Agenzia Spaziale Italiana

Il Direttore Generale

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Oggetto: Richiesta d'offerta per l'affidamento delle "*Attività industriali per le fasi B2/C/D/E1 dello strumento secondario VNIR per la missione SBG/TIR",* in cooperazione con NASA, ai sensi dell'art. 135 e nel rispetto dei principi di cui agli artt. 1, 2 e 3 del D.Lgs. n. 36/2023.

CIG: B372BC4E76

Contesto programmatico

ASI e NASA collaborano dal 2018 nello studio della missione di Osservazione di Terra "*Surface Biology and Geology (SBG)*", la quale è composta da due missioni satellitari separate, una dedicata ad acquisire immagini iper-spettrali nel visibile e nel vicino infrarosso (SBG-VSWIR) e una dedicata per acquisire immagini multispettrali nell'infrarosso termico (SBG-TIR); la pianificazione prevede il lancio di SBG-TIR nel 2028.

Per ottemperare alle responsabilità di propria competenza derivanti dall' **"***Implementing Arrangement between the National Aeronautics and Space Administration of the United States of America and the Italian Space Agency of the Italian Republic for cooperation on the Surface Biology and Geology mission, phases A study*" l'ASI ha avviato il contratto ASI/Leonardo S.p.A n. 2022-33-I.0 "*Attività industriali di fase A/B1 per lo strumento secondario VNIR per la missione SBG/TIR*" per lo strumento (VIREO) di competenza italiana, affidato a seguito di procedura selettiva avviata con Avviso di indagine di mercato approvata con decreto del Direttore generale 595/2022 del 28 giugno 2022, nell'ambito della quale era stato previsto che l'eventuale soggetto affidatario delle suddette fasi A/B1 si impegnava a garantire il proseguimento delle attività anche per le fasi successive (fasi B2/C/D/E1) in accordo con l'offerta presentata nell'ambito delle attività oggetto della procedura medesima.

Sono attualmente in corso le ulteriori attività a seguito dell'Atto Aggiuntivo n. 2022-33-I.1-2024, firmato tra ASI e Leonardo S.p.A. il 26/9/2024 per una durata di 12 mesi.

Durante le attività di fase A/B1, ASI e NASA, il 27 ottobre 2023, hanno stipulato l'"*Implementing Arrangement between the National Aeronautics and Space Administration of the United States of America and the Italian Space Agency of the Italian Republic for cooperation on the Surface Biology*

and Geology mission, phases B-F" che disciplina le rispettive responsabilità di ASI e NASA per le successive fasi B2/C/D/E1 della missione SBG/TIR.

Obiettivi

È necessario l'avvio delle fasi di sviluppo B2/C/D/E1 della missione SBG-TIR al fine di raggiungere l'obiettivo concordato con la NASA che prevede un lancio della missione SBG-TIR entro il 2028, e garantire continuità alle attività in corso con il partner americano, che non prevede interruzioni tra le diverse fasi del programma.

Oggetto dell'offerta

Le attività di fase B2/C/D/E1, secondo lo standard ECSS, dovranno essere finalizzate a garantire:

- il disegno, lo sviluppo, la realizzazione, il test, la verifica, la validazione e la calibrazione del *payload* VIREO;
- il supporto alle attività di integrazione e test del *Payload* VIREO sullo strumento OTTER, realizzato dal NASA/JPL;
- il supporto alle attività di integrazione e test del *payload*, composto dallo strumento OTTER e dallo strumento VIREO, sulla piattaforma e alla relativa campagna di test a livello di satellite;
- il disegno, lo sviluppo, la realizzazione, il test, la verifica e la validazione dell'E2E VIREO *Performance Simulator;*
- il disegno, lo sviluppo, la realizzazione, il test, la verifica e la validazione dei processori (VNIR) fino al livello L2 (incluso);
- lo svolgimento della campagna di lancio, delle attività di LEOP e di *commissioning* dello strumento in orbita,
- il supporto alla corretta integrazione della catena di processamento dei prodotti VIREO (fino a livello L2 incluso) nel Segmento di terra, da considerarsi come CFI fornito da ASI;
- la partecipazione a gruppi di lavoro, eventi e *milestones* di progetto del partner internazionale, del sistema e del Segmento di Terra con preparazione del relativo materiale documentale.

Nello svolgimento delle attività di cui sopra, il contraente dovrà considerare la suddivisone delle responsabilità tra ASI e NASA e conseguentemente prevedere l'interazione con NASA/JPL per le interfacce con lo strumento principale OTTER, di competenza di NASA/JPL secondo quanto stabilito nell *Implementing Arrangement* sopracitato.

Dovrà inoltre prevedere le interazioni con Thales Alenia Space Italia S.p.A. responsabile verso ASI della realizzazione delle attività di sistema della missione SBG-TIR, e con l'industria che verrà indicata da ASI per la realizzazione del Segmento di Terra.

Le attività sono dettagliate nel Capitolato Tecnico allegato alla presente RdO.

Si chiede, pertanto, di voler formulare la Vostra migliore offerta per le "*Attività industriali per le fasi B2/C/D/E1 dello strumento secondario VNIR per la missione SBG/TIR in cooperazione con NASA*", nei limiti di un importo massimo complessivo di € 17.000.000,00 (IVA non imponibile) e una durata di 54 mesi.

L'offerta sarà sottoposta alla consueta valutazione di congruità ASI, ai sensi e per gli effetti dell'art. 61 del Regolamento di Amministrazione, Contabilità e Finanza dell'ASI.

Tali attività sono da intendersi per servizi di ricerca e sviluppo e, in quanto tali, identificabili con il codice del Common Procurement Vocabulary (CPV) n. CPV73300000-5 "Progettazione e realizzazione di ricerca e sviluppo", sono da considerarsi escluse dall'applicazione del D. Lgs.

36/2023 secondo le previsioni di cui all'art. 135 c. 2 del medesimo ed ai principi di cui agli art. 1, 2 e 3, in quanto non ricorre il caso di cui alla lettera a) che recita "i risultati appartengono esclusivamente all'amministrazione aggiudicatrice e all'ente aggiudicatore, affinché li usi nell'esercizio della sua attività"; infatti i risultati del servizio vengono resi disponibili dall'ASI alla comunità industriale e scientifica, nonché a la modalità, la tempistica e gli ambiti di tale diffusione saranno definiti da ASI;

Le attività oggetto del presente provvedimento sono non imponibili ai fini IVA ai sensi dell'art. 8 bis, lettera e), del D.P.R. 26 ottobre 1972, n. 633 e successive modificazioni, in quanto concernente prestazioni di servizi relativi alla costruzione ed allestimento di satelliti, reso applicabile all'ASI dall'art. 34 bis D.L. 2 marzo 1989, n. 69, articolo aggiunto dalla Legge di conversione n. 154 del 27 aprile 1989;

L'offerta dovrà essere predisposta in conformità ai requisiti indicati negli allegati alla presente.

La presente procedura, in ossequio a quanto disposto dall'art. 25 del Codice, si svolge con modalità telematica. L'offerta predisposta in conformità ai requisiti indicati negli allegati alla presente dovrà pervenire mediante l'utilizzo del sistema di gestione telematica della gara disponibile al seguente link https://app.albofornitori.it/alboeproc/albo_asi **entro 30 giorni dalla data di pubblicazione** della presente Richiesta di offerta.

Entro il termine di scadenza indicato, mediante l'utilizzo del sistema di gestione telematica della gara suddetto, codesta Società dovrà depositare sul sistema (upload), collegandosi alla propria area riservata dell'albo fornitori dell'ASI, nell'apposito spazio la documentazione d'offerta, seguendo le indicazioni fornite dal sistema.

Si sottolinea che a norma delibera ANAC 19 dicembre 2023, n. 610 recante "Attuazione dell'articolo 1, commi 65 e 67, della legge 23 dicembre 2005, n. 266 per l'anno 2024" (legge finanziaria 2006), codesta Spett.le Società è tenuta ad effettuare il pagamento del contributo previsto dalla legge in favore dell'Autorità Nazionale Anticorruzione per un importo pari a € 220,00 secondo le modalità indicate sul sito ANAC. La ricevuta di pagamento del contributo a favore dell'ANAC dovrà essere allegata all'offerta.

