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20/06/2022	First Issue	1
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ATTACHMENTS:

Annex A: “Deliverables”

DOCUMENT DISTRIBUTION:

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1. SCOPE

This document establishes the top-level Product Assurance Requirements applicable to **"Space Debris Laser Ranging (SDLR)"** project.

The PA program shall ensure that for **SDLR** project the required objectives will be successfully achieved in a cost-effective way and assuring the required quality level by managing the available resources and personnel within the allocated budget and by co-ordinating, in an integrated effort, the PA and QA activities in all the processes involved.

This document considers all the policy and principles of **ECSS-S-ST-00C**.

The Product Assurance requirements specified by this document are applicable to the Prime Contractor during the whole life cycle of the project. The latter shall be responsible to tailor the PA requirements to his sub-Contractors and Suppliers, according to their contribution, through the process explained in **ECSS-S-ST-00C** and ASI document **[AD 3]**. It is under the responsibility of the Prime Contractor to ensure the PA requirements implementation throughout the whole contractual supply chain.
It is an applicable document to the "**SDLR** project Statement of Work" [AD2] and shall be complied with by the Contractor during the project execution.

2. DEFINITIONS

All the definitions of the contractual documents will be applicable, in addition the definitions from the applicable ECSS standards shall be taken in charge.

3. DOCUMENTS

The PA requirements are based on **ECSS** series "Q" documents, after that the required tailoring process, taking into account the specific objectives, needs and constraints for **"SDLR"** project, will be set up, documented by the Contractor and agreed with ASI **[RD01]**.
The ECSS standards shall be applicable documents to the extent they have been made applicable to **"SDLR"** by the process of first level tailoring performed by ASI (this tailoring is defined in **[AD5]**) and to the extent that their applicability has been negotiated, through the process of tailoring of second level performed by the Prime Contractor with ASI agreement and final approval.

3.1 Applicable Documents

The following documents are applicable to the Product Assurance requirements document (this document) and are hierarchically above:

AD1. THE CONTRACT (OR THE ASI LETTER "REQUEST FOR PROPOSAL")

AD2. CAPITOLATO TECNICO - PROJECT: SDLR, ASI DOCUMENT N° DC-UOM-022-040, 24-05-2022

AD3. ISTRUZIONE OPERATIVA LINEE GUIDA PER IL TAILORING DELLE NORME ECSS", ASI DOCUMENT N° OP-UQT-2022-001

AD4. NORMA PER LA REDAZIONE DEL PIANO DI ASSICURAZIONE DEL PRODOTTO_ ASI DOCUMENT N° OP-QTA-2012-005

AD5. PROGETTO "SDLR " - "ECSS FIRST STEP TAILORING"_ ASI DOCUMENT N° DC-UQT-2022-014

AD6. "SISTEMI DI GESTIONE PER LA QUALITÀ" DOCUMENT UNI EN ISO 9001:2015

AD7. ISTRUZIONE OPERATIVA 'TAILORING PER "SPACE ENGINEERING – SOFTWARE E "SOFTWARE PRODUCT ASSURANCE"', ASI DOCUMENT N° OP-UQT-2022-002

3.2 Reference Documents

Reference documents are those documents used to provide clarification and integration in support of the applicable documents. Although the following reference documents do not form part of the Contract and are not identified in the Contract they do integrate Product Assurance requirements for **"SDLR"**.

RD1. ISTRUZIONE OPERATIVA "ECSS APPLICABILITY GUIDELINES FOR ASI PROGRAMMES" ASI DOCUMENT N° OP-IPC-2006-002, ISSUE B

4. PA REQUIREMENTS

To fulfil the **"SDLR"** PA requirements the Contractor shall establish and maintain a PA program in accordance with the requirements specified by the **ECSS** series "Q" standards, tailored to the specific Program's needs and constraints as per **[AD3].**

Contractor's PA aspects, responsibilities, tasks and deliverables to ASI are specified in the following sections.

4.1 Product Assurance Plan

The PA program shall be based upon a **"SDLR"** Program's **PA Plan** to be prepared, implemented and maintained by the Contractor throughout the whole Program life cycle and to be submitted to ASI for approval. The Contractor's PA Plan shall describe the resources, tasks, responsibilities, methods and procedures adopted by the Contractor for the implementation of the PA and QA requirements and for the achievement of the PA objectives. Document **[AD4]** describes the objectives and the general contents required for the **PA Plan**.

The **PA Plan** shall be used as a master planning and control document for the Product Assurance program. The **PA Plan** shall include a section addressing the compliance with the requirements of **ECSS** "Q" (as tailored to the Program) identifying any relevant discrepancy.

