investment is anticipated based on this commercial order alone (i.e. it is not dependent upon any other product sales).

­ The product has reached an appropriate level of maturity, such that performance specifications and commercial terms and conditions have been released by the customer of the development to be undertaken.

The commercial opportunity must be judged as credible by ESA.

Specific provisions are made for proposed activities with a “confirmed business case”:

­ Certain elements of the Business Plan part of the proposal are optional and need not be provided, since the business case is confirmed by the commercial customer.

­ Prior work, which fulfils all required conditions, can be accepted for up to 20% of the cost of the Development Phase.

Provide the following statements in support of your claim of a confirmed business case:

The proposed activity has a confirmed business case and satisfies the associated criteria for eligibility/is expected to satisfy the associated criteria for eligibility at the time of Full Proposal submission:

1. A letter from our customer confirming their intended commercial procurement of our product/evidence that a commercial order has been placed for our product is attached as Annex X to this outline proposal.
2. Technical and commercial requirements have been received from the customer.
3. The Business Plan elements of our Outline Proposal show that a positive return on investment is secured based on this commercial order alone.

# Business Plan

The extent of information provided in this section shall be in line with the maturity of the proposed development phase(s) (e.g. for the initial Development Phases such as Definition and Technology, only preliminary information on the business case is required).

Elements 2.1 to 2.9 below can also be presented using a single page Business Model Canvas (available at <https://artes.esa.int/documents>).

The supporting spreadsheet (“C&G Space Segment and System – Financial Forecast Workbook”, or “C&G Ground Segment and Applications – Financial Forecast Workbook”) can be downloaded from the same location.

Assuming favourable feedback on your outline proposal by the Agency, the business plan provided here in the outline proposal should be carried forward to form part of your associated Full Proposal (with updated information, as appropriate).

It is not mandatory to complete Sections 2.2, 2.3, 2.4, 2.6, 2.7, 2.10 and 2.11 below if it is proposed to develop a product with a “confirmed business case”. See section 1.9 for more information.

## Customer Segments

The key customers/customer segments targeted by our product(s) are identified and described in the table below.

Table .1 Key Customers/Customer Segments and their Needs

|  |  |
| --- | --- |
| **Customer/Customer Segment** | **Customer Problems/Needs** |
| ……… | ……… |
| ……… | ……… |
| ……… | ……… |

The term “product” is defined in Annex 2. The proposed development activities shall increase the competitiveness of the target product(s). Such activities may include all developments necessary to achieve such a goal (e.g. new features, tools, processes, techniques and technologies). Please note that the Business Plan presented in this document shall be related to the target product(s) to be sold on the market. The target product(s) may include other elements or features not covered by the proposed activities.

If the product(s) is (are) targeting a few important customers, each customer should be clearly identified. Add any supplementary text you feel is necessary to clarify the nature of your intended customers and to explain their main needs.

## Value Propositions

This section is optional if you propose to develop a product with a “confirmed business case”.

The table below identifies the specific characteristics of our product(s) that will address the customer problems/needs identified previously. (e.g. performance, cost, new features)

Table .2 Key Product Characteristics

|  |  |
| --- | --- |
| **Customer Problem/Need** | **Product Characteristics Addressing this Problem/Need** |
| ……… | ……… |
| ……… | ……… |
| ……… | ……… |

Add any supplementary text that you feel is necessary to explain your value proposition fully. For example, you could explain how the proposed development fits into your overall product development strategy to meet the needs of the customers in the longer term. Indicate whether or not the adoption of the product is going to change the way the customers are traditionally running their business, for instance, if the product is bringing a disruptive innovation.

## Channels

This section is optional if you propose to develop a product with a “confirmed business case”.

In the commercial exploitation stage, our product(s) will be sold to the customers via these channels.

Indicate whether or not the sales channels are already established. If not, explain how they will be created. If customers are new for your company (i.e. your company has not sold products to them in the past), please explain your approach to reaching these customers.

## Customer Relationships

This section is optional if you propose to develop a product with a “confirmed business case”.

Our relationships with the key customers already exist/must be created/have to be improved.

Provide factual information, for instance, existing contracts with figures. If the product targets only one specific customer, a letter of interest from this customer has to be attached to the outline proposal, confirming the adequacy of the value proposition. Indicate whether or not customer representatives will be involved in the proposed project and, if so, the kind of formal agreement that you intend to set up with them.

## Revenue Streams

For the Definition and Technology Phases, an estimation (target) shall be provided in line with the maturity of the proposed activity. Provide estimated ROM prices including all features, even if they are developed outside of the proposed development activities.