Si fa presente sin d'ora che a norma degli artt. 117 e 106 del D.lgs. n. 36/2023 la garanzia di corretta esecuzione del Contratto potrà essere ridotta del 20 % in caso di possesso di una o più delle seguenti certificazioni/marchi:

- UNI EN ISO 9001:2015 (Sistemi di gestione per la qualità);
- ISO/IEC 27001:2022 (Sistemi di gestione per la Sicurezza delle Informazioni - N.B.: Le aziende certificate a fronte della ISO/ IEC 27001:2013 hanno tempo tre anni dalla pubblicazione della ISO/IEC 27001:2022 (24/10/2022) per effettuare la transizione);
- UNI EN 9100:2018 (Sistemi di gestione per la qualità – Requisiti per le organizzazioni dell'aeronautica, dello spazio e della difesa).

Tale riduzione è cumulabile con quelle indicate all'art. 106 co. 8, primo e secondo periodo del D.Lgs. medesimo. In caso di cumulo delle riduzioni, la riduzione successiva è calcolata sull'importo che risulta dalla riduzione precedente. Per fruire delle riduzioni l'operatore economico segnala, in sede di offerta, il possesso dei relativi requisiti e lo documenta nei modi prescritti dalle norme vigenti.

Il Responsabile Unico del Progetto è l'ing. Francesco Longo, mail francesco.longo@asi.it.

Si precisa che la presente richiesta di offerta non vale come proposta contrattuale ovvero come ordine di acquisto. Essa non vincola l'ASI a darvi alcun seguito, a sottoscrivere alcun accordo, a remunerare alcuna attività svolta, nonché a rimborsare eventuali spese sostenute per effetto della medesima. La presente richiesta non legittima e/o costituisce titolo ad avanzare diritti e/o pretese di sorta.

Trattamento dei dati personali

Ai sensi del Regolamento (UE) 2016/679 del 27 aprile 2016, art. 13, si informa che i dati personali forniti saranno trattati per le esclusive finalità di partecipazione alla presente procedura negoziata nonché per gli eventuali adempimenti successivi nel caso in cui dovesse risultarne aggiudicatario; saranno trattati a cura delle persone all'uopo preposte mediante l'utilizzo di procedure anche informatizzate, nei modi e nei limiti, anche temporali, necessari per perseguire le predette finalità, più un ulteriore periodo di dieci anni quale termine massimo in caso di eventuale contenzioso. I dati personali in questione potranno essere altresì, in conformità alle norme vigenti, oggetto di accesso da parte di eventuali soggetti controinteressati, nonché da parte degli organi giudiziari e di controllo.

Il conferimento di tali dati è necessario per verificare i requisiti di partecipazione alla procedura negoziata; pertanto in caso di rifiuto a fornirli non sarà possibile parteciparvi.

L'interessato gode dei diritti di cui agli artt. 15 e ss. del citato Regolamento, tra i quali figura il diritto di accesso ai dati personali che lo riguardano, il diritto di far rettificare, cancellare, limitare i propri dati nelle modalità e nei casi ivi stabiliti, nonché il diritto di opporsi al loro trattamento per motivi connessi ad una propria situazione particolare. Tali diritti possono essere fatti valere nei confronti dell'ASI, che è il Titolare dei dati trattati, contattando il Responsabile della Protezione dei dati personali all'indirizzo Agenzia Spaziale Italiana – Responsabile della Protezione dei dati personali, via del Politecnico snc, 00133 Roma ovvero all'indirizzo di posta elettronica rpd@asi.it. L'interessato ha altresì diritto di proporre reclamo all'autorità di controllo, il Garante per la protezione dei dati personali, all'indirizzo rinvenibile sul suo sito istituzionale.

Cordiali saluti

Luca Vincenzo Maria SALAMONE

Agenzia Spaziale Italiana
Luca
Vincenzo
Maria
Salamone

Allegati:

- Capitolato Tecnico per il Progetto
- OP-UPQ-2016-004-PREPARAZIONE_OFFERTA
- MO-UPQ-2017-007_fac-simile lettera trasmissione

	UNITA' / NOME	FIRMA	DATA
PREPARATO	*UOT* – Tiziana Scopa *SQA* - Vincenzo Martucci *UOT* - Sara Venafra *UOT* - Giorgio Viavattene *STE* - Raffaele Votta *STE* - Francesco Tataranni	Tiziana Scopa 07.11.2024 11:12:59 GMT+02:00 Vincenzo Martucci 05.11.2024 18:28:07 GMT+02:00 Sara Venafra 05.11.2024 11:09:49 GMT+01:00 Giorgio Viavattene 05.11.2024 15:36:51 GMT+02:00 Raffaele Votta 05.11.2024 22:14:28 GMT+02:00 FRANCESCO TATARANNI 05.11.2024 14:37:37 GMT+02:00	
VERIFICATO	*UOT* – Simona Zoffoli *UOT* – Francesco Longo	Francesco Longo 08.11.2024 13:39:29 GMT+02:00	
APPROVATO	*UOT* – Francesco Longo		

Registro delle modifiche

Data	Sezione del documento / Motivo della revisione	Revisione
03/10/2024	Prima emissione formale	A

ALLEGATI:

Vedi INDICE all'interno

DISTRIBUZIONE DEL DOCUMENTO:

Allegato alla Richiesta d'Offerta

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1. SCOPO E CAMPO D'APPLICAZIONE

Questo documento costituisce il Capitolato Tecnico (CT) relativo alla richiesta d'offerta dell'Agenzia Spaziale Italiana (ASI) del payload secondario per la missione congiunta tra ASI e NASA/JPL denominata "Surface Biology and Geology Thermal Infrared (SBG-TIR) Mission" e delle associate catene di processamento nonché simulatore di strumento.

I requisiti e quanto specificato nel presente CT sono resi applicabili al Contraente, che assumerà la completa responsabilità ("end-to-end") dell'esecuzione del progetto e, per quanto loro applicabile, a tutti i partner e/o sotto-contraenti coinvolti per le attività/responsabilità conferite al fine di assicurare la piena conformità della fornitura.

Le attività di fase A/B1 sono state svolte da Leonardo S.p.A. con l'obiettivo di definire il design e il piano di sviluppo preliminari dello strumento secondario.

2. DEFINIZIONI ED ACRONIMI

2.1 DEFINIZIONI

Le definizioni contenute nello standard "ECSS system - Glossary of terms", ECSS-S-ST-00-01C sono applicabili.

Si riportano qui di seguito le definizioni di uso frequente nel processo

Committente: ASI

Prodotto: Fornitura contrattuale

Contraente: Esecutore dei lavori

2.2 ACRONIMI

ASI: Agenzia Spaziale Italiana
CGA: Capitolato Generale ASI
CI: Configuration Item
DA: Documento applicabile
DEL: (documento da consegnare)
DR: Documento di riferimento
ECSS: European Cooperation for Space Standardisation
EIDP: End Item Data Package
GSE: Ground Support Equipment
HW: Hardware
PA: Product Assurance
PT: Product Tree
RdO: Richiesta d'Offerta
SOC: Statement Of Compliance
SW: Software
WBS: Work Breakdown Structure

3. DOCUMENTAZIONE APPLICABILE E DI RIFERIMENTO

Tutti i requisiti inclusi nei "Documenti Applicabili", per quanto non espressamente richiamati nel testo del presente documento, formano il set completo dei Requisiti che il Contraente deve considerare come applicabili allo sviluppo di un payload iperspettrale compatto di osservazione della terra.

Laddove i Documenti Applicabili contengano requisiti contraddittori, il Contraente è tenuto a notificarli ad ASI e proporre soluzioni tese alla loro risoluzione. In caso di mancata notifica si applica il requisito più stringente.

Per i documenti, laddove non sia specificata la versione, si intende applicabile l'ultima versione disponibile

3.1 DOCUMENTAZIONE APPLICABILE

I seguenti documenti costituiscono parte integrante del Capitolato Tecnico secondo la priorità definita nel seguente paragrafo § 3.3 "Ordine di Precedenza"; essi debbono essere applicati dal contraente nello sviluppo dell'offerta.