The **PA Plan** shall describe how the Contractor intends to verify that the PA program for **"SDLR"** will be accomplished and how the Contractor intends to perform supervisory and monitoring actions on sub-Contractors (suppliers). Contractor's internal Company procedures may be referenced in the PA Plan to meet specific requirements; in this case they shall be provided to ASI on request.

Contractors should be aware that referencing internal Company's procedures in the PA Plan will limit the Company's ability to unilaterally change those procedures. Any change to those procedures shall be considered as modifications to the PA Plan.

The PA Plan, an integrated document including separate sections corresponding to the various PA activities, shall be prepared according to the instruction provided in the applicable document **[AD4]** and in the applicable ECSS standard tailored as per **[AD 5]**.

SDLR-PAR-001 'PRODUCT ASSURANCE PLAN

The Contractor shall prepare, implement and maintain a **"SDLR"** specific **PA Plan**, made applicable throughout the whole Program life cycle and to be submitted to ASI for approval.

Required output:

Delivery schedule	
PDR, CDR Update as required by AD2	**Product Assurance Plan** (PA Plan) prepared according to the required DRD-PA00 and the related applicable documents.

ASI reserves the right to:

a. access all documents and records made for the **"SDLR"** project, including the physical access to all Contractor's or sub-Contractor (suppliers) facilities where activities are carried-out or documents, equipments, materials are stored;

b. perform or participate in any audit, survey, inspection, review, test, etc. relevant to the **"SDLR"** project activities at Contractor's premises or one of his sub-Contractors (suppliers). ASI participation in the above activities, or ASI performed audits towards Contractors, shall not replace or relieve the Contractor of his contractual responsibilities.

The **PA Plan** shall specifically mention the above retained rights of ASI, as specified at point 4, Annex "A" of **[AD4].**
Intellectual property issues, associated with documentation and access rights, are managed by the Contract **[AD1]** and the Statement of Work **[AD2]**.

4.2 PA Progress reporting

PA Progress reporting shall be part of the overall Program's progress reporting as defined in the Program Management section of **[AD2].** For the PA activities the Contractor shall produce a dedicated and detailed PA report/section to ASI.

SDLR-PAR-002 'PA PROGRESS REPORT'

The Contractor shall issue a PA progress report documenting all the PA activities carried out in the relevant period as defined in the contract/SoW. This report could be part of the periodic project progress report.

Required output:

Delivery schedule	
as required by SoW	**PA Progress Report** to be prepared as required by Annex "A", point 18, of **[AD4]**.

4.3 Quality Assurance

The Contractor shall prepare, implement, maintain and control a Plan for all QA activities. The plan could be part of the overall PA Plan. QA requirements are made applicable to the **"SDLR"** Program by documents **[AD3]** and tailored by **[AD5]** and to the specific Program's needs and constraints**.**

SDLR--PAR-003 'QUALITY ASSURANCE PLAN'
The Contractor shall prepare, implement, maintain and control a Plan for all QA activities. The QA plan could be part of the overall PA Plan.

Required output:

Delivery schedule	
as for PA Plan	**Quality Assurance Plan** (QA Plan), could be part of PA Plan as specified in **[AD4].**

4.4 Audits Plan

The Contractor shall identify the external and internal PA/QA audits planned to:

a. verify the implementation and effectiveness of the PA/QA Program for **"SDLR"** project

b. assess the capability of the Contractor and sub-Contractors (suppliers) to perform the required tasks or the suitability of their internal procedures to the requirements of the **"SDLR"** project.

The audits shall be planned according to the level of risks of the **"SDLR"** project, therefore higher priority shall be given to new sub-Contractors (suppliers) or when new or not yet qualified technologies or processes are foreseen. Detailed organization and plan for each audit will be prepared and given in advance to all the parties involved in the process.

The Contractor shall prepare dedicated checklist(s) to be used when performing audits. The checklist(s) shall cover all the PA requirements,

applicable to the **"SDLR"** project, that are supposed or selected to be audited. Checklist(s) shall be made available to ASI upon request.

ASI reserves the right to be represented in sub-Contractor (supplier) audits. For this reason, a minimum of ten working days notice shall be given to ASI.

Audit reports shall be made available to ASI upon request.

SDLR-PAR-004 'AUDIT PLAN'

The Contractor shall identify the external and internal PA/QA audits planned to:

a. verify the implementation and effectiveness of the PA/QA Program for **"SDLR"** project

b. assess the capability of the Contractor and sub-Contractors (suppliers) to perform the required tasks or the suitability of their internal procedures to the requirements of the **"SDLR"** project.

