|  |
| --- |
| PROJECT NAME – Company name |
| Date: ……Reference: …… |

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

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

**OUTLINE PROPOSAL TEMPLATE
ARTES 4.0 Technologies and Products**

**for C&G, ScyLight, 4S and 5G**

Ver. 5.2

**Notes:**

1. To prepare this Outline Proposal, please take into consideration the information about the ARTES 4.0 Technologies and Products programme element provided on the ARTES web site: <https://artes.esa.int>. In particular, the required objectives per Development Phase and Segment shall be respected:

|  |  |  |
| --- | --- | --- |
| ***Development Phase*** | ***Main Activities*** | ***Outcome*** |
| **Definition Phase** | Technical studies | Performance requirements defined, or system analysis completed |
| **Technology Phase** | Technical risk mitigation excluding any qualification or industrialisation.Early in-orbit experimentation, when it is not possible to test the technology in a ground-based environment | Breadboard, prototype or Engineering Model (EM)Flight hardware for early in orbit test purposes. |
| **Product Phase** | Development, qualification, verification and industrialisation | **Space product**: Engineering/Qualification Model (EQM) or similar |
| **Ground product**: verified product in a non- operational environment |
| **Demonstration Phase** | **Space product**: in-orbit validation/demonstration "Atlas" | Flight hardware |
| **Ground product**: validation in operational environment | Product validated in an operational environment |

1. An ARTES 4.0 Technologies and Products outline proposal shall comprise the following two elements:
	1. This template, duly completed as appropriate.
	2. A supporting spreadsheet document that provides the financial analysis elements of your business plan (the “Financial Forecast Workbook”), which can be downloaded at <https://artes.esa.int/documents>.
2. To initiate the outline proposal review process, the two completed documents must be sent to one of the following the email addresses according to the ARTES 4.0 Programme Line selected in Section 1.1:

Competitiveness & Growth: artes-cg@esa.int

Space for 5G: 5g@esa.int

Space Systems for Safety and Security (4S): artes-4s@esa.int

Optical Communication – ScyLight: scylight@esa.int

1. 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.
2. Please ensure that the submitted versions of the two documents are mutually consistent. Failure to do so may lead to feedback delay.
3. 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.
4. The content of this template may 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 3 (“Business Plan”) of this document please make reference to the relevant tables of the attached financial forecast workbook, providing supplementary information as necessary to substantiate the assumptions behind the commercial forecasts. Guidance on how to use the financial forecast workbook can be found in the first sheet of the workbook.

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# Overview of the Proposed Activity

## ARTES 4.0 Programme Line

*Select one ARTES 4.0 programme line. To submit your outline proposal please see Note 3 above.*

This outline proposal is submitted under the following ARTES 4.0 programme line:

Choose an item.

## Disclosure

*The Agency will treat this Outline Proposal as Proprietary Information and will restrict its circulation within the Agency to the minimum number of experts necessary to conduct an informal review of the proposal as described in Section 4 of the Letter of Invitation.*

We confirm that the information provided in this Outline Proposal may be freely disclosed to Agency personnel solely for the purposes of the review process described in Section 4 of the Letter of Invitation.

## Company Information

|  |  |  |  |
| --- | --- | --- | --- |
| **Company Details** |  | **Contact Point** |  |
| Company Name: | ……… | Name: | ……… |
| Address: | ……… | Function: | ……… |
| Country: | ……… | Telephone: | ……… |
| SME Status: | yes/no | E-Mail: | ……… |
| ESA Entity Code: | 1 000 xxx xxx | ESA Business Unit Code | 8 000 xxx xxx |

*If known, please enter your ESA Entity Code and, if applicable, your ESA Business Unit Code. This information is required as soon as possible so that, subject to successful evaluation of your Outline Proposal, ESA has the information necessary to create a Bidder Restricted Area on ESA-STAR for the submission of your Full Proposal.*

*To obtain the above code(s) you have to be registered with the Agency as an entity wishing to do business with ESA. If you have not yet registered with the Agency you are requested to do so by completing the online questionnaire on the “ESA-STAR registration” website (*[*https://esastar-emr.sso.esa.int*](https://esastar-emr.sso.esa.int)*). The ESA-STAR Registration User Manual is available* [*here*](http://esamultimedia.esa.int/docs/business_with_esa/CG-EM-ORR-S-16_End_User_Manual_v1.2.pdf)*. More information on doing business with ESA is available* [*here*](http://www.esa.int/About_Us/Business_with_ESA)*.*

Key company information follows: ………

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

*Describe briefly your background (and of your Subcontractor(s), if any) and experience related to the proposed activity.*