GENERALI

[DA 01] *Istruzione Operativa "Preparazione e trasmissione dell'offerta all'ASI" – Doc. OP-IPC-2005-012, per Richieste di Offerta di importo superiore ai 400 Keuro, IVA esclusa*

[DA 02] *Capitolato generale ASI, , disponibile su http://www.asi.it/html/norme/cap_gen.pdf*

[DA 03] *Implementing Arrangement between NASA and ASI for the cooperation on the SBG-TIR mission phases B-F, firmato in data 27/10/2023*

[DA 04] *Istruzione Operativa "Linee guida per il Tailoring delle norme ECSS" – Doc. OP-IPC-2005-007*

GESTIONE

[DA 05] *Istruzione Operativa "Capitolato gestionale delle Richieste d'Offerta dell'ASI" – Doc. OP-IPC-2005-010*

[DA 06] *Istruzione Operativa "Requisiti per la preparazione della Work Breakdown Structure (WBS)" - Doc. OP-IPC-2005-002*

[DA 07] *"ECSS Glossary" – Doc. ECSS-P-001 Rev. B*

PRODUCT ASSURANCE

[DA 08] *"Sistemi di Gestione per la Qualità", doc. UNI EN ISO 9001:2015*

[DA 09] *Istruzione Operativa "Norme per la redazione del Piano di Assicurazione del Prodotto (PA Plan)", Doc. OP-IPC-2005-008*

[DA 10] *VIREO ECSS first level tailoring, Doc. DC- SQA-2024-013_A*

[DA 11] *VIREO PA requirements, Doc.* DC- *SQA-2024-014_A*

INGEGNERIA E TECNICI

[DA 12] *SBG-TIR Mission Requirement Document, D-1001214, nella versione più recente*

3.2 DOCUMENTAZIONE DI RIFERIMENTO

I documenti di riferimento di seguito elencati devono essere utilizzati dal Contraente al fine di trarre: linee guida, dati di confronto, informazioni suppletive per la migliore comprensione dei requisiti, esempi gestionali, etc.

In assenza di specifici requisiti, i documenti di riferimento devono costituire l'elemento di confronto tecnico, operativo e gestionale rispetto al quale il Contraente deve realizzare le attività contrattuali.

[DR 1] *ECSS-P-001, Glossary of terms (*)*

[DR 2] *ECSS-M-00-03, Risk Assessment (*)*

[DR 3] *ECSS-M-20, Project organization (*)*

[DR 4] *ECSS-M-60, Cost and schedule management (*)*

(*) disponibili presso il sito web dell'ECSS all'indirizzo: www.ecss.nl

[DR 5] *DP del contratto ASI - Leonardo SpA n. 2022-33-I.0 "Attività industriali di fase A/B1 per lo strumento secondario VNIR per la missione SBG/TIR" Codice Unico di Progetto (CUP) F83D22001930005*

3.3 ORDINE DI PRECEDENZA

L'ordine di precedenza tra i documenti applicabili all'offerta sarà il seguente:

- lettera di RdO
- CGA
- il presente Capitolato Tecnico
- i Documenti Applicabili identificati nella sezione 3.1
- tutti i documenti generati dall'ASI ed accettati dal Contraente.

In caso di conflitto tra i requisiti ha prevalenza il più stringente.

Il Contraente è tenuto ad evidenziare ogni eventuale conflitto tra i requisiti e sottoporlo ad ASI per la sua risoluzione.

4. OBIETTIVI ED ATTIVITA'

Obiettivo del presente provvedimento, in accordo con quanto indicato nel PTA ASI 2022-2024, è l'affidamento dello sviluppo di un payload nel visibile VNIR di Osservazione della Terra e delle associate catene di processamento per la missione congiunta ASI-JPL nell'infrarosso termico "SBG TIR Free Flyer", dedicata allo studio del pianeta per gli aspetti di biologia e geologia.

Nello specifico la procedura prevede che il proponente presenti in fase di offerta una proposta di fasi B2/C/D/E1 per l'intero sviluppo del Payload VNIR, delle associate catene di processamento, e del simulatore di strumento dal punto di vista tecnico, programmatico e dei costi a finire.

4.1 CONTESTO DI RIFERIMENTO

L'Agenzia Spaziale Italiana (ASI) e la NASA collaborano dal 2018 nello studio della missione di Osservazione di Terra Surface Biology and Geology (SBG). SBG è una delle 5 Designated Observables dell'Earth Observing System (ESO) della NASA, l'osservatorio che l'ente spaziale americano sta sviluppando per rispondere al Earth Science Decadal Survey del 2017 e che fornirà informazioni fondamentali per lo studio dei cambiamenti climatici, degli ecosistemi terrestri e marini, per i rischi naturali, il ciclo dell'acqua, gli incendi boschivi e la produzione alimentare mondiale.

SBG è composta da due missioni satellitari separate, una dedicata ad acquisire immagini iperspettrali nel visibile e nel vicino infrarosso (SBG-VSWIR) e una dedicata ad acquisire immagini multispettrali nell'infrarosso termico (SBG-TIR).

La pianificazione prevede il lancio di SBG-TIR nel 2028, in un'orbita eliosincrona a 700 Km e acquisizioni nel primo pomeriggio per catturare il calo dell'evapotraspirazione dovuto allo stress delle piante con una frequenza sufficiente per misurare la funzione dell'ecosistema su scale temporali settimanali, stagionali e annuali e con una risoluzione spaziale di 100 metri o migliore.

L'Italia non dispone, ad oggi, di un proprio sistema satellitare per l'Osservazione della Terra nell'infrarosso termico ed il programma in cooperazione con la NASA risponde a tale necessità, espressa dalla comunità nazionale degli utenti (sia scientifica che applicativa), e permette di completare la capacità osservativa del nostro Paese nelle bande emissive dello spettro, capacità attualmente limitata a livello nazionale alla strumentazione SAR e a quella elettro-ottica di tipo iperspettrale.

Tra il 2018 e il 2022, ASI e NASA/JPL hanno condotto uno studio di architettura (pre fase A) della missione SBG-TIR, che è terminato con la Mission Confirmation Review (MCR) superata con successo a giugno 2022.

La collaborazione tra le parti si è consolidata il 19/04/2022 con la firma di un accordo congiunto per lo studio di fase A della missione SBG-TIR (Implementing Arrangement (IA) between the National Aeronautics and Space Administration of the United States of America and the Italian Space Agency of the Italian Republic for cooperation on the Surface Biology and Geology mission, phases A study).

Si specifica che la fase A secondo la terminologia NASA corrisponde alla fase A/B1 dello standard di riferimento europeo ECSS.

In base alle responsabilità concordate tra le parti per la fase A/B1 l'ASI si è occupata del sistema, del satellite, dello strumento secondario (VIREO - **VI**sible infra**R**ed **E**arth **O**bservation camera) e del servizio di lancio. La NASA si è occupata dello strumento primario (OTTER), sulla base dell'esperienza di uno strumento (ECOSTRESS) in volo sulla Stazione Spaziale Internazionale, e del relativo centro dati. Mentre entrambe le agenzie hanno partecipato alla definizione dei requisiti di missione e del segmento di terra.

Per ottemperare alle responsabilità di propria competenza derivanti dalla firma dell'IA di fase A/B1, l'ASI ha condotto le seguenti attività industriali:

- Contratto ASI n. 2023-5-I.0 Attività industriali di fase A/B1 di sistema della missione SBG/TIR con TAS-I, per lo svolgimento delle attività di sistema,
- Contratto ASI n. 2022-23-I.0 Attività industriali di fase A/B1 per lo strumento secondario VNIR per la missione SBG/TIR con LEONARDO SpA, per lo strumento secondario (VIREO - **VI**sible infra**R**ed **E**arth **O**bservation camera) di competenza italiana.

I risultati delle attività contrattuali di fase A/B1 dedicate allo studio e design dello strumento secondario hanno dimostrato la fattibilità e maturità e del design dello strumento VNIR, denominato VIREO.

Sono attualmente in corso le ulteriori attività previste dal suddetto contratto, come modificato a seguito dell'Atto Aggiuntivo n. 2022-33-I.1-2024. Le attività aggiuntive sono dedicate principalmente allo sviluppo di un E2E Performance Simulator dello strumento VNIR definito in SRR.

Durante le attività di fase A/B1, ASI e NASA, il 27/10/2023, hanno firmato l'accordo per la fasi successive (Implementing Arrangement between the National Aeronautics and Space Administration of the United States of America and the Italian Space Agency of the Italian Republic for cooperation on the Surface Biology and Geology mission, phases B-F).

In base a tale accordo, l'ASI ha la responsabilità:

- del sistema, del satellite, dell'integrazione del P/L sulla piattaforma e di eseguire tutti i test a livello di sistema,

- della fornitura dello strumento secondario (VIREO), di acquisire i servizi di lancio e di trasportare il satellite al sito di lancio, dell'integrazione del satellite sul lanciatore e della gestione delle operazioni di lancio,
- di operare il satellite durante tutte le fasi della missione, in coordinamento con NASA e fornire i prodotti dello strumento VIREO alla NASA e i necessari dati ancillari. Inoltre si coordinerà con la NASA per la conduzione di attività scientifiche ed applicative congiunte e per la divulgazione dei risultati della missione.