SDLR-PAR-005 'AUDIT REPORTS'

The Contractor shall issue for each audit specific report, made available to ASI upon request

Required output:

Delivery schedule	
First issue at KOM and update as required	**PA/QA Audit Plan**, prepared according to DRD-PA01
as required/generated	**Audit Reports**, prepared according to DRD-PA02

4.5 Non Conformances Control

The Contractor shall define and implement a non-conformance management process and related control system in accordance with the requirements specified by the **ECSS** series "Q" standards, tailored to the specific Program's needs and constraints by document **[AD05].**
To this end the Contractor shall define a procedure covering all the steps, from initial notification until final close-out, for each class of non-conformance.

In particular the procedure shall clearly define the relationship between the Risk Management, the Configuration Management and the PA Management processes when handling non-conformances.

SDLR-PAR-006 'NON CONFORMANCE MANAGEMENT PROCEDURE'

1. The Contractor shall define and implement a non-conformance management process and related control system in accordance with the requirements specified by the ECSS-Q-ST-10-09C.
2. Contractor shall define a Non conformance control procedure covering all the steps of the management process, from initial notification until final close-out, for each class of non-conformance.

SDLR-PAR-007 'NON CONFORMANCE REPORTS'

The Contractor shall issue for each Non conformances specific report, made available to ASI upon request

SDLR-PAR-008 'REQUEST FOR DEVIATION/WAIVER MANAGEMENT PROCEDURE'

Based on the non-conformance system and on the configuration management standard, the Contractor shall also define specific procedures for processing of Waivers/Deviations (RFW/D) that require ASI approval.

Required output:

Delivery schedule	Required output (no specific DRDs are required)
As PA Plan, updated as necessary	**Non-conformance management procedure (normative reference is ECSS-Q-ST-10-09C)** could be part of PA Plan
As required/generated	**Non-conformance Reports**
As PA Plan, updated as necessary	**Request for Deviation/Waiver management procedure,** could be part of PA Plan

4.6 Qualification processing and Acceptance

The Contractor shall identify, substantiate and foresee the implementation of an incremental qualification and acceptance philosophy and process for all items that compose the **"SDLR"** project, in order to fulfil all requirements and constraints (Programmatically and Management, Technical, PA/QA).

The Contractor's PA Organisation shall be responsible for the incremental qualification and acceptance definition process from his sub-Contractors (suppliers). During this process the Contractor shall implement a

qualification status reporting system in accordance with **"SDLR"** project PA requirements. (ECSS-Q-ST-10C Annex B).

Appropriate Qualification and Testing Plan(s) shall be foreseen, developed, mantained and agreed with ASI Program Manager and PA Manager, in particular for any modified or not previously qualified/tested item.

Final ASI acceptance or delivery Review(s) shall be pre-planned and prepared by the Contractor, in coordination with ASI, according to a specific procedure to be produced by the Contractor and to be approved by ASI. Foreseen **"SDLR"** project reviews are specified in **[AD2].**

A Qualification Status List of the programme items shall be maintained in conformance with ECSS-Q-ST-10C Annex B to summarize for each configuration item the status achieved with respect to the planned qualification
The delivery should include the **Final Report,** at acceptance events**.**

4.7 Criticality analysis

The objective of criticality analysis is to ensure the success of **"SDLR"** project using methods to analyze possible failure or defect modes of a process, product or system, analyze the causes and evaluate the effects on the entire system / plant.

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SDLR-PAR-009 'FMEA/FMECA ANALYSIS'

The Contractor shall perform functional and product FMECA based on the criticality of consequences, according to ECSS-Q-ST-30-02.

Required output:

Delivery schedule	
PDR, CDR, updated as necessary	**FMEA/FMECA Analysis** (as prescribed by ECSS-Q-ST-30-02C)

The Contractor shall establish and maintain a list of **Critical Items,** if any, that provides the rationale for their identified criticality and the specific actions taken to reduce the criticality levels. Periodic Risk analysis and assessment will contribute to the identification of Critical Items.

A close-out reference shall be recorded when the corresponding actions have been implemented.

SDLR-PAR-010 'CRITICAL ITEMS LIST'

The Contractor shall establish and maintain a Critical Items List, according to ECSS-Q-ST-10-04C Annex A.

Required output:

Delivery schedule	
, PDR, CDR, SAR, updated as necessary	**Critical Items List** prepared according to ECSS-Q-ST-10-04C Annex A DRD-PA06.