##  Scope and Duration

*Please indicate in the table below a segment (Space Segment Payload, Space Segment Platform, Ground Segment) and one or more development phase(s) (Definition, Technology, Product, Demonstration/Atlas), for which financial support is being requested in the present proposal.*

*Place an “X” in the relevant table cell(s) and remove the table rows / columns as appropriate.*

*One or more development phase(s) can be proposed.*

This proposal addresses the following development phase(s) and segment:

Table ‑ Scope of the Proposed Activity

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Space Segment** | **Ground Segment** | **Intended Start Date** | **Intended Duration (months)** |
| **Development Phase** | **Payload** | **Platform** |
| Definition Phase | X | X | X | dd/mm/yy | xx |
| Technology Phase | X | X | X | dd/mm/yy | xx |
| Product Phase | X | X | X | dd/mm/yy | xx |
| Demonstration Phase | (Atlas) X | (Atlas) X | X | dd/mm/yy | xx |

*To assist ESA in making sure resources are available to review the full proposal in a timely manner please provide the date when you expect 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 at the following gate: Day/Month/Year

## Objectives

The objective/s of the proposed activity is/are to develop / validate / qualify / demonstrate a …

*Please define the target final product that will be ready for commercial exploitation once all developments (with ARTES support or otherwise) have been completed.*

*Should the product be an integrated end-to-end satcom solution comprising both Space and Ground products, then the target final product shall be defined as ‘System and/or Service”. In this case the Business case shall be built around the ‘System / Service” target product.*

## Context

*Briefly explain the background and motivation for the proposed development. Provide insight into the rationale for this development and the logic behind the proposed development approach.*

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

## Main Activities

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

Table ‑ Overview of Activities

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

*List all of the main activities that are to be performed in each of the proposed development phases (those which 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, qualification activities, test (verification) activities, validation 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 main activities, please keep in mind the objectives for each development activity presented in Note 1. In particular, the Technology Phase should target technical risk mitigation (which may include an early in-orbit experimentation) and not product qualification or industrialisation (these types of activity belong in the Product Phase).*

## Main Deliverables

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

Table ‑ Main Deliverable Items

|  |  |  |  |
| --- | --- | --- | --- |
| **Type** | **Deliverable Item** | **Phase(s)[[1]](#footnote-2)** | **Notes** |
| hardware/ software/document | ……… | Technology | ……… |
| hardware/ software/document | ……… | Product | ……… |
| ……… | ……… | Demonstration | Embedded / independent case |
| ……… | ……… | ……… | ……… |

## In-Orbit Activities

*Include this section if a Space Segment (Atlas) Demonstration Phase is proposed, or a Technology Phase that includes an early in-orbit experiment.*

*For a proposed project that includes in-orbit activities:*

*1 The proposal shall support the demonstration of new or significantly upgraded capabilities at technology, product, system or service level.*

*2 The proposal must identify if the equipment is:*

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

*b. “Independent” where it is on board alongside the main mission but does not form part of the operational mission (“Independent Case (hosted)”, e.g. stand-alone platform elements, or mini payload as a hosted payload on a large satellite), or*

*c. “Independent” where the flight hardware constitutes the main purpose of the mission (“Independent Case (standalone)”, e.g. a demonstration payload on a dedicated small sat mission).*

*Support for satellite platform, launch, in-orbit testing and early operations costs can be provided for an independent case, but not for an embedded case.*

An overview of the proposed in-orbit activity is provided in the table below. Further information is provided in Section 4.

Table ‑ Items to be Flown in the Proposed In-Orbit Activity

|  |  |  |
| --- | --- | --- |
| **Item** | **Currently Proposed to Customers for Flight** | **Type of Deployment** |
| ……… | yes/no | Embedded/Independent |
| ……… | yes/no | Embedded/Independent |
| ……… | yes/no | Embedded/Independent |

*Include the following table only if the proposed in-orbit activity is an Independent Case*

Table ‑ Independent Case Spacecraft Information

|  |  |
| --- | --- |
| **Type/size of Spacecraft** | **Key functional requirements of the spacecraft** |
| ……… | ……… |
| ……… |
| ……… |
| ……… |
| ……… | ……… |
| ……… |
| ……… |
| ……… |

## Overall Planning and Cost Summary

*Development Phases that overlap in time are allowed.*

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[[2]](#footnote-3) required before commercial exploitation.[[3]](#footnote-4)

*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 ‑ Planning and Costing Summary

|  |
| --- |
|  |

## Project 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 one Development Phase at a time. A copy of Table 1‑7 will be sent to all the relevant national delegations by ESA upon submission of the outline proposal if they are not in copy of the email containing the outline proposal.*