Refer to the relevant table in the financial forecast workbook that records your assumptions regarding the product revenue stream:

* Table 2.3 “Product Pricing” for the Ground Segment and Applications.
* Table 3 “Product Sales Assumptions for the Commercial Exploitation Phase” for the Space Segment and Systems.

In the commercial exploitation stage, our product(s) will be sold to our customers as quantified in the relevant table of the attached financial forecast workbook.

Optionally, you may also provide a copy of the table in this section, replacing the table placeholder below.

A copy of this table is provided below.

## Key Resources and Dependencies

This section is optional if you propose to develop a product with a “confirmed business case”.

To realise our product and deliver the value propositions we confirm that all of the resources are in place. The critical resources and dependencies are defined in the following table.

Table .3 Key Resources and Dependencies

|  |  |  |  |
| --- | --- | --- | --- |
| **Development Phase** | **Required Resource** | **In Place** | **Potential Issues** |
| ……… | ……… | yes/no | ……… |
| ……… | ……… | yes/no | ……… |
| ……… | ……… | yes/no | ……… |

Resources could include, for example, assets, company competences, key suppliers, consultancy services, and manufacturing, test or other facilities. Indicate whether or not the resources are expected to be in place at the time of need. If not, explain the actions to be taken to secure their availability on time. Indicate potential issues associated with each key resource. These could include, for example, long lead items, software licensing, patent constraints, procurement policies and national/international restrictions (e.g. export restrictions).

## Key Activities

This section is optional if you propose to develop a product with a “confirmed business case”.

To realise our product and deliver the value propositions we need to perform the key activities identified in the table below for each of the proposed development phases.

Table .4 Overview of Key Activities

|  |  |  |
| --- | --- | --- |
| **Development Phase** | **Key Activity** | **Description** |
| ……… | ……… | ……… |
| ……… | ……… | ……… |
| ……… | ……… | ……… |

List all of the main activities that are to be performed in each of the proposed development phases (those that are considered critical to the success of that development phase). These could include, for example, evaluating a new technology, developing a new subsystem, interface adaptations, manufacturing process development, materials development, software/firmware development, and qualification and test activities. Briefly explain the criticality of each key activity to the success of the associated development phase and to the overall activity. When compiling this list of key activities, please keep in mind that activities performed in the Technology Phase must target technical risk mitigation and not product qualification or industrialisation (these types of activity belong in the Product Phase).

## Key Partners

The value chain involves the actors defined in the table below.

Table .5 Key Partners

|  |  |  |  |
| --- | --- | --- | --- |
| **Partner Type** (e.g. Satellite Prime, Operator, Service Provider, Supplier, User, Customer) | **Partner Name** (company name, country, web link) | **Involvement in the Project** (e.g. none, subcontractor, supplier, pilot user, alpha customer, integrator) | **Type of Agreement** (e.g. NDA, partnership agreement, contract) |
| ……… | ……… | ……… | ……… |
| ……… | ……… | ……… | ……… |
| ……… | ……… | ……… | ……… |

## Cost Structure

Refer to the relevant table(s) in the financial forecast workbook that record your assumptions regarding the costs associated with the commercial exploitation phase:

* Table 2.7 “Cost of Sales”, Table 2.8 “Operational Expenditures” and Table 2.9 “Capital Expenditures” for the Ground Segment and Applications.
* Table 3 “Product Sales Assumptions for the Commercial Exploitation Phase” for the Space Segment and Systems.

The key elements of cost for realising the value proposition are presented in the attached financial forecast workbook.

Optionally, you may also provide a copy of the relevant table(s) in this section, replacing the table placeholders below, as appropriate.

A copy of this table/these tables is provided below.

The following assumptions have been made when deriving the figures provided in this cost analysis: ……

## Competitive Landscape

This section is optional if you propose to develop a product with a “confirmed business case”.

Our product is addressing the sector of …… (e.g. provide a few examples), which has the following characteristics: …. (e.g. geographical reach, trends, sales model).

Our key competitors and the nature of the competition are identified in the table below.

Table .10 Summary of the Competition

|  |  |  |
| --- | --- | --- |
| **Competitor** | **Nature of Competition** | **References** |
| ……… | ……… | ……… |
| ……… | ……… | ……… |
| ……… | ……… | ……… |

Indicate the nature of the competition for each of the identified competitors. For example, an existing or potential supplier of the same type of product, an established supplier of similar products, a new entrant to the market, an entity known or suspected to have plans to develop the same type of product, a market incumbent. Quantify the nature of the competition as far as possible (e.g. provide estimates of their market share, competitiveness in terms of pricing, etc.). Provide references to substantiate your assessment of the competition (e.g. web links, references to market analyses, data sheets, etc.).