La NASA, nell'ambito del medesimo accordo di fasi B2/C/D/E1, ha la responsabilità:

- del disegno, della realizzazione della calibrazione dello strumento TIR e dell'integrazione dello strumento italiano VIREO sullo strumento TIR. Avrà inoltre la responsabilità della spedizione del paylaod integrato (TIR VNIR) in Italia,
- di fornire supporto ad ASI per gli aspetti di propria competenza per la realizzazione delle interfacce con il paylaod, per l'integrazione del paylaod sulla piattaforma, per l'esecuzione dei test end to end e per le operazioni di lancio,
- di mettere a disposizione della missione il Near Space Network (NSN) per le comunicazioni con il satellite in banda S e per il downlink dei dati in banda X. In coordinamento con ASI, fornirà i servizi di downlink e di uplink verso il satellite e i servizi di trasferimento dei dati tra i diversi elementi del segmento di terra,
- di fornire ad ASI i piani di osservazione dello strumento TIR e i relativi telecomandi e supporterà l'ASI nella definizione dei servizi di uplink e downlink per la gestione del satellite in orbita. La NASA fornirà all'ASI i prodotti dello strumento TIR e i necessari dati ancillari.

I contenuti del presente capitolato descrivono le attività richieste al Contraente ed i relativi requisiti di prestazione necessarie per ottemperare le responsabilità di ASI nei confronti di NASA, ad eccezione delle attività relative alla fornitura del sistema di missione e GS saranno oggetto di contratti separati.

Nel contesto descritto, con la presente è richiesto al proponente di fornire un'offerta per lo sviluppo delle attività tipiche di fase B2/C/D/E1 secondo lo standard ECSS necessarie alla realizzazione del Payload VNIR, delle associate catene di processamento (fino a livello L2) e del simulatore di strumento per la missione SBG-TIR in cooperazione con NASA, che consenta di consolidare la prestigiosa collaborazione bilaterale con la NASA nel settore dell'Osservazione della Terra, nonché consenta di sviluppare competenze scientifiche ed applicative che potranno essere ri-utilizzate nel programma Copernicus e di migliorare i modelli climatici e lo studio dell'impatto delle variazioni di temperatura superficiale sulla vegetazione, aree urbane, aree costiere e per lo studio dei precursori delle eruzioni vulcaniche e delle caratteristiche termiche degli incendi.

4.2 DESCRIZIONE DELLA FORNITURA

Tutti gli elementi (documenti/dati, H/W, S/W, modelli, tools, ecc.) prodotti, sviluppati o acquisiti nel corso del programma sono di proprietà del Committente e come tali anche da considerarsi "deliverables" in accordo alle condizioni generali dei Contratti ASI.

4.3 DESCRIZIONE E REQUISITI DELLE ATTIVITA'

Le principali attività richieste dal presente Capitolato Tecnico dovranno essere sviluppate nell'ambito della proposta in modo da soddisfare i requisiti riportati di seguito e nei documenti applicabili:

I. realizzare la missione SBG-TIR in cooperazione internazionale con NASA/JPL in grado di effettuare osservazioni ad alta risoluzione spaziale e temporale nelle bande TIR/MIR e VNIR sulla superficie terrestre e sulle zone costiere per rispondere alle esigenze della comunità scientifica ed applicativa in una varietà di aree tematiche, in particolare ecosistemi/risorse naturali, idrologia e terra solida;
II. abilitare lo sviluppo di applicazioni individuate tra le priorità stabilite dalla comunità degli utenti (i.e. sicurezza alimentare, gestione dell'acqua, disastri e rischi naturali, biodiversità, etc.).

Il proponente dovrà:

1. presentare un'offerta relativa allo sviluppo di un Payload VNIR e delle associate catene di processamento (fino a livello L2 incluso) per le fasi B2/C/D/E1 secondo lo standard ECSS ed in linea con quanto specificato nei requisiti inclusi nel presente CT e nella documentazione applicabile,
2. dettagliare in sede di offerta gli elementi hardware e software in corrispondenza a quanto già dichiarato nella WBS, coerentemente a ciascun WP e nell'ottemperanza del master schedule,
3. includere nella proposta la quotazione di tutte le necessarie attività di P/L (VNIR) atte a garantire la compatibilità del design del P/L, e delle associate catene di processamento, con la P/F e il G/S, la sua verifica a partire dal design e fino all'integrazione e alla validazione in orbita,
4. effettuare, a partire dal KO contrattuale e fino al completamento della fase C (CDR, Critical Design Review), lo sviluppo e aggiornamento dell'E2E VIREO Performance Simulator e delle associate catene di processamento (fino a livello L2 incluso) sulla base degli sviluppi del design del payload VNIR e degli input che arriveranno dal sistema. Si osserva che tali attività per le fasi A/B1 sono al momento in corso e a carico di Leonardo SpA.,
5. capitalizzare le attività di commissioning aggiornando l'E2E VIREO Performance Simulator affinchè questo sia rappresentativo delle reali caratteristiche dello strumento e delle catene di processing.

Le attività da includere nell'Offerta e da svolgere nel corso delle future fasi di programma sono quelle tipiche di fase B2/C/D/E1 secondo lo standard ECSS e dovranno essere finalizzate a garantire:

- Il disegno, lo sviluppo, la realizzazione, il test, la verifica, la validazione e la calibrazione del payload VIREO,
- Il supporto alle attività di integrazione e test del Payload VIREO sullo strumento OTTER, realizzato dal NASA/JPL,
- Il supporto alle attività di integrazione e test del Payload, composto dallo strumento OTTER e dallo strumento VIREO, sulla piattaforma e alla relativa campagna di test a livello di satellite,
- L'aggiornamento del disegno, lo sviluppo, la realizzazione, il test, la verifica e la validazione dell'E2E VIREO Performance Simulator,
- Il disegno, lo sviluppo, la realizzazione, il test, la verifica e la validazione dei processori (VNIR) fino al livello L2 (incluso),
- Lo svolgimento della campagna di lancio, delle attività di LEOP e di commissioning dello strumento in orbita,
- Il supporto alla corretta integrazione della catena di processamento dei prodotti VIREO (fino a livello L2 incluso) nel Segmento di terra, da considerarsi come CFI fornito da ASI,
- Il supporto per la stima dello spazio di archivio, con le varie configurazioni di politiche di mantenimento che saranno individuate per i trade-off per il dimensionamento dell'archivio dei prodotti VIREO,
- La gestione delle interfacce verso ASI,
- La gestione delle interfacce di responsabilità del JPL, relative allo strumento principale OTTER,
- La gestione delle interfacce verso il team industriale responsabile delle attività di sistema della missione,
- La gestione delle interfacce verso il team industriale responsabile del Segmento di Terra,
- La partecipazione a gruppi di lavoro (tra cui System Engineering, Mission, Science WG, TIM, etc.) e milestones di progetto del partner internazionale, ed eventuali ulteriori eventi (e.g. workshop, conferenze, etc.) nazionali e internazionali (e.g. ESA, NASA, etc.) correlati alle attività di progetto/programma con preparazione del relativo materiale documentale (presentazioni, note tecniche, etc.),
- La partecipazione, nel suo ruolo di responsabile dello strumento VIREO, alle principali review dello strumento di NASA/JPL, del sistema e del Segmento di Terra.

Le attività dovranno essere sviluppate nell'ambito della proposta in modo da soddisfare i requisiti riportati nel presente capitolato tecnico e nei documenti applicabili alla RdO.

Nello svolgimento delle attività di cui sopra, il contraente dovrà considerare la suddivisone delle responsabilità tra ASI e NASA e conseguentemente prevedere l'interazione con NASA/JPL per le interfacce con lo strumento principale OTTER, di competenza di NASA/JPL secondo quanto stabilito nell'IA.

Dovrà inoltre prevedere le interazioni con TAS-I, responsabile verso ASI della realizzazione delle attività di sistema della missione SBG-TIR, e con l'industria che verrà indicata da ASI per la realizzazione del Segmento di Terra.

4.4 ALBERO DEL PRODOTTO

Il Contraente dovrà sviluppare l'albero del prodotto in dettaglio, fino al livello di unità, e fornirlo ad ASI in sede di Offerta.