Table ‑ Project Cost and Price Breakdown

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Development Phase** | **Company/ Organisation** | **Country** | **Cost (k€)** | **Price (k€) (requested from ESA)** | **% Funding from ESA** | **National Delegation Support[[4]](#footnote-5)**  |
| ……… | 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 |

Table 1‑8 Prime and Subcontractor Source of co-funding

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Company Name** | **SME yes/no** | **Total Budget (cost) kEUR**  | **Total ESA contribution kEUR** | **Source of co-funding** |
| ……… | yes/no | ……… | ……… | ……… |
| ……… | yes/no | ……… | ……… | ……… |
| ……… | yes/no | ……… | ……… | ……… |

Examples of possible sources of co-funding are: existing funds in bank account coming from sales / profit, already approved / prospective bank loan, investment from external source e.g. private investment funds, other contributions. Note that public grant funding cannot be considered as the source of co-funding.

The purpose of this information is to provide evidence on the capabilities of the involved company(ies) to pay their share of the cost of the proposed activity elements (procurements, facilities, manpower) and, as such, can serve the obligations of the activity.

## 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 ‑ Estimated Expenditure Outside of the Bidding Consortium

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

# Product Definition, Development and Verification

*Describe briefly the approach you will take to elaborate and develop the opportunity within this activity, including a definition of main requirements, a description of starting point, identification of the elements to be developed, verification activities, a top level risk assessment and the validation/qualification status at the end of the activity.*

## Product Description

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

*The definition of a “Product” is provided in Annex 1. It is understood as the final product ready for commercialisation. 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). A product may be Space or Ground Segment hardware or software, or a system/service (integrated end-to-end satcom solution comprising both Space and Ground Segment products).*

*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.*

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 building blocks and major interfaces.*

The main elements are described in the table below.

Table ‑ Product Elements Overview

|  |  |  |
| --- | --- | --- |
| **Product Element** | **Functions/Features** | **Critical Technologies** |
| Name of element 1 | … | … |
| Name of element 2 | … | … |
| Etc. | … | … |

*All elements that form the final product shall be described, even if they are not part of the proposed development activity, including key features/performance/attributes.*

## Product Specification

The main requirements for the product and its constituent elements are given in the following table:

Key requirements are those considered essential to the success of the proposed development, or those that are likely to significantly affect the course of the development (e.g. design drivers).

Table ‑ Key Product Requirements

| **Product Requirements** |
| --- |
| **Requirement ID** | **Requirement Name** | **Requirement Value** | **Description of Criticality** |
| … | … | … | … |
| … | … | … | … |
| … | … | … | … |

## Heritage and Starting point

### Related Development Activities

The proposed activity is/is not a follow-up of a planned/running/completed activity/activities.

*Include the text and complete the table below only if the proposed activity is a follow-up of a planned, running and/or completed activity or activities. Any other publicly funded (ESA/National/EU) activity linked to the proposed development shall be described.*

*Describe any 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 ‑ Related Development Activities

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Programme[[5]](#footnote-6)** | **Activity Name[[6]](#footnote-7)** | **Completion Date[[7]](#footnote-8)** | **Brief Description** | **Outcome** |
| ……… | ……… | ……… | ……… | ……… |
| ……… | ……… | ……… | ……… | ……… |
| ……… | ……… | ……… | ……… | ……… |

The dependencies between the proposed activity and other activities falling outside of the scope of the proposed activity are ...

### Starting point

The starting point and technical work to be performed on main functional modules, sub-assemblies and the final product are described in the table below:

Table ‑ Heritage and development activity of the Product

|  |  |  |
| --- | --- | --- |
| **Product Element** | **Starting Point / Heritage** | **Start TRL** |
| ……… | ……… | ……… |
| ……… | ……… | ……… |
| ……… | ……… | ……… |

*The assessment of the current TRL should be substantiated by a brief description of the current status of maturity or heritage of the product, with supporting evidence wherever possible.*

## Development Approach

To realise our product and deliver the value propositions, we need to follow the development approach identified in the table below for each product element and for each of the proposed development phases.

Table ‑ Overview of the Proposed Development Approach

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Product Element** | **Developed in the Proposed Activity** | **Development Phase(s)[[8]](#footnote-9)** | **Target TRL[[9]](#footnote-10)** | **Development Activities[[10]](#footnote-11)** |
| Module xxx | yes/no | ……… |  |  |
| sub-system yyy | yes/no | ……… |  |  |
| Component, material or process zzz | yes/no | ……… |  |  |

*A product element could be, for example, a module, sub-system, component, technique or process.*

*Provide supplementary text as necessary to fully explain the development activities and approach.*

*The work to be performed on all product elements that form the final product shall be described, even if the work will not be carried out within the scope of the proposed activity.*