Our key competitive differentiations are summarised in the following table.

Please note that a SWOT analysis and the corresponding strategic options to achieve the commercial goal are only required for the Outline Proposal when the proposed development phase(s) target **a new product** (you can remove the table below if not applicable). However, the Full Proposal shall include the SWOT analysis and the strategic options.

Table .11 SWOT Analysis

|  |  |
| --- | --- |
| STRENGTHS  - List of strengths | WEAKNESSES  - List of weaknesses |
| OPPORTUNITIES - List of opportunities | THREATS - List of threats |

Strengths are characteristics that give you an advantage over your competitors. Weaknesses are characteristics that place you at a disadvantage with respect to the competition. Opportunities are (usually external) elements that you could exploit to improve your business prospects. Threats are elements (e.g. external influences) that could threaten your business prospects. Add supplementary material as necessary to describe fully the competitive environment.

Based on the SWOT analysis, please identify your strategic options to achieve the commercial goals.

## Market Analysis

This section is optional if you propose to develop a product with a “confirmed business case”.

The position of our product in the market is summarised in the matrix below.

Table .12 Market Positioning

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  | **Product** | | |
|  |  | **Existing** | **Incremental** | **New** |
| **Market** | **Existing** | X | X | X |
| **Adjacent** | X | X | X |
| **New** | X | X | X |

Refer to the relevant table(s) in the financial forecast workbook that record your assumptions regarding the sales that you expect to be realised in the commercial exploitation phase:

* Table 2.2 “Served Obtainable Market” for the Ground Segment and Applications.
* Table 3 “Product Sales Assumptions for the Commercial Exploitation Phase” for the Space Segment and Systems.

Our projection in terms of the market we aim to capture in the short term for each of the identified commercial opportunities is shown in the attached financial forecast workbook.

Optionally, you may also provide a copy of the relevant table in this section, replacing the table placeholder below.

A copy of this table is provided below.

Present the underlying assumptions behind the estimated sales volumes over time.

The assumptions behind this sales projection are ….

## Financial Indicators

Refer to the relevant tables and figures in the financial forecast workbook that quantify the expected return on investment:

* Table 2.13 “Profit & Loss and Cash Flow Statement” and Table 2.14 “Financial Indicators with and without ESA Support” for the Ground Segment and Applications.
* Table 6 “Financial Indicators” and Figure 1 “Cumulative Discounted Cash Flow” for the Space Segment and Systems.

The financial forecast is detailed in the attached financial forecast workbook. It shows the impact of ESA financial support on the return on investment.

Optionally, you may also provide a copy of the relevant tables/figures in this section, replacing the placeholders below.

A copy of the relevant information is provided below.

# Product Definition, Development and Verification

## Product Description

The product consists of ………… The main components of the product are …….

The product is illustrated in the following high-level block diagram, which identifies the key building blocks and major interfaces.

Insert a block diagram showing key features/performance/attributes, and highlight key building blocks and major interfaces.

The main functional modules are described in the table below.

Table .1 Functional Modules of the Product

|  |  |  |  |
| --- | --- | --- | --- |
| **Module** | **Functions/Features** | **Description** | **Critical Technologies/ Techniques** |
| ……… | ……… | ……… | ……… |
| ……… | ……… | ……… | ……… |
| ……… | ……… | ……… | ……… |

The external interfaces of the product are summarised in the table below.

Table .2 External Interfaces of the Product

|  |  |  |
| --- | --- | --- |
| **Interface Identification** | **Key Parameters** | **Purpose** |
| ……… | ……… | ……… |
| ……… | ……… | ……… |
| ……… | ……… | ……… |

Include text to describe how the product operates in its host environment (e.g. its parent sub-system, the end-to-end system) if this is not fully described by the above elements, or if some elements need further explanation or clarification.

## Development Approach

An overview of the proposed development approach is given in the table below.

Table .3 Overview of the Proposed Development Approach

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Item** | **Current TRL** | **Basis of the Current TRL/SRL Assessment[[11]](#footnote-11)** | **Developed in the Proposed Activity** | **Development Phase(s)[[12]](#footnote-12)** | **Target TRL/SRL[[13]](#footnote-13)** | **Development Activities[[14]](#footnote-14)** |
| ……… | ……… | ……… | yes/no | ……… | ……… |  |
| ……… | ……… | ……… | yes/no | ……… | ……… |  |
| ……… | ……… | ……… | yes/no | ……… | ……… |  |

An item could be, for example, a module, sub-system, component, technique or process. The assessment of the current TRL/SRL should be substantiated by a brief description of the status of maturity or heritage of the product, with supporting evidence wherever possible.