4.10 Materials, Parts & Processes

The objectives associated to Materials, Mechanical Parts and Processes (MMPP) selection is to ensure that they will satisfy the performance requirements during the intended life-time of the **"SDLR"** Project, by an appropriate approach for evaluation, selection, procurement and control process of MMPPs .

The Contractor shall define in the PA Plan the Materials, Parts and Processes Assurance organisation and associated tasks. With this plan it shall be ensured that the selection, approval, procurement, and usage of Materials, Mechanical parts and Processes for all flight hardware meet the **"SDLR"** System Dependability requirements. The corresponding required activities are defined by documents **[AD3]** and **[AD5]** and are tailored, to the specific Program's needs and constraints, according to the **ECSS-Q-ST-70 C** standard.

Any process that involves hazards above "marginal" shall be identified as "Critical Item" and reported to ASI through the **Critical Items List**.

4.11 Safety

The Contractor shall define the safety programme and the safety technical requirements to protect from hazards:

- Ground personnel and the general public,
- Ground support equipment, the space system and associated segments and facilities,
- Public and private property,
- The environment.

The safety engineer, operating in the PA organization, will assure the implementation of the Safety program in close co-operation with design

engineering and the other disciplines of the same organization (RAM, Parts Materials & Processes - PMP, Quality Assurance, etc.).
Safety is designed into the System, Safety controls shall be adequately implemented and verified.

SDLR-PAR-0011 'SAFETY PROGRAMME PLAN'
The supplier shall establish and maintain a safety programme plan in conformance with the DRD in Annex B of ECSS-Q-ST-40C, that could be part of the overall Product Assurance Plan.

SDLR-PAR-0012 'SAFETY ANALYSIS REPORT'
The safety analysis report shall be established in conformance with the ECSS-Q-ST-40C Annex D in order to gather results of safety analyses

Required output:

Delivery schedule	
as part of the PA plan	**Safety programme plan**
PDR, CDR, SAR and as required by the contract/SoW	**Safety analysis report (including hazard reports)** (as prescribed by ECSS-Q-ST-40C, Annex D

4.12 Software

The Contractor shall prepare, maintain and implement a Software PA program and tasks as part of the overall PA tasks. This program shall be based upon a **SW PA Plan** showing how the Contractor intends to perform the Software PA tasks, in conjunction with other PA and SW Engineering tasks, during all Program's phases.

SW PA discipline requirements are made applicable to the **"SDLR"** by documents **[AD3]** and **[AD6]** and are tailored, to the specific Program's needs and constraints according to the **ECSS-Q-ST-80 C** and **ECSS-E-ST-40 C** standard.

The **SW PA Plan** shall describe how the Contractor plans verify that the SW PA program will be accomplished and how the Contractor intends to perform supervisory and monitoring actions on sub-Contractors (suppliers) in charge of developing, integrating, validating software (during whole SW life cycle). Contractor's internal company procedures may be referenced in the SW PA Plan, in this case they shall be provided to ASI on request.

Dependability analysis will determine the contribution of software to potential System, S/System, Equipment failure conditions and therefore determine the corresponding software criticality levels.
Software criticality levels shall be used to modulate the software PA requirements that apply to the corresponding software developments.

SDLR-PAR-013 'SOFTWARE PA PLAN'
The supplier shall develop a software product assurance plan in response to the software product assurance requirements in conformance with DRD in annex B of ECSS-Q-ST-80C; this plan could be a section of overall Product Assurance Plan.

Required output:

Delivery schedule	
Part of the PA Plan	**Software PA Plan** prepared according to Annex "A" of **[AD4].**

5. ANNEX "A"- DELIVERABLES.

For those deliverables where no specific DRD has been required (*) the Contractor shall propose one for ASI approval, according to ECSS applicability, at offer evaluation time. The "first issue" of a document shall be a document that has obtained internal Contractor's approval as its contents is suitable for the intended use.