The development approach is illustrated in the following chart:

*Provide a chart illustrating the overall development time line, the main product development activities and their interdependencies.*

Insert chart – development time line

The top-level Work Breakdown Structure (WBS) is illustrated in the following figure:

*The WBS shall be at Level 1 or 2 in the outline proposal, as appropriate in order to outline the scope of the proposed work.*

**

## Overview of Verification Activities

The following table provides an overview of the verification activities to be performed and the corresponding verification environment and 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), and ensuring consistency with the deliverables listed in Section 1.8.*

*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.*

*Column 1: Development Phase during which the verification activity will be performed.*

*Column 2: The aspect(s) of the product to be confirmed by the verification activity (e.g. product functional requirements, technical performance requirements, etc.).*

*Column 3: The verification method (test, analysis, simulation, inspection, etc.).*

*Column 4: The analytical, simulation, hardware or software model that will be used as a vehicle to perform the verification.*

*Column 5: The verification environment. For Space Segment and Ground Segment developments this is typically the environmental (e.g. thermal) conditions.*

Table ‑ Overview of Verification Activities

| **Development Phase** | **Functionalities/ Requirements Verified** | **Verification Method** | **Model** | **Environment** |
| --- | --- | --- | --- | --- |
| … | … | … | … | … |
| … | … | … | … | … |
| … | … | … | … | … |
| … | … | … | … | … |

The product test matrix is the following:

Table ‑ Test Matrix

|  | **Test phases** *(for instance temperature, vacuum, etc.)* |
| --- | --- |
|  | *For instance, initial ambient test* | *For instance, hot thermal vacuum test* |
| Requirement 1 | … | … |
| Requirement 1 | … | … |
| … | … | … |

## Validation Activities (Ground Segment Demonstration Phase)

*Complete this section only for a Ground Segment Demonstration Phase.*

The proposed validation[[11]](#footnote-12) activities are indicated below. The validation activities will be supported by …

*Examples of validation support means are test beds, facilities, assets, satellite capacity and pre-operational services.*

1. Duration of the validation activities: … months.
2. Number of validation sites to be equipped and geographical locations: …
3. Number/type/name of user organisations involved in/and definition of the validation activities: …
4. Objectives of the validation activities and related Key Performance Indicators to be achieved during the validation activities: …

## Risks

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

Table ‑ Overview of the Major Development Risks[[12]](#footnote-13) and the Proposed Risk Mitigation Actions

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Risk Identifier** | **Description** | **Likelihood** | **Severity** | **Mitigation Actions** | **Mitigation Phase(s)[[13]](#footnote-14)** |
| ……… | ……… | 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.

# Business Plan

*The Business Plan is intended to analyse the strategic context and commercial potential of the output of the proposed activity and to demonstrate that the Contractor’s initiative is conceived to lead to a commercial exploitation. It shall be provided from both Tenderer’s and Industrial participants perspectives.*

*The Business Plan shall provide the commercial rationale for the proposed development activities with the key commercial aspects, including the potential Satcom target market, the target customers, the competitive environment and own positioning, as well as the market strategy.*

*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). Please note that the Business Plan presented in this document shall be related to the* ***target final product(s)*** *to be sold on the market. The target product(s) may include other elements or features not covered by the proposed activities.*

*The supporting spreadsheet (“Financial Forecast Workbook”) can be downloaded from* [*https://artes.esa.int/documents*](https://artes.esa.int/documents)*.*

*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).*

## Market Analysis

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

Table ‑ Market Positioning

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

Our product is

Space Segment hardware/software

or

Ground Segment hardware/software

or

System/Service (integrated end-to-end satcom solution comprising both Space and Ground Segment products).

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).

The Total Available Market (TAM) of the targeted product is the following:

*TAM (the total worldwide market available for your product) shall be presented, including quantitative figures. If the product is new (not existing), the market of a similar product may be used.*

The Serviceable Available Market (SAM) of the targeted product is the following:

*The SAM (the market you can really address with your product and your channels, it comprises all your potential customer segments) shall be presented including quantitative figures and assumptions.*

*If you already have a share of this market, you shall present it including quantitative figures and factual information (for instance, sales of existing products in this market, or of previous generations, for the different customer segments).*

Our projection in terms of the Serviceable Obtainable Market (SOM or target market) we aim to capture in the short term for each of the identified customer segments is shown in our financial forecast workbook.

The assumptions behind these sales projections are ….