Provide supplementary text below to explain the development approach.

The starting point for our product development is …

The key elements to be developed in the proposed phase are …

Describe the source of the key building blocks, such as existing elements and/or all items to be developed.

Our proposed development approach is the following: …

This will result in the following hardware/software models to be built, tested and delivered: …

Include the following text and table if the proposed activity includes a Space Segment element. Modify and complete the table as appropriate, ensuring consistency with the deliverables listed in Section 1.7.

Verification of the space segment product and its constituent elements will be performed using the models identified in the following table.

Table .4 Model Philosophy

|  |  |
| --- | --- |
| **Item** | **Model(s)** |
| ……… | BB, EM, EQM, PFM (delete as appropriate) |
| ……… | BB, EM, EQM, PFM (delete as appropriate) |
| ……… | BB, EM, EQM, PFM (delete as appropriate) |

## Risks

The major development risks associated with the proposed activity are summarised in the following table.

Complete the following table as appropriate.

Table .5 Overview of the Major Development Risks[[15]](#footnote-15) and the Proposed Risk Mitigation Actions

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Risk Identifier** | **Description** | **Likelihood** | **Severity** | **Mitigation Actions** | **Mitigation Phase(s)[[16]](#footnote-16)** |
| ……… | ……… | low/medium/high | low/medium/high | ……… | ……… |
| ……… | ……… | low/medium/high | low/medium/high | ……… | ……… |
| ……… | ……… | low/medium/high | low/medium/high | ……… | ……… |

Include and complete the following text if the proposed activity includes a Technology Phase, explaining why some risks are considered high enough to justify a Technology Phase development as a mandatory step to de-risk a subsequent Product Phase development.

The risks to be addressed in the Technology Phase, as identified in the table above, are considered to be of sufficiently high risk to jeopardise the success of a Product Phase development. The reasons for this assessment are as follows: …….. For these reasons, support is requested for the identified Technology Phase activities.

## Overview of Test and Verification Activities

Include and complete the following text if the proposed activity includes a **Ground Segment or Application** element.

The proposed development includes verification and (if applicable) validation[[17]](#footnote-17) activities as indicated below. The verification/validation activities will be supported by …   
Examples of verification/validation support means are test beds, facilities, assets, satellite capacity and pre-operational services.

Include and complete the following text if the proposed activity includes validation performed for an **Application within a Demonstration Phase**.

The validation performed for the Application within the Demonstration Phase shall include the following elements of the envisaged pilot utilisation stage:

1. Duration of the validation activities: … months.
2. Number of pilot sites to be equipped and geographical locations: …
3. Number/type/name of user organisations involved in/and definition of “Pre-operational Stage”: …
4. Success criteria/goals to be achieved for customer commitment and proposed approach for evaluating the system and the service: …

Include the following text and table if the proposed activity includes a **Space Segment** element.

The following table provides an overview of the verification activities to be performed and the corresponding verification environment or facilities.

Complete the following table as appropriate, indicating the verification activities that are planned to be carried out in each of the proposed development phases (Definition, Technology, Product, Demonstration).

For example, in the Definition Phase verification of a key performance parameter could be by computer simulation using a specific software package (the verification environment/facility), or technical trade-off/analysis. Alternatively, the performance of key enabling technology could be assessed by testing of representative hardware samples. In later development phases (e.g. the Product Phase) verification will typically involve tests performed on a development model (e.g. EQM), using specific test facilities.

Table .6 Overview of Test and Verification Activities

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Item to be Verified** | **Verification Activity** | **Verification Objective** | **Development Phase** | **Model** | **Verification Environment/ Facilities** |
| ……… | ……… | ……… | ……… | ……… | ……… |
| ……… | ……… | ……… | ……… | ……… | ……… |
| ……… | ……… | ……… | ……… | ……… | ……… |

# Space Segment Demonstration Phase (Atlas).

Include this section only if the proposed activity includes a Space Segment Demonstration Phase. See the notes following each table for guidance on how to complete the tables.