Ciascun elemento dell'albero del prodotto dovrà essere identificato mediante il numero di CI.

L'elenco dei CI, consegnato in sede di offerta, aggiornato come necessario durante lo sviluppo del prodotto.

4.5 FILOSOFIA DI SVILUPPO E DEI MODELLI

Il contraente dovrà fornire il payload, comprensivo delle sue unità, del simulatore di strumento e delle associate catene di processamento, secondo i modelli indicati nel par. 7.1.

5. PIANIFICAZIONE DELLE ATTIVITA', FASI ED EVENTI CHIAVE

Lo sviluppo del payload avrà una durata complessiva di 54 mesi (30 mesi fino al rilascio del PFM) con le seguenti milestones di primo livello da tenere entro le date specificate:

- VIREO-B2 KO --------- --- T0
- VIREO-PDR ----- ------ - T0 + 8 Mesi
- VIREO-CDR ---- ------ --- T0 + 18 Mesi
- VIREO ME DRB- ------ -- T0 + 30 Mesi
- VIREO PFM (OH+PE) DRB- T0 + 30 Mesi
- IOCR ------ ------ ---- T0 + 54 Mesi

Il Contraente si impegna a fornire in occasione delle review del payload principale, di sistema e di ground segment tutto l'HW/SW e deliverables necessari e previsti per assicurare la corretta esecuzione delle milestone del partner internazionale, del sistema e del segmento di terra.

Il Contraente dovrà prevedere l'eventuale storage in casi di ritardi non meglio specificati nel corso delle attività di Sistema.

Le review sopra indicate corrispondono a SAL.

Per la definizione degli eventi chiave far riferimento allo standard ECSS in particolare ECSS M 30, ECSS M 40, ECSS E 10.

6. FORNITURE DI RESPONSABILITA' DELL'ASI

6.1 HW/SW

N/A

6.2 DOCUMENTAZIONE

N/A

7. FORNITURA CONTRATTUALE

Tutti gli elementi (documenti/dati, H/W, S/W, modelli, tools, ecc.) prodotti, sviluppati o acquisiti nel corso del programma sono di proprietà dell'Agenzia e come tali anche da considerarsi "deliverables" in accordo alle condizioni generali dei Contratti ASI.

7.1 HW/SW

Il Contraente, in sede di proposta, deve consegnare la lista di dettaglio dell'hardware ed il software secondo lo schema riportato in Allegato 2, dove sono evidenziati:

- Prodotti da consegnare (HW, GSE, strumenti, unità, SW, modelli, ricambi, etc.)
- le quantità di ciascun prodotto
- evento di consegna
- luogo di consegna
- Note

Il Contrante nei modelli di sviluppo dello strumento VIREO dovrà prevedere la realizzazione di un fit&form model.

La pianificazione delle consegne dell'HW-SW deve essere in linea con la pianificazione degli eventi contrattuali del paragrafo 5.0.

7.2 DOCUMENTAZIONE

Il Contraente deve consegnare la documentazione riportata nel dettaglio nella Lista in All.1, che identifica la pianificazione delle consegne di tale documentazione e la documentazione che sarà sottoposta all'approvazione dell'ASI, quale contenuto dell'EIDP, in coerenza con quanto previsto dalle norme ECSS.

8. ALLEGATO 1: Documentazione deliverabile

CODICE	TITOLO	EVENTO DI CONSEGNA E NOTE	PDR	CDR	QR	AR	FRR	LRR	CRR
DEL 001	Product Breakdown Structure	*Offerta*							
DEL 002	Work Breakdown Structure	*Offerta*							
DEL 003	Work Package Description	*Offerta*							
DEL 004	Configuration Items Numbers List	*Offerta*	X	X					
DEL 005	Statement Of Compliance ai requisiti tecnici	*Offerta*							
DEL 006	Struttura industriale	*Offerta*							
DEL 007	Configuration and Documentation Management (CADM) Plan	*Offerta*	X						
DEL 008	Procedure per il trattamento delle forniture ASI	*Offerta*							
DEL 009	Procedura di gestione e controllo della documentazione	*Offerta*							
DEL 010	Price Breakdown and Milestone Payment Plan	*Offerta*							
DEL 011	Product Tree (PT)	*Offerta*	X						
DEL 012	Function Tree (FT)	*Offerta*	X						
DEL 013	Specification tree		X						
DEL 014.x	Progress Report	*Mensile e riunioni di avanzamento*							
DEL 015	Minutes of Meeting/Reviews								
DEL 016	Project Management Plan		X						
DEL 017	Configuration Item Data List (CIDL)		X	X	X	X			
DEL 018	As-Built Configuration List (ABCL)			X	X	X			
DEL 019	Risk management policy document E Risk Management Plan		*X*						
DEL 020	Risk Register and Assessment Report		X	X	X	X	*X*		
DEL 021	Schedule Report (including Master Schedule)		X	X	X	X	*X*		
DEL 022	Contract Change Notice (CCN)	*Any change is initiated by a Change Request (CR)*							
DEL 023	Request for Deviation (RFD)		X	X	X	X			
DEL 024	Request for Waiver (RFW)		X	X	X	X			
DEL 025	List of Acronyms and Abbreviation	*Offerta*	X						
DEL 026	System engineering plan		X	X	X	X			

DEL 027	Technology plan		X						
DEL 028	Technolody Readiness Status List		X						
DEL 029	Technology matrix		x						
DEL 030	Design, Development and Verification Plan		X	X	X	X			
DEL 031	Equipment/Unit Calibration, Characterisation and Performance Verification Plan		X	X	X	X			
DEL 032	Coordinate system document		X	X	X				
DEL 033	Instrument Requirements Specifications		X	X					
DEL 034	Equipment/Unit Requirements Specifications		X	X					
DEL 035	Technical requirements specifications for next lower level		X						
DEL 036	Design Description and Justification Document	*Offerta*	X	X	X				
DEL 037	Design definition file for next lower level		X	X	X	X			
DEL 038	Design justification file for next lower level			X	X	X			
DEL 039	Requirements traceability matrix w.r.t. next lower level		X						
DEL 040	Requirement justification file		X						
DEL 041	Trade off reports		X	X					
DEL 042	Technical Budgets Report		X	X	X	X			
DEL 043	Mathematical Models Description		X	X	X	X			
DEL 044	Failure Detection Isolation and Recovery (FDIR) Concept			X					
DEL 045	Structural analysis report	*Including stability analysis*	X	X					
DEL 046	Thermal analysis report		X	X					
DEL 047	Optical Analysis Report		X	X					
DEL 048	Straylight Analysis Report		X	X					
DEL 049	EMC Control Plan			X					
DEL 050	Flight Operational Manual			X					
DEL 051	Instrument Interface Control Document (ICD)		X	X	X	X	X	X	
DEL 052	Electrical Interface Control Document (E-ICD)		X	X	X	X	X	X	
DEL 053	Mechanical and Thermal Interface Control Document (M-ICD)	*Including O-ICD*	X	X	X	X	X	X	
DEL 054	Characterisation and Calibration Database (CCDB) Interface Control Document (ICD)		X	X	X	X	X	X	

DEL 055	TM/TC and DATA Handling interface document		X	X	X	X	X	X	
DEL 056	CAD Model	*Offerta*	X	X		X			
DEL 057	Structural FEM			X		X			
DEL 058	Thermal FEM			X		X			
DEL 059	Optical Model		X	X		X			
DEL 060	Verification Control Document (VCD)		X	X	X	X	X	X	X
DEL 061	Manufacturing, Assembly, Integration and Test (MAIT) Plan		X	X	X	X			
DEL 062	Space debris mitigation plan		X	X	X	X	X	X	*X*
DEL 063	Test Specification			X	X	X	X	X	
DEL 064	Test Procedures				X	X	X		
DEL 065	Test Reports					X	X	X	X
DEL 066	Review of design report			X	X				
DEL 067	Inspection report			X	X	X			
DEL 068	GSE Design Description			X					
DEL 069	GSE Test & Calibration Report				X				
DEL 070	Ground Operations and Handling Constraints			X		X			
DEL 071	Alignment Plan		X	X	X	X			
DEL 072	GSE Specification		X	X	X	X			
DEL 073	Product Assurance and Safety Plan	*Offerta*	X	X					
DEL 074	Cleanliness and Contamination Control Plan (C&CCP)		X	X					
DEL 075	Mandatory and Key Inspection Point MIP/KIP Report			X		X			
DEL 076	Non-Conformance Report (NCR)			X		X			
DEL 077	Non-Conformance (NCR) Status List			X		X			
DEL 078	Declared Components List (DCL)		X	X		X			
DEL 079	Declared Material List (DML)		X	X		X			
DEL 080	Declared Processes List (DPL)		X	X		X			
DEL 081	Declared Mechanical Parts List (DMPL)		X	X		X			
DEL 082	Certificate of Conformity					X			
DEL 083	Parts Stress Analysis			X		X			
DEL 084	Failure Modes and Effects Analysis (FMEA) Report			X					
DEL 085	Worst Case Circuit Performance Analysis (WCA) Report			X					
DEL 086	Reliability & Availability function Report		X	X					
DEL 087	Radiation function Report		X	X					