*Present the percentage of the Serviceable Available Market that your company could realistically reach in the short term and the underlying assumptions that led to the projected sales volumes over time, taking into account competition, trends, demand forecast, sales channels and other elements that could have influence. This value is usually estimated taking into account specific customers (or group of customers) within the targeted customer segment(s).*

## Competitive Landscape

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

Table ‑ Summary of the Competition

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Competitor** | **Nature of Competition** | **Description of Competitor’s Product** | **Market Share** | **References** |
| ……… | ……… | ……… | ……… | ……… |
| ……… | ……… | ……… | ……… | ……… |
| ……… | ……… | ……… | ……… | ……… |

*Columns 1 & 2: Show the competitors already present in your market (SAM) or serving it partially. Indicate the nature of the competition, highlighting their value proposition in relation to the market you are trying to serve. Include the strengths/weaknesses of the competitors’ products compared to the targeted product. For example, an existing or potential supplier of the same type of product with the same characteristics and a lower price, a new entrant to the market with an innovative value proposition, a market incumbent.*

*Column 3: Describe the competitor’s product. Quantify the nature of the competition as far as possible (e.g. performance, competitiveness in terms of pricing, performance, etc.).*

*Column 4: Quantify their market share.*

*Column 5: 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.

*Identify your competitive advantage and your strategy for competing in the target market (e.g. using a SWOT analysis).*

Table ‑ 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 fully describe the competitive environment.*

On the basis of the SWOT analysis, our strategic options to achieve the commercial goals are ………

## Business Model Canvas

*A single page Business Model Canvas is available at* [*https://artes.esa.int/documents*](https://artes.esa.int/documents) *and may be used as a tool to help generate and structure the overall Business Plan.*

### Customer Segments and Value Proposition

The table below identifies the key customers/customer segments identified as the Serviceable Obtainable Market (SOM or target market) targeted by the proposed product(s), and the specific characteristics of our product(s) that will address the customer problems/needs.

Table ‑ Customer Segments/Needs and Key Product Characteristics/Requirements

|  |  |  |  |
| --- | --- | --- | --- |
| **Customer/Customer Segment** | **Customer Problems/Needs** | **Product Characteristics Addressing this Problem/Need** | **Key product requirement** |
| ……… | ……… | ……… | ……… |
| ……… | ……… | ……… | ……… |
| ……… | ……… | ……… | ……… |

*Each customer segment targeted 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.*

*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.*

*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 development activities.*

### Value Chain

*This section is optional if you propose to develop a Space Segment product fitting in the white cell in Table 3‑1 (existing/incremental product targeting an existing/incremental market). Otherwise this section is mandatory.*

The following diagram describes the value chain, its composition and the role of the stakeholders in the commercial exploitation phase of the product.

Figure 3‑‑ Value Chain

**EXAMPLE**



*Provide a diagram which illustrates the value chain and the interactions among customers, users, the project team and other key stakeholders (e.g. regulators) in the commercial exploitation phase of the product you intend to realise. Include a discussion of the changes, if any, introduced in the value chain by the proposed new product and/or service.*

### Revenue Streams

In the commercial exploitation stage, our product(s) will be sold to our customers as described in the financial forecast workbook.

*Show here the product/s pricing scheme as reported in the financial forecast workbook. Refer to the relevant table that records your assumptions regarding the product revenue stream.*

The underlying assumptions that led to the projected product unit sales price and unit cost are the following: ……

 *This shall include, for instance:*

* *A description of how cost reduction will be achieved.*
* *Evidence that the projected unit sales price is competitive (what are your customers willing to pay? what do your customers currently pay?).*
* *How much does each revenue stream contribute to the overall revenues?*

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

### Cost Structure

The key elements of cost for realising the value proposition are the following: ……

*You should list the most important costs that characterise your business opportunity in terms of:*

* *Key resources costs (e.g. hubs, satellite bandwidth, sales personnel, financing).*
* *Costs of key activities needed to pursue your business opportunity (e.g. R&D, sales, marketing, creating and delivering value, maintaining customer relationships).*
* *Costs of all previous, current and future developments that were, are or will be necessary to prepare the product for commercial exploitation (for instance, delta qualification required for other product variants not covered by the EQM, material, parts and process evaluations/qualifications, etc.). This may include operations cost.*

The following assumptions have been made when deriving the cost figures: ……

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

*Optionally, you may also provide a copy of the relevant table(s) in this section.*

### Channels

*This section is optional if you propose to develop a Space Segment product fitting in the white cell in Table 3‑1 (existing/incremental product targeting an existing/incremental market). Otherwise this section is mandatory.*

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 Relations

*This section is optional if you propose to develop a Space Segment product fitting in the white cell in Table 3‑1 (existing/incremental product targeting an existing/incremental market). Otherwise this section is mandatory.*

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.*

### Key Activities to Establish the Business

*This section is optional if you propose to develop a Space Segment product fitting in the white cell in Table 3‑1 (existing/incremental product targeting an existing/incremental market). Otherwise this section is mandatory.*