## Overview

For a Space Segment Development Phase:

1 The proposal must be for the first flight opportunity of innovative space segment equipment.

2 The proposal must identify if the equipment is “embedded” (part of the satellite mission) or a “passenger”. Support for satellite platform, launch, in-orbit testing and early operations costs can be provided for a passenger case, but not for an embedded case.

a. The product is “embedded” if it is part of the main commercial mission (e.g. insertion of a new generation equipment into a redundancy ring of a conventional equipment, such as an LNA, TWTA or telecommand receiver).

b. The product is a “passenger” if it is deployed on board alongside the main mission, but does not form part of the commercial mission (e.g. new platform elements, new payload elements, mini payload).

An overview of the proposed Demonstration Phase activity is provided in the table below.

Table .1 Products to be Flown in the Proposed Demonstration Phase

|  |  |  |
| --- | --- | --- |
| **Product** | **Currently Proposed to Customers for Flight** | **Type of Deployment (ATLAS Case)** |
| ……… | yes/no | Embedded/Passenger |
| ……… | yes/no | Embedded/Passenger |
| ……… | yes/no | Embedded/Passenger |

## Flight Opportunity

The tables below provide a summary of the proposed space segment Demonstration Phase activity.

Table .2 Overview of the Flight Opportunity

| **Item** | **Statement** |
| --- | --- |
| Name of spacecraft/mission: | ……… |
| Satellite operator(s): | ……… |
| Prime manufacturer(s): | ……… |
| Product(s) proposed to be flown in the Demonstration Phase: | ……… |
| Type of support requested: | embedded/passenger |
| Beneficial owner of the product(s) once in orbit: (passenger case only) | company name/not applicable |
| Nature of the product(s): | new/upgrade |
| Summary of changes/innovation with respect to the heritage product(s): (product upgrade only) | ……… |
| Justification for support for a flight opportunity under ARTES C&G Demonstration Phase: (product upgrade only) | ……… |

If possible, identify a specific flight opportunity (spacecraft/mission name), the name of satellite operator and the name of the space segment prime contractor. If this information is not yet available, indicate to which satellite manufacturing primes and satellite operators you are offering the product(s) for flight on future missions.

Please see the Call for Proposals cover letter for a definition of the “Embedded” and “Passenger” cases.

Indicate if each product to be flown is new for your company, or is a heritage product that will be significantly modified or improved (“upgrade”). If the product to be flown is an upgrade of a heritage product, provide a description of the changes/innovation with respect to the heritage product and the reasons why you consider the upgrade to be substantial enough to merit support for a flight opportunity under the ARTES C&G Demonstration Phase.

Table .3 Intended Flight Configuration

| **Item** | **Statement** |
| --- | --- |
| Number of flight items to be embarked on the mission for which support under ARTES C&G is requested: | ……… |
| Reason why this number of supported flight items is the minimum number necessary to demonstrate in orbit heritage: (if more than one) | ……… |
| Total number of flight items of the same type to be flown on the mission (i.e. without ARTES support): | ……… |
| The product(s) will be incorporated into the main mission as follows: (embedded case only) | brief description of how the product(s) will be incorporated within the main mission  (e.g. standalone unit, within an equipment redundancy ring) |

For each product type, indicate the number of flight items for which support is requested under ARTES. If more than one item, explain the rationale for this number of units and why you consider that it is the minimum necessary to demonstrate in orbit heritage. Also indicate the total number of flight items of the same product type to be flown on the mission (i.e. including those items for which no support is being requested under the ARTES C&G Demonstration Phase).

For an embedded case, including a drawing showing how the product will be incorporated within the main mission, clearly indicating the flight items for which support under ARTES C&G is requested and how they interface with other flight items. Add explanatory text as necessary to properly explain the flight configuration and the role of the supported flight items within the platform/payload.

Table .4 Statements Relating to the Proposed Space Segment Demonstration Phase

| **Item** | **Statement** |
| --- | --- |
| Current Relationship to Flight Customer | Marketing to them/  Already Identified Flight Opportunity/  Formal Proposal submitted/  In Negotiation |
| The prime contractor has been informed that support is being sought from the Agency for a flight opportunity for the product(s): | yes/no |
| The flight opportunity supported by the Agency will be the first demonstration of the product(s) in space: | yes/no |
| The beneficial owner of the product(s) once in orbit confirms that the product shall not be used to generate revenue: (passenger case only) | yes/no/not applicable |

If applicable, modify and include the following statement, listing the changes to the product(s) required for each potential flight opportunity.

The product will require the following modifications compared to that currently under/having recently completed qualification:

1. Modification 1.
2. Modification 2.
3. …

If applicable, modify and include the following statement, listing the activities for which support is requested by the prime (from European Participating States only).