DEL 088	Loogbook					x			
DEL 089	Critical Item List (CIL)		x	x	x	x			
DEL 090	Qualification Status List		x	x	x	x			
DEL 091	Equipment Status Qualification Review (EQSR) Report		x	x	x	x			
DEL 092	E2E Performance Simulator (ATBD, IODS/PSD, user and installation manual)		x	x					*X*
DEL 093	Products Specification Document (SPE, including all VIREO products and relative format, metadata and expect performances)		x	x	x	x	x	x	
DEL 094	Software Requirement Document		X	X					
DEL 095	Software Development Plan		X	X					
DEL 096	Software Configuration & Management Plan		X	X					
DEL 097	Software Product Assurance Plan		X	X					
DEL 098	Software Verification and Validation Plan		X	X	X				
DEL 099	Software Test Procedures		X	X	X				
DEL 100	Software Design Document		X	X					
DEL 101	Software Interface Control Document		X	X	X	X	X	X	
DEL 102	Software Verification Control Document		X	X	X	X	X	X	X
DEL 103	Software Verification Report		X	X	X	X			X
DEL 104	Software User's Manual		X	X	X	X			
DEL 105	Software Release Note		X	X	X	X			
DEL 106	L0 Data Processor Software		X	X	X	X			
DEL 107	L1 Data Processor Software		X	X	X	X			
DEL 108	L2 Data Processor Software		X	X	X	X			
DEL 109	CALVAL Data Processor Software		X	X	X	X			
DEL 110	Acceptance Test Plan		X	X	X				
DEL 111	Maintenance Plan		X	X	X				
DEL 112	Acceptance Test Report		X	X	X	X			

9. ALLEGATO 2: Fornitura HW/SW

Agenzia Spaziale Italiana		***HARDWARE E SOFTWARE OGGETTO DI FORNITURA***			
PRODOTTO	***QUANTITA'***	***MODELLO (se applicabile)***	***EVENTO***	***LUOGO***	***NOTE***

	UNIT – NAME	SIGNATURE	DATE
PREPARED	SQA – Vincenzo MARTUCCI	Vincenzo Martucci 25.10.2024 11:01:37 GMT+02:00	
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APPROVED	SQA – Rita CARPENTIERO	Rita Carpentiero 25.10.2024 18:08:28 GMT+02:00	

Document change log

Date	Reason for change / Page-paragraphs affected	Revision
01/10/2024	First Issue	A

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1. INTRODUCTION

1.1 SCOPE OF THE DOCUMENT

This document establishes the tailoring (first step/level tailoring) for applicable ECSS Standards, in accordance with the document [**AD 01**], taking into consideration Project risks, constraints and characteristics. According to the project phases, all management, quality and technical aspects are evaluated through an integrated approach.

The document takes into consideration the main characteristics defined in [**AD 02**] and it is lower-level in hierarchy wrt the Contratto and "Allegato Tecnico Gestionale".

The document has been produced by ASI 'Quality and Product Assurance' department.

1.2 FIELD OF APPLICATION

The present document is applicable to the 'VIREO' project, covering all the branches S, Q, M, E and U of the ECSS system of standards.

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2. DOCUMENTS

2.1 APPLICABLE DOCUMENTS

[AD 01] Istruzione Operativa "Istruzione Operativa "Linee guida per il Tailoring delle norme ECSS", ASI document n° OP-UQT-2022-001

[AD 02] "Attività industriali fasi B2/C/D/E1 strumento VIREO per la missione SBG/TIR**,** ASI document n° DC-UOT-2024-103, Rev. A

2.2 REFERENCE DOCUMENTS

None.

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3. TAILORING OF THE STANDARD

Chapter **4** defines the lists of ECSS standards that have been deemed applicable to this Program throughout all the planned phases.

The ECSS standards are intended to be used with the extension required by the program phase and and specificities.

The ECSS Standards shall be made applicable throughout the entire contractual chain.

Starting from the present document, the Contractor shall develop the detailed tailoring of the requirements of the selected ECSS Standards (ECSS 2nd step tailoring), to be made applicable also to subcontractors on the basis of project characteristics.

The Contractor shall ensure application of ECSS Standards down to the lower level of the supply chain.

Instructions for the second level tailoring development are provided in Section **5**.

REMARK: since ECSS Standards are are continuously being updated and developed, the final list of the applicable standards shall be frozen at beginning of the activities (kick-off meeting or contract signature).

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4. "FIRST STEP TAILORING" TABLES

General documents

Description	ECSS Standard	Title	Issue, Date Of publication	Applicability
Top-level requirements are defined for implementation of the ECSS system in space projects	**S-ST-00C**	Description, implementation and general requirement	First issue Rev 1, 15 June 2020	**Y**
The Glossary and general terms of ECSS are applicable	**S-ST-00-01C**	Glossary of terms	Rev.1, 11 October 2023	**Y**
This document provides requirements and methodology for tailoring	**S-ST-00-02C**	Draft 1 "Tailoring"	First issue DRAFT1, 15 June 2020	**Y**

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Series ECSS "M" – Management

Description	ECSS Standard	Title	Issue, Date Of publication	Applicability
For project/product/organization management	**M-ST-10C**	Project planning and implementation	Third issue Rev. 1, 6 march 2009	**Y**
A structured way to perform reviews is required also depending on project organization complexity.	**M-ST-10-01C**	Organisation and conduct of reviews	Third issue Rev 1, 06 March 2009	**Y**
Configuration control is needed to ensure interface management, control of all the items also considering the project organization complexity	**M-ST-40C**	Configuration and information management	Third issue Rev 1, 06 March 2009	**Y**
Standard procedure for cost and schedule management shall be applied	**M-ST-60C**	Cost & schedule management	Third issue Rev 1, 06 March 2009	**Y**
--	**M-70A**	Integrated logistic support	Third issue, 19 April 1996	**N**
Technological innovation and programmatic constraints could introduce risk factors, to be analised and controlled.	**M-ST-80C**	Risk management	First issue, 31 July 2008	**Y**

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Series ECSS "Q" – Product Assurance

Description	ECSS Standard	Title	Issue, Date of publication	Applicability
The Policy and general principle are applicable	**Q-ST-10C**	**Product assurance management**	First issue Rev 1, 15 March 2016	**Y**
Need to control nonconformance items	**Q-ST-10-09C**	**Nonconformance Control System**	Third issue Rev 1, 01 March 2018	**Y**
Need to control items potentially critical	**Q-ST-10-04C**	**Critical-item control**	Second issue, 31 July 2008	**Y**
Quality Assurance is applicable in order to guarantee achievement of contractual obligation	**Q-ST-20C**	**Quality Assurance**	Third issue Rev 2, 01 February 2018	**Y**
to ensure that space test centres working for project operate a quality and safety assurance system in line with ECSS requirements	**Q-ST-20-07C**	**Quality and safety assurance for space test centres**	Second issue, 01 October 2014	**N**
to ensure safe handling, storage, transportation of space segment hardware	**Q-ST-20-08C**	**Storage, handling and transportation of spacecraft hardware**	First issue, 1 October 2014	**Y**
Utilisation of OTS is foreseen	**Q-ST-20-10C**	**Off-the-shelf items utilisation in space systems**	First issue, 8 October 2010	**Y**
Dependability aspects shall be taken in due consideration during the definition phase	**Q-ST-30C**	**Dependability**	Third issue Rev 1, 15 February 2017	**Y**