*You should describe crucial activities you must carry out to make your business model work. (e.g. key activities necessary to realise the value proposition, for establishing the distribution channels, to have in place the key resources, to establish the customer relations, to secure agreements with the key partners).*

*Note that key technical development activities shall be described in the implementation proposal.*

### Key Resources

*This section is optional if you propose to develop a Space Segment product fitting in the white cell in Table 3‑1 (existing/incremental product targeting an existing/incremental market). Otherwise this section is mandatory.*

*You should describe crucial resources (physical, intellectual, human, financial) that you must have to make your business model work. (e.g. key resources* *necessary to realise the value proposition, for having channels in place, to establish the customer relations, to secure agreements with the key partners, to make your revenue stream work).*

### Key Partners

*This section is optional if you propose to develop a Space Segment product fitting in the white cell in Table 3‑1 (existing/incremental product targeting an existing/incremental market). Otherwise this section is mandatory.*

*You should identify the stakeholders (suppliers, partners, users, etc.) that are crucial to the success of your business model.*

The key partners in the commercial exploitation of the product are listed in the table below.

Table ‑ Key Partners

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Partner Type**(e.g. satellite manufacture, operator, service provider, supplier, user, customer) | **Partner Name**(company name, country, web link) | **Involvement in the Project**(e.g. none, subcontractor, supplier, integrator) | **Type of Agreement**(e.g. NDA, partnership agreement, contract) | **Existing Agreement** |
| ……… | ……… | ……… | ……… | Yes |
| ……… | ……… | ……… | ……… | No (planned) |
| ……… | ……… | ……… | ……… | ……… |

The following table provides an overview of the relevant background and experience of the key partners and their roles in the development and commercial exploitation of the product.

Table ‑ Key Partner Background, Experience and Roles

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Partner** | **Background and Experience** | **Role in the project implementation** | **Role in the commercial exploitation** | **Key obstacle for partnership (e.g. IPR constraints)** |
| ……… | ……… | ……… | ……… | ……… |
| ……… | ……… | ……… | ……… | ……… |
| ……… | ……… | ……… | ……… | ……… |

## Financial Indicators

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

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

*You shall 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:

The Internal Rate of Return (IRR), the Net Present Value (NPV) and the break-even point are ….

# In-Orbit Activities

*Include this section if a Space Segment (Atlas) Demonstration Phase is proposed, or a Technology Phase that includes an early in-orbit experiment. See the notes following each table for guidance on how to complete the tables.*

*Please see 1.9 for a definition of “Embedded Case” and “Independent Case”.*

*Indicate if each item to be flown is new for your company, or is a heritage item that will be significantly modified or improved (“upgrade”). If the item to be flown is an upgrade of a heritage item, provide a description of the changes/innovation with respect to the heritage item and the reasons why you consider the upgrade to be substantial enough to merit support for an in-orbit activity.*

## General In-Orbit Activity Information

*Please see 1.9 for a definition of “Embedded Case”, “Independent Case (hosted)” and “Independent Case (standalone)”.*

The purpose of the in-orbit activity is: ………

The in-orbit activity is an Embedded Case/Independent Case (hosted)/Independent Case (standalone).

## Information Related to an Embedded Case

*Include this section only if an Embedded Case is proposed. See the notes following each table for guidance on how to complete the tables.*

Table ‑ Intended Flight Configuration

| **Item** | **Statement** |
| --- | --- |
| Number of flight items to be embarked on the mission for which ARTES 4.0 support is requested: | ……… |
| Reason why this number of supported flight items is the minimum number necessary to achieve the objectives of the in-orbit activity: *(if more than one flight item)* | ……… |
| Total number of flight items of the same type to be flown on the mission (i.e. including those without ARTES 4.0 support): | ……… |
| The item(s) will be incorporated into the main mission as follows:  | brief description of how the item(s) will be incorporated within the main mission*(e.g. standalone item, within an equipment redundancy ring)* |
| Current Relationship to Flight Customer  | Marketing to them/Already Identified Flight Opportunity/Formal Proposal submitted/In Negotiation |
| The spacecraft manufacturer has been informed that support is being sought from the Agency for a flight opportunity for the items(s): | yes/no |
| The flight opportunity supported by the Agency will be the first demonstration of the item(s) in space: | yes/no |

*If possible, identify a specific flight opportunity (spacecraft/mission name), the name of satellite operator and the name of the satellite manufacturer. If this information is not yet available, indicate to which satellite manufacturers and satellite operators you are offering the items(s) for flight on future missions.*