The proposed space segment Demonstration Phase includes the following activities at prime level for which support is requested from the Agency by the prime:

1. Prime manufacturer activity 1.
2. Prime manufacturer activity 2.
3. …

Complete the following statement, providing a draft/preliminary list of telemetry and data related to the product(s) to be collected during the first year of operation of the product(s) in orbit.

It is proposed to collect the following data to demonstrate the performance of the product in its operational environment during its first year in orbit:

1. Parameter/data type 1.
2. Parameter/data type 2.
3. …

## Atlas Passenger Case

Please provide the following information if the Tenderer is proposing a Passenger case within the Space Segment Demonstration Phase (Atlas).

Table .5 Passenger Cost Breakdown

| **Activity element** | **Estimated Cost** | **Price to ESA** |
| --- | --- | --- |
| Accommodation studies | ……… | ……… |
| Flight equipment or sub-system development including manufacturing, assembly, integration and test | ……… | ……… |
| Accommodation of the innovative item, including assembly, integration and test on the spacecraft | ……… | ……… |
| Portion of the main mission spacecraft platform cost (as a shared resource between the main mission and the item) | ……… | ……… |
| Portion of the launch cost (as a shared resource between the main mission and the item) | ……… | ……… |
| Launch campaign (testing and early operation phase specific to the item, for validation of function and performance or monitoring) | ……… | ……… |
| IOT and validation of the performance and function of the product | ……… | ……… |

The co-funding for the activity (alongside ESA) will be provided by name of company that will provide the funds that make up the difference between the identified cost of the activity and the price paid by ESA.

Note the company providing the funds may be the tenderer themselves from internal funds, or a third party who has an interest in the demonstration of the product in orbit.

**ANNEX 1**

**Definition of Technology and Service Readiness Levels (TRL/SRL)**

**Definition of Technology Readiness Levels – Space Segment**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **TRL** | **ISO Definition** | **Associated Model(s)** | **Performance Requirements** | **Test Environment Representative of Operational Environment** |
| 1 | Basic principles observed and reported | Not applicable | In elaboration | Not applicable |
| 2 | Technology concept and/or application formulated | Not applicable | In elaboration | Not applicable |
| 3 | Analytical and experimental critical function and/or characteristic proof-of-concept | Mathematical models, supported e.g. by sample tests | Partly Defined | No |
| 4 | Component and/or breadboard functional verification in laboratory environment | Breadboard | Partly Defined | No |
| 5 | Component and/or breadboard critical function verification in a relevant environment | Scaled EM for the critical functions | Fully Defined | Yes (for critical functions subject to scaling effect) |
| 6 | Model demonstrating the critical functions of the element in a relevant environment | Full scale EM, representative for critical functions | Fully Defined | Yes (for critical functions) |
| 7 | Model demonstrating the element performance for the operational environment | QM / EQM / PFMa | Fully Defined | Yes |
| 8 | Actual system completed and accepted for flight (“flight qualified”) | PFM / FM | Fully Defined | Yes |
| 9 | Actual system “flight proven” through successful mission operations | PFM / FM | Fully Defined | Yes |

a  A PFM may be used to achieve qualification provided that the commercial customer accepts the risk and it is demonstrated that the use of an alternative qualification model (e.g. EQM) is not viable. In this case, the cost of the flight hardware is not supported by ESA.

See also, “Guidelines for the use of TRLs in ESA programmes”, ESSB-HB-E-002, Issue 1, Rev 0, 21 August 2013 (available on the ARTES web site at <https://artes.esa.int/documents>).

**Definition of Technology Readiness Levels – Ground Segment**

|  |  |  |
| --- | --- | --- |
| **TRL** | **ISO Definition** | **Associated Model(s)** |
| 1 | Basic principles observed and reported | Idea or concept |
| 2 | Technology concept and/or application formulated | Concept supported by paper study |
| 3 | Analytical and experimental critical function and/or characteristic proof-of-concept | Demonstrate feasibility |
| 4 | Component and/or breadboard functional verification in laboratory environment | Partial prototype |
| 5 | Component and/or breadboard critical function verification in a relevant environment | Reduced scale prototype (for large pieces) |
| 6 | Model demonstrating the critical functions of the element in a relevant environment | Full prototype to demonstrate functionality |
| 7 | Model demonstrating the element performance for the operational environment | Verified Product with final BOM, layouts, released software, full GUI, certifications, documentation |
| 8 | Actual system completed and accepted for flight (“flight qualified”) | Validated Product in operation, and commercial offer ready |
| 9 | Actual system “flight proven” through successful mission operations | Product operationally deployed and used by paying customers |