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Description	ECSS Standard	Title	Issue, Date of publication	Applicability
Need to support dependability analysis	**Q-ST-30-02C**	**Failure Modes, effects (and criticality) analysis (FMEA/FMECA)**	Second issue, 06 March 2009	**Y**
System availability to be considered	**Q-ST-30-09C**	**Availability analysis**	Second issue, 31 July 2008	**N**
Need to limit the component stresses to specified levels order to increase its reliability	**Q-ST-30-11C**	**Derating-EEE components**	Third issue Rev 2, 23 June 2021	**Y**
Safety aspects shall be taken in due consideration during the definition phase	**Q-ST-40C**	**Safety**	Third issue Rev 1, 15 February 2017	**Y**
Need to support safety analysis	**Q-ST-40-02C**	**Hazard analysis**	Second issue, 15 November 2008	**Y**
In support to failure analysis	**Q-ST-40-12C**	**Fault tree analysis - Adoption notice ECSS/IEC 61025**	Second issue, 31 July 2008	**N**
Need to ensure that EEE components used enables the project to meet its mission requirements	**Q-ST-60C**	**Electrical, electronic and electromechanical (EEE) components**	Third issue Rev 3, 12 May 2022	**Y**
To set requirements for the user development of ASIC and FPGA	**Q-ST-60-02C**	**ASIC and FPGA development**	Second issue, 31 July 2008	**N**

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Description	ECSS Standard	Title	Issue, Date of publication	Applicability
--	**Q-ST-60-05C**	**Generic procurement requirements for hybrids**	Second issue Rev 1, 06 March 2009	**N**
--	**Q-ST-60-12C**	**Design, selection, procurement and use of die form monolithic microwave integrated circuits (MMICs)**	Second issue, 31 July 2008	**N**
For selection, control, procurement and usage of EEE commercial components	**Q-ST-60-13C**	**Commercial electrical, electronic and electromechanical (EEE) components**	First issue rev. 1, 12 May 2022	**Y**
Need to garanty that initial quality and reliability of EEE components which are intended to be used in the project have not been affected by time.	**Q-ST-60-14C**	**Relifing procedure - EEE components**	First issue Rev 1 Corrigendum 1, 02 March 2020	**Y**
Need to garanty that initial quality and reliability of EEE components which are intended to be used in the project have not be affected by space environment	**Q-ST-60-15C**	**Radiation hardness assurance**	First issue, 01 October 2012	**Y**

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Description	ECSS Standard	Title	Issue, Date of publication	Applicability
Need to ensure that MMPP used enables the project to meet its mission requirements	**Q-ST-70C**	**Materials, Mechanical Parts & Processes**	Third issue Rev 2, 15 October 2019	**Y**
to satisfy specific requirements at system and mission level	**Q-ST-70-01C**	**Cleanliness and contamination control**	Second issue, 15 November 2008	**Y**
to determine the outgassing screening properties of used materials	**Q-ST-70-02C**	**Thermal vacuum outgassing test for the screening of space materials**	Second issue, 15 November 2008	**N**
--	**Q-ST-70-03C**	**Black-anodizing of metals with inorganic dyes**	Second issue, 31 July 2008	**N**
To establish requirements for space items to withstand changes of ambient temperature under vacuum.	**Q-ST-70-04C**	**Thermal testing for the evaluation of space materials, processes, mechanical parts and assemblies**	Second issue, 15 November 2008	**N**
--	**Q-ST-70-05C**	**Detection of organic contamination surfaces by infrared spectroscopy**	Second issue Rev 1, 15 October 2019	**N**
--	**Q-ST-70-06C**	**Particle and UV radiation testing for space materials**	First issue, 31 July 2008	**N**

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Description	ECSS Standard	Title	Issue, Date of publication	Applicability
For the the methodology to be used to calculate the thermo-optical properties of thermal-control materials	**Q-ST-70-09C**	**Measurements of thermo-optical properties of thermal control materials**	Second issue, 31 July 2008	**N**
Utilisation of PCB is foreseen	**Q-ST-70-12C**	**Design rules for printed circuit boards**	First issue, 14 July 2014	**N**
to assess the suitability of coatings, paints, films and other thin materials in space	**Q-ST-70-13C**	**Measurements of the peel and pull-off strength of coatings and finishes using pressure-sensitive tapes**	Second issue Rev 1, 05 October 2011	**N**
to qualify the materials and processes selected to provide corrosion protection.	**Q-ST-70-14C**	**Corrosion**	First issue, 01 November 2016	**Y**
--	**Q-ST-70-16C**	**Adhesive bonding for spacecraft and launcher applications**	First issue, 01 December 2020	**N**
To specify requirements for the durability testing of coatings used for space applications	**Q-ST-70-17C**	**Durability testing of coatings**	First issue, 01 February 2018	**N**
To define the technical and quality assurance requirements s for the assembly and mounting of high-reliability RF coaxial-cable interconnections	**Q-ST-70-18C**	**Preparation, assembly and mounting of RF coaxial cables**	Second issue, 15 novembre 2008	**N**

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Description	ECSS Standard	Title	Issue, Date of publication	Applicability
--	**Q-ST-70-20C**	**Determination of the susceptibility of silver-plated copper wire and cable to "red-plague" corrosion**	Second issue, 31 July 2008	**N**
--	**Q-ST-70-21C**	**Flammability testing for the screening of space materials**	Second issue, 05 February 2010	**N**
to satisfy specific requirements at system and mission level	**Q-ST-70-22**	**Control of limited shelf-life materials**	Second issue, 31 July 2008	**N**
--	**Q-ST-70-26C**	**Crimping of high-reliability electrical connections**	Second issue rev. 1, 15 March 2017+Corr.1 (1 June 2017)	**N**
Requirements and procedures for repair and modification of single-sided, double-sided and multi-layer printed circuit board assemblies.	**Q-ST-70-28C**	**Repair and modification of printed circuit board assemblies for space use**	Second issue, 31 July 2008	**Y**
--	**Q-ST-70-29C**	**Determination of offgassing products from materials and assembled articles to be used in a manned space vehicle**	Second issue, 31 November 2008	**N**

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Description	ECSS Standard	Title	Issue, Date of publication	Applicability
		crew compartment		
--	**Q-ST-70-30C**	**Wire wrapping of high-reliability electrical connections**	Second issue, 31 July 2008	**N**
To control application of suitable paints	**Q-ST-70-31C**	**Application of paints on space hardware**	First issue Rev 1, 15 October 2019	**N**
To satisfy specific requirements at system and mission level	**Q-ST-70-36C**	**Material selection for controlling stress-corrosion cracking**	Second issue, 06 March 2009	**N**
to satisfy specific requirements at system and mission level	**Q-ST-70-37C**	**Determination of the susceptibility of metals to stress corrosion cracking**	Second issue, 15 November 2008	**N**
To provide process and quality assurance requirements for the different types of metallic welding applications.	**Q-ST-70-39C**	**Welding of metallic materials for flight hardware**	First issue, 01 May 2015	**N**
Processing and quality assurance requirements for brazing processes for space flight application	**Q-ST-70-40C**	**Processing and quality assurance requirements for brazing of flight hardware**	First issue, 8 April 2022	**N**

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Description	ECSS Standard	Title	Issue, Date of publication	Applicability
--	**Q-ST-70-45C**	**Mechanical testing of metallic materials**	Second issue, 31 July 2008	**N**
Applicable only if threaded fasteners are procured	**Q-ST-70-46C**	**Requirements for manufacturing and procurement of threaded fasteners**	Second issue Rev 1, 06 March 2009	**Y**
To define the requirements and guidelines for the measurement of particulate contamination on the surfaces of space items and those of the cleanrooms	**Q-ST-70-50C**	**Particles contamination monitoring for spacecraft systems and cleanrooms**	First issue, 04 October 2011	**N**
--	**Q-ST-70-53C**	**Materials and hardware compatibility tests for sterilization processes**	First issue, 15 November 2008	**N**
--	**Q-ST-70-54C**	**Ultracleaning of flight hardware**	First issue, 15 February 2017	**N**
--	**Q-ST-70-55C**	**Microbial examination of flight hardware and cleanrooms**	First issue, 15 November 2008	**N**
--	**Q-ST-70-56C**	**Vapour phase bioburden**	First issue, 30 August 2013	**N**