*For each item type, indicate the number of flight items for which support is requested under ARTES 4.0. If more than one item, explain the rationale for this number of units and why you consider that it is the minimum necessary to achieve the objectives of the in-orbit activities (e.g. to gain flight heritage for a new product). Also indicate the total number of flight items of the same type to be flown on the mission (i.e. including those items for which no support is being requested under ARTES 4.0).*

drawing showing how the item(s) will be incorporated within the main mission,

*In the drawing please clearly indicate the flight items supported by ARTES 4.0 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.*

*If applicable, modify and include the following statement, listing the changes to the items(s) required for each potential flight opportunity. Provide information for each supported flight item type.*

The xx item is undergoing qualification/has recently completed qualification/is a … development model. It will require the following modifications for use in the proposed in-orbit activity:

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

*If applicable, modify and include the following statement, listing the activities for which ARTES 4.0 support is requested by the satellite manufacturer (from European Participating States only).*

The proposed in-orbit activity includes the following activities at satellite level for which support is requested from the Agency by the satellite manufacturer:

1. Satellite manufacturer activity 1.
2. Satellite manufacturer activity 2.
3. …

*Complete the following statement, providing a draft/preliminary list of telemetry and data related to the flight item(s), to be collected during the first year of operation of the items(s) in orbit. In the case of multiple flight types, provide separate information for each item type (e.g. in a table).*

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

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

## Information Related to an Independent Case (hosted)

*Include this section only if an Independent Case is proposed with item(s) flying alongside the main mission but not forming part of the main mission (“Independent Case (hosted)”).*

Table ‑ Overview of the Flight Opportunity

| Item | **Statement** |
| --- | --- |
| Name of spacecraft/mission: | ……… |
| Satellite operator(s): | ……… |
| Satellite manufacturer(s): | ……… |
| Item(s) proposed to be flown with ARTES 4.0 support: | ……… |
| Beneficial owner of the item(s) once in orbit:  | company name/not applicable |
| Nature of the item(s): | new/upgrade |
| Summary of changes/innovation with respect to the current development status of the item(s):  | ……… |
| Justification for ARTES 4.0 support of the flight opportunity: | ……… |

## Information Related to an Independent Case (standalone)

*Include this section only if an Independent Case is proposed and the flight item(s) constitute the main purpose of the mission (“Independent Case (standalone)”).*

**Table 4‑3 Overview of Flight Opportunity(s)**

| **Item** | **Statement** |
| --- | --- |
| Number of Spacecraft: | ……… |
| Type of Spacecraft: | ……… |
| Orbit: | ……… |
| Platform Manufacturer: | ……… |
| Payload Manufacturer: | ……… |
| Company who will be registered owner of the spacecraft: | ……… |
| Country through which the satellite will be registered (in the UN database): | ……… |
| Company responsible for operating the satellite: | ……… |
| Justification for ARTES 4.0 support of the flight opportunity: | ……… |

## Cost Information Related to an Independent Case

*Include this section only if an Independent Case is proposed.*

Table 4.4 Independent Case - 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(s), 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(s), for validation of function and performance or monitoring): | ……… | ……… |
| In-orbit test and validation of the performance and function of the item(s): | ……… | ……… |

*The costs associated with launch can only be supported if the flight item(s) will not be used to generate income to the company during the operational lifetime of the spacecraft.*

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.