**Definition of Service Readiness Levels – Applications**

|  |  |  |
| --- | --- | --- |
| **SRL** | **ISO Definition (TRL)** | **Service Readiness Level** |
| 1 | Basic principles observed and reported | Not applicable |
| 2 | Technology concept and/or application formulated | Application/service concept formulated, market opportunities not yet addressed |
| 3 | Analytical and experimental critical function and/or characteristic proof-of-concept | Concept analysis performed and target market identified |
| 4 | Component and/or breadboard functional verification in laboratory environment | Application/service verification in laboratory environment, market segment(s) and customers/users identified |
| 5 | Component and/or breadboard critical function verification in a relevant environment | Application/service verified using operational elements, customers/users not involved |
| 6 | Model demonstrating the critical functions of the element in a relevant environment | Demonstration of prototype in relevant environment, price policy identified |
| 7 | Model demonstrating the element performance for the operational environment | Trials with customers/users to validate utilisation and business models |
| 8 | Actual system completed and accepted for flight (“flight qualified”) | Application/service completed and validated, commercial offer ready |
| 9 | Actual system “flight proven” through successful mission operations | Application/service operationally deployed and used by paying customers |

**ANNEX 2  
Terminology Used in ARTES Competitiveness & Growth**

|  |  |
| --- | --- |
| Application Segment: | Consists of activities related to the utilisation of satellite telecommunications for the provision of downstream applications and pre-operational services with the active participation of users and other relevant stakeholders. |
| Breadboard (BB): | An initial development model for a space product, electrically and functionally representative of the complete end item, or of one or more key elements of the end item. It is used to prototype the intended design and to mitigate technical risks. Verification is typically performed in a laboratory environment. |
| CAPEX: | Capital Expenditure or CAPEX is investment in the long-term, consisting of assets that are bought by the company and go on the balance sheet. The value of those assets is typically depreciated over the years. |
| Customer Segment: | A group of customers identified on the basis of their needs, behaviours, or other traits that they share. |
| Customer: | An individual or an organisation that meets three criteria: 1. they have a problem they want to solve; 2. they have money/budget to spend to solve the problem; 3. they are willing and authorised to execute the buying decision. |
| Definition Phase: | Consists of the set of activities in which system performance requirements are defined, and system level analyses are performed. |
| Demonstration Phase: | Consists of the activities needed to validate the operational effectiveness and capabilities of the final product in its final configuration and within the user utilisation environment. |
| EGSE: | Electrical ground support equipment. |
| Engineering Model (EM): | Flight representative model in terms of form, fit and function used for functional and failure effect verification. The engineering model is usually not equipped with high reliability parts or full redundancy. The engineering model is also used for final validation of test facilities, ground support equipment and associated procedures. See ECSS‑S‑ST‑00‑01C. |
| Engineering Qualification Model (EQM): | Model which fully reflects the design of the flight model except for the parts standard, used for functional performance and EMC verification and possibly for qualification. Military grade or lower-level parts can be used instead of high reliability parts, provided they are procured from the same manufacturer with the same packaging. Functional performance qualification includes verification of procedures for failure detection, isolation and recovery and for redundancy management. The engineering qualification model may also be used for environmental testing if the customer accepts the risk, in which case the qualification model rules apply. See ECSS‑S‑ST‑00‑01C. |
| Flight Model (FM): | End product that is intended for flight. The flight model is subjected to formal functional and environmental acceptance testing. See ECSS-S-ST-00-01C. |
| Ground Segment: | Consists of all the ground-based elements of a satellite communication system. |
| Ground Support Equipment (GSE): | Non flight product (hardware/software) used on ground to assemble, integrate, test, transport, access, handle, maintain, measure, calibrate, verify, protect or service a flight product (hardware/software). See ECSS‑S‑ST‑00‑01C. |
| Market: | A broad landscape of buyers looking to solve different types of problems. A market can comprise many different types of customer segments. |
| MGSE: | Mechanical ground support equipment. |
| Model: | Physical or abstract representation used for calculations, predictions or further assessment. Model can also be used to identify particular instances of the product e.g. flight model. See ECSS‑S‑ST‑00‑01C. |
| OPEX: | Operational costs, or OPEX, are the costs associated with the day-to-day running of the company or the used up expenses. |
| Pre-operational Stage: | Utilisation of a service performed as part of an applications project, used to validate the requirements and assess the success criteria. This corresponds to the pilot stage. |
| Product: | A product is any hardware, software, system or sub-system, service or application item that is ready for commercial exploitation. |
| Product Development Plan: | Is the development logic to develop a product ready for commercial exploitation using the C&G Development Phases as required (Definition, Technology, Product, and Demonstration), but including as a minimum a Product Phase or a Demonstration phase. |
| Product Phase | Consists of the activities needed to produce a product ready for commercial exploitation. This includes all industrialisation activities needed to manufacture, integrate and qualify the product, as well as the testing needed to verify the final product. |
| Proto Flight Model (PFM): | Flight model on which a partial or complete proto flight qualification test campaign is performed before flight. See ECSS‑S‑ST‑00‑01C. |
| Qualification: (space products) | That part of verification which demonstrates that the product meets specified qualification margins. This can apply to personnel, products, manufacturing and assembly processes. See ECSS‑S‑ST‑00‑01C. |
| Qualification Model (QM): | Model which fully reflects all aspects of the flight model design, used for complete functional and environmental qualification testing. A qualification model is only necessary for newly-designed hardware or when a delta qualification is performed for adaptation to the project. The qualification model is not intended to be used for flight, since it is over-tested. See ECSS‑S‑ST‑00‑01C. |
| Scaled Engineering Model (Scaled EM): | Engineering model that is not fully representative of the end product, but is sufficiently representative to permit the verification of critical functions of the product in a relevant environment. Critical functions are those functions of the product that deserve control and special attention in order to mitigate technical risks. |
| Space Segment: | Part of a space system, placed in space, to fulfil the space mission objectives. Space segment activities relate to any product to be used on a spacecraft. |
| Technology Phase: | Consists of the activities performed to mitigate the technical risks of the product development up to and including the manufacturing and test of a representative model of the product (e.g. an Engineering Model), but excluding qualification or industrialisation. |
| Validation: | Process which demonstrates that the product is able to accomplish its intended use in the intended operational environment. The user shall have a key role in this process. Validation addresses whether a product will satisfy the needs of its users. Validation proves it is the right product. |
| Value Proposition: | This is a statement of the value that a company or solution offers to its customers and/or partners. It is expressed from the perspective of the value to the target customer and addresses the main benefit(s) derived by the use of the product. |
| Verification: | Process which demonstrates through the provision of objective evidence that the product is designed and produced according to its specifications and the agreed deviations and waivers, and is free of defects. Users are not involved in the verification. Verification addresses whether a product satisfies the requirements placed upon it. Verification proves the product is right. |
|  |  |