Outputs N.	Deliverable code	Deliverable title	DRD no.	ASI action	First issue required by (event or milestone)
1	**SDLR-PAR-001**	**Product Assurance Plan**	**DRD-PA-00**	A	PDR, CDR, updated as required
2	**SDLR-PAR-002**	**PA Progress Report**		R	as required
3	**SDLR-PAR-003**	**Quality Assurance Plan (could be part of PA Plan)**		A	as PA Plan
4	**SDLR-PAR-004**	**PA/QA Audit Plan**	**DRD-PA-01**	R	First issue at KOM and update as required

Outputs N.	Deliverable code	Deliverable title	DRD no.	ASI action	First issue required by (event or milestone)
5	SDLR-PAR-005	Audits Reports	DRD PA-02	I	As generated/as required
6	SDLR-PAR-006	Non conformance management procedure (could be part of PA Plan)		A	as PA Plan
7	SDLR-PAR-007	Non-conformance reports		A	As defined in PA Plan
8	SDLR-PAR-008	Request for Deviation/Waiver management procedure' (could be part of PA Plan)		A	As defined in PA Plan
9	SDLR-PAR-009	FMEA/FMECA Analysis'		R/A	First at PDR (as a minimum, updated at major Design Reviews
10	SDLR-PAR-010	Critical Items List	DRD-PA-03	R	PDR, CDR, SAR, updated as necessary
11	SDLR-PAR-011	Safety Programme Plan		A	as PA Plan
12	SDLR-PAR-012	Safety analysis report (including hazard reports)		R	PDR, CDR, SAR and as required by the contract/SoW
13	SDLR-PAR-013	Software PA Plan		A	as PA Plan

A = approval ; I = information ; R = review

TITLE:	**PRODUCT ASSURANCE PLAN**
DRD NO.:	**PA00**

REMARKS: this plan shall be approved by ASI

INTENDED USE OR APPLICATION: .

The PA Plan of the Prime Contractor shall describe how the Contractor intends to implement and verify that the PA program will be accomplished and how the Contractor intends to perform supervisory and monitoring actions on sub-Contractors and suppliers. Contractor's internal company procedures may be referenced in the PA Plan, in this case they shall be provided to ASI on request.

REFERENCES, INPUTS AND RELATED DOCUMENTS:

Program Management Plan , Program Development Plan, Program Verification Plan.

DOCUMENT DESCRIPTION:

The PA Plan, including separate sections corresponding to the various PA disciplines and activities, shall be prepared according to the instruction provided in the applicable document **[AD4].**

Note.
Contractors should be aware that referencing internal Company's procedures in the PA Plan will limit the Company's ability to unilaterally change these Company's procedures. Any change to procedures shall be considered as modifications to the PA Plan (requiring ASI's approval).

TITLE: **AUDIT PLAN**

DRD NO.: **PA01**

REMARKS: For ASI review

INTENDED USE OR APPLICATION:

To identify the external and internal PA audits planned to verify the implementation and effectiveness of the PA Program and to assess the capability of the Contractor and sub-Contractors / suppliers to perform the required tasks or the suitability of their internal Procedures to the requirements of the Program.

ASI has right of access to audit activities insight the project; ASI may request surveillance and audit of Contractor, its Subcontractors and Suppliers, in case of potential criticalities.

REFERENCES, INPUTS AND RELATED DOCUMENTS:

Program Risk assessment. Audit procedures and check-lists

DOCUMENT DESCRIPTION:

The Audit Plan shall contain at least the following basic elements:

- Identification of Company (department) / sub-Contractor / supplier to be audited
- Date (or reference to a program milestone) of audit(s)
- Description of audit objectives and field
- Audit baseline identification
- Audit check-list identification
- Audit team composition
- Audit schedule and agenda
- Audit report format and distribution
- Audit actions control

TITLE: AUDIT REPORT DRD NO.: PA02
REMARKS: For ASI information
INTENDED USE OR APPLICATION: . To report status on performed audits
REFERENCES, INPUTS AND RELATED DOCUMENTS: Audit Plan
DOCUMENT DESCRIPTION:

The Audit Report shall contain at least the following basic elements:

- Audit reference
- Place / Company (unit) audited
- Area being audited
- Audit baseline (used documentation)
- Audit checklist (reference)
- Audit team and observers (names, functions)
- Recall of audit objectives
- Audit results, actions plan and observations
- Conclusions and recommendations of the audit team
- Closure visit(s) reference

TITLE: **CRITICAL ITEMS LIST**

DRD NO.: **PA03**

REMARKS: For ASI review

INTENDED USE OR APPLICATION: The Dependability and Safety technical risk identification , reduction and control as part of the Program Risk Management Process.

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REFERENCES, INPUTS AND RELATED DOCUMENTS:

ECSS-Q- ST-10-04C , Program Risk assessment

DOCUMENT DESCRIPTION:

To identify and track the critical items as a result from risk assessment. The dependability critical items list shall contain the list of all items identified by dependability analyses performed to support the risk reduction and control process.

- classification of functions and items
- identified risk
- critical levels
- causes
- actions and recommendations for risk reduction
- due date
- risk decisions
- verification of risk reductions

The safety critical items list shall list all safety-related items.