*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 item(s) in orbit.*

**ANNEX 1
Terminology Used in ARTES 4.0 Technology & Product Developments**

|  |  |
| --- | --- |
| 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. |
| Business Model | The mechanism(s) by which an organisation generates revenue. There is a wide array of business models – some examples include monthly subscriptions to services, direct sales to organisations, channel resellers, technology licensing, etc. The choice of business model is critical to success in capturing the business opportunity. An organisation can have more than one business model to achieve its objectives. |
| Business Model Canvas | Business Model Canvas is a strategic management and lean start-up template for developing new or documenting existing business models.  |
| CAPEX: | Capital Expenditure or CAPEX is investment for the long term, consisting of assets that are bought by the company and go on the company’s balance sheet. The value of the assets is typically depreciated over the years. |
| Channels | An organisation you form a partnership with to represent your solution in a specified market. Channel partners can include: resellers, service providers, system integrators, distributors, etc. |
| Cost | In ESA terms, “cost” refers to the total cost of development including labour, travel, development tools, subcontractors, external services, etc. |
| 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. |
| Domain | In ESA terms, it can be a Space Segment or Ground Segment related development  |
| 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. |
| ESA Price | The amount of ESA funding that can be granted to a successful bidder.  |
| 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. |
| Internal Rate of Return | Refers to the rate of return used to measure and compare the profitability of investments. It is the value that the cost of capital has in order to have a NPV equal to 0. |
| Market: | A group 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. |
| Net Present Value | Net Present Value is an important value in discounted cash flow analysis, and is a standard method for using the time value of money to assess the viability of long-term projects. NPV reflects the fact that expenses or revenues that will not occur until sometime in the future should be discounted to reflect the impact of risk, interest, and inflation over that time period. |
| OPEX: | Operational costs, or OPEX, are the costs associated with the day-to-day running of the company or the used up expenses. (e.g. employee wages, R&D funds) |
| Partner | A relationship between two parties to collaborate to achieve agreed upon objectives. For example, a business partnership between two organisations could be between a manufacturer and a reseller to distribute products to a defined territory or customer segment. |
| Pay Back Period | Refers to the period of time required for the return on an investment to "repay" the sum of the original investment |
| Pre-operational Stage: | Is the activity related to the utilisation of a product in a user representative environment prior to its operational deployment. |
| Product: | A product is any hardware, software, system or sub-system or service item that is ready for commercial exploitation. |
| Product Development Plan: | Is the development logic to develop a product ready for commercial exploitation using the Development Phases as required (Definition, Technology, Product, and Demonstration), but including as a minimum a Product Phase or a Demonstration phase. |
| Product Phase | The Product Phase includes non-recurring development activities to prepare for the commercial production of the product. This phase shall include a test program suitable for validating the final product. For the development of a product to be used on spacecraft, the Product Phase shall include verification that the product is suitable for operational use in its intended space environment. For the development of a product to be used on the ground, the Product Phase shall be related to product verification and industrialisation. The Product Phase may include studies of spacecraft communication systems or parts thereof related to the final product for up to 25% of the total allowable cost of the proposal. |
| 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. |
| Revenue  | Revenue is the total/gross amount of sales for a given product, service or company. Revenue is also a term used to describe Turnover. |
| Return on Investment | This is the amount, expressed as a percentage, that is earned on a company's total capital calculated by dividing the total capital into earnings before interest, taxes or dividends are paid. Colloquially, ROI is often used to express the idea that the benefit gained through any type of investment (e.g. time, resources) outweighs the investment. |
| 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. |
| Sector | A sector is one of a few general segments in the economy within which a large group of companies can be categorized. A sector represents a group of industries and markets that share common attributes. Each sector has unique characteristics and a different profile. |
| Serviceable Available Market (SAM) | The portion of the total available market (A/the segment/s (i.e. definable subgroup)) that the product/s and/or service/s fills. |
| Serviceable Obtainable Market (SOM)  | The percentage of the serviceable available market that a company aims to capture in the short term. |
| 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. |
| Target Market | Look at Serviceable Obtainable Market. |
| 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. The Technology Phase may exceptionally include early in-orbit experimentation to verify the functioning of the technology in an end-to-end system context when it is not possible to test the technology in a ground-based environment. |
| Technology Readiness Level (TRL) | TRL definition is available on the ARTES web site at <https://artes.esa.int/documents> (“TRL Definitions in ARTES Technology & Product Developments”). |
| Total Available Market (TAM) | The total market demand for a product or service. It represents the revenue opportunity for a product/s and/or service/s. It counts the total of all unit sales of all competing product/s and/or service/s. Also known as the Total Addressable Market. |
| Validation: | Process which demonstrates that the product is able to accomplish its intended use in the intended (pre)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. |
| Value Chain | An informal set of organisations that participate together in an ecosystem to satisfy the needs of users and other stakeholders. Organisations participate at specific levels of a Value Chain to add capabilities to complement other components or solutions in the chain. Companies in a Value Chain look to collaborate with other members of the same chain in areas such as marketing, sales, and development. |
| 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. The item is deliverable during or at the end of the indicated phase(s). [↑](#footnote-ref-2)
2. For example, Development Phases partly funded by ESA, or covered by other programmes/funds. [↑](#footnote-ref-3)
3. 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-4)
4. 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-5)
5. For example, a National, EU or ESA programme, or an internal project (i.e. company financed). [↑](#footnote-ref-6)
6. For an ESA activity please include the contract number. [↑](#footnote-ref-7)
7. 3 Expected or actual, as appropriate. [↑](#footnote-ref-8)
8. The development phase(s) in which the proposed development will take place. [↑](#footnote-ref-9)
9. The TRL for this item at the end of the proposed development. [↑](#footnote-ref-10)
10. Brief description of the proposed main development activities for this item. [↑](#footnote-ref-11)
11. For the definition of the “Verification” and “Validation” terms, please refer to Annex 1. [↑](#footnote-ref-12)
12. Technical and programmatic risks. [↑](#footnote-ref-13)
13. The development phase(s) in which this risk will be mitigated. [↑](#footnote-ref-14)