1. For example, ARTES C&G Development Phases partly funded by ESA, or covered by other programmes/funds. [↑](#footnote-ref-1)
2. Please note that the provided table is limited to a maximum of 20 years span (within a ±10 year time interval with respect to the commercial launch date of the product). [↑](#footnote-ref-2)
3. yes = The National Delegation has been contacted with regard to the proposed activity.  
   no = The National Delegation has not yet been contacted with regard to the proposed activity.  
    [↑](#footnote-ref-3)
4. The item is deliverable during or at the end of the indicated phase(s). [↑](#footnote-ref-4)
5. For example, a National, EU or ESA programme, or an internal project (i.e. company financed). [↑](#footnote-ref-5)
6. For an ESA activity, please include the contract number. [↑](#footnote-ref-6)
7. 7 Expected or actual, as appropriate. [↑](#footnote-ref-7)
8. For example, a National, EU or ESA programme, or an internal project (i.e. company financed). [↑](#footnote-ref-8)
9. Expected or actual, as appropriate. [↑](#footnote-ref-9)
10. For example, schedule interdependencies, input/output interdependencies, external influences on key decision points, both for the proposed activity and for other activities (i.e. include the impact of the proposed activity on other activities, if appropriate). [↑](#footnote-ref-10)
11. Brief description of the status of maturity or heritage of the product and evidence for the TRL/SRL assessment. [↑](#footnote-ref-11)
12. The development phase(s) in which the proposed development will take place. [↑](#footnote-ref-12)
13. The TRL/SRL for this item at the end of the proposed development. [↑](#footnote-ref-13)
14. Brief description of the proposed main development activities for this item. [↑](#footnote-ref-14)
15. Technical and programmatic risks. [↑](#footnote-ref-15)
16. The development phase(s) in which this risk will be mitigated. [↑](#footnote-ref-16)
17. For the definition of the “Verification” and “Validation” terms, please refer to Annex 2. [↑](#footnote-ref-17)