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Description	ECSS Standard	Title	Issue, Date of publication	Applicability
		reduction for flight hardware		
--	**Q-ST-70-57C**	**Dry heat bioburden reduction for flight hardware**	First issue, 30 August 2013	**N**
--	**Q-ST-70-58C**	**Bioburden control of cleanrooms**	First issue, 15 November 2008	**N**
To define the requirements for evaluation, qualification and Procurements of PCB	**Q-ST-70-60C**	**Corrigendum 1 – Qualification and procurement of printed circuit boards**	First issue, 01 March 2019	**Y**
To define technical requirements and quality assurance provisions for manufacturing and verification of high reliability electronic circuits of surface mount, through hole, solderless assemblies and soldering of harness and wire interconnections	**Q-ST-70-61C**	**High reliability assembly for surface mount and through hole connections**	First issue, 08 April 2022	**Y**
to satisfy specific requirements at system and mission level	**Q-70-71C**	**Materials, processes and their data selection**	Second issue Rev 1, 15 October 2019	**Y**

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Description	ECSS Standard	Title	Issue, Date of publication	Applicability
To define requirements for processing and quality assurance of powder bed fusion technologies for space applications	**Q-70-80C**	**Processing and quality assurance requirements for metallic powder bed fusion technologies for space applications**	First Issue, 30 July 2021	**N**
Complex software development/use is foreseen	**Q-ST-80C**	**Software Product Assurance**	Third issue Rev 1,15 February 2017	**Y**

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Series ECSS "E" – Engineering

Description	ECSS Standard	Title	Issue, Date of publication	Applicability
Complex system and subsystem activities are foreseen. A structured way to perform SE activities is mandatory.	**E-ST-10C**	**System Engineering general requirements**	Third issue Rev. 1, 15 February 2017	**Y**
Complex system and subsystem activities are foreseen. A structured way to perform verification activities is mandatory.	**E-ST-10-02C**	**Verification**	Second issue Rev 1, 01 February 2018	**Y**
A structured way to perform testing activities is mandatory.	**E-ST-10-03C**	**Testing**	Second issue Rev. 1, 31 May 2022	**Y**
to satisfy specific requirements at system and mission level	**E-ST-10-04C**	**Space environment**	Second issue Rev 1, 15 June 2020	**Y**
to satisfy specific requirements at system and mission level	**E-ST-10-06C**	**Technical requirements specification**	Third issue Rev 1, 15 June 2020	**Y**
For definition of reference directions, coordinate systems and their inter-relationships	**E-ST-10-09C**	**Reference coordinate system**	First issue, 31 July 2008	**Y**
--	**E-ST-10-11C**	**Human factors engineering**	First issue, 31 July 2008	**N**

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Description	ECSS Standard	Title	Issue, Date of publication	Applicability
To the evaluation of radiation effects on all space systems	**E-ST-10-12C**	**Method for the calculation of radiation received and its effects, and a policy for design margins**	First issue, 15 November 2008	**Y**
To management and control of interfaces	**E-ST-10-24C**	**Interface management**	First issue 1 June 2015	**Y**
For the assessment of technology maturity at each level	**E-AS-11C**	**Adoption Notice of ISO 16290, Space systems - Definition of the Technology Readiness Levels (TRLs) and their criteria of assessment**	First issue, 01 October 2014	**Y**
to satisfy specific requirements at system and mission level	**E-ST-20 C**	**Electrical and electronic**	Rev 2 8 April 2022	**Y**
To define the requirements and recommendations for the design and test of RF components/equipment to achieve acceptable performance with respect to multipactor-free operation in space	**E-ST-20-01C**	**Multipactor design and test**	Second issue, 15 June 2020	**N**
To avoid/minimize hazardous effects arising from spacecraft charging	**E-ST-20-06C**	**Spacecraft charging**	First issue Revision 1, 15 May 2019	**N**
For design of space system able to function satisfactorily in its electromagnetic environment	**E-ST-20-07C**	**Electromagnetic compatibility**	Revision 2, 03 January 2022	**Y**

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Description	ECSS Standard	Title	Issue, Date of publication	Applicability
for the qualification, procurement, storage and delivery of photovoltaic assemblies	**E-ST-20-08C**	**Photovoltaic assemblies and components**	Second issue Revision 1, 18 July 2012	**N**
To identify the requirements needed to specify, procure or develop a space power distribution system	**E-ST-20-20C**	**Electrical design and interface requirements for power supply**	First issue, 15 April 2016	**N**
--	**E-ST-20-21C**	**Electrical design and interface requirements for actuators**	First issue, 15 May 2019	**N**
to satisfy specific requirements at system and mission level	**E-ST-31C**	**Thermal control**	Second issue, 15 November 2008	**Y**
--	**E-ST-31-02C**	**Two-phase heat transport equipment**	First issue Revision 1, 15 March 2017	**N**
--	**E-ST-31-04C**	**Exchange of thermal analysis data**	First issue, 01 February 2018	**N**
to satisfy specific requirements at system and mission level	**E-ST-32C**	**Structural general requirements**	Second issue Revision 1, 15 November 2008	**Y**
to satisfy specific requirements at system and mission level	**E-ST-32-01C**	**Fracture Control**	Second issue Revision 2,	**N**

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Description	ECSS Standard	Title	Issue, Date of publication	Applicability
			30 July 2021	
To define the structural design and verification of metallic and non-metallic pressurized hardware	**E-ST-32-02C**	**Structural design and verification of pressurized hardware**	First issue Revision 1, 15 November 2008	**N**
to satisfy specific requirements at system and mission level	**E-ST-32-03C**	**Structural finite element models**	First issue, 31 July 2008	**Y**
to satisfy specific requirements at system and mission level	**E-ST-32-08C**	**Space engineering – Materials**	Second issue Revision 1, 15 October 2014	**N**
to satisfy specific requirements at system and mission level	**E-ST-32-10C**	**Structural factors of safety for spaceflight hardware**	First issue Revision 2, 15 May 2019	**N**
--	**E-ST-32-11C**	**Modal survey assessment**	Second issue, 31 July 2008	**Y**
Manage the requirements applicable to mechanisms on space items	**E-ST-33-01C**	**Mechanisms**	Second issue Revision 2, 01 March 2019	**N**

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Description	ECSS Standard	Title	Issue, Date of publication	Applicability
--	**E-ST-33-11C**	**Explosive systems and devices**	Third issue Revision 1, 01 June 2017	**N**
--	**E-ST-34C**	**Environmantal control and life support (ECLS)**	Second issue, 31 July 2008	**N**
To specify the activities to be performed in the engineering of propulsion systems and their applicability.	**E-ST-35C**	**Propulsion general requirements**	First issue Revision 1, 06 March 2009	**N**
To specify the activities to be performed in the engineering of propulsion systems and their applicability.	**E-ST-35-01C**	**Liquid and electric propulsion for spacecraft**	First issue, 15 November 2008	**N**
--	**E-ST-35-02C**	**Solid propulsion for spacecrafts and launchers**	First issue, 08 October 2010	**N**
--	**E-ST-35-03C**	**Liquid propulsion for launchers**	First issue, 13 May 2011	**N**
To define design requirements for cleanliness of propulsion components	**E-ST-35-06C**	**Cleanliness requirements for spacecraft propulsion hardware**	First issue Revision 2, 07 April 2020	**N**

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Description	ECSS Standard	Title	Issue, Date of publication	Applicability
--	**E-ST-35-10C**	**Compatibility testing for liquid propulsion systems**	First issue, 06 March 2009	**N**
Complex software development/use is foreseen.	**E-ST-40C**	**Software**	Third issue, 06 March 2009	**Y**
--	**E-ST-40-07C**	**Simulation modelling platform**	First issue, 02 March 2020	**N**
Complex system and subsystem activities are foreseen.	**E-ST-50C**	**Communications**	Rev.1 1 March 2021	**N**
For requirements concerning spacecraft transponder and Earth station equipment	**E-ST-50-02C**	**Ranging and Doppler tracking**	Second issue, 31 July 2008	**N**
To define the radio communication techniques used for the transfer of information between spacecraft and Earth stations in both directions, and for the tracking systems.	**E-ST-50-05C**	**Radio frequency and modulation**	Second issue Revision 2, 04 October 2011	**N**
To support high data-rate and long distance communications	**E-ST-50-11C**	**SpaceWire - Very high-speed serial link**	First issue, 15 May 2019	**Y**
to satisfy specific requirements at system and mission level	**E-ST-50-12C**	**SpaceWire – Links, nodes, routers and networks**	Second issue Revision 1, 15 May 2019	**Y**

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Description	ECSS Standard	Title	Issue, Date of publication	Applicability
To use standard communication protocols for spacecraft communication links	**E-ST-50-13C**	**Interface and communication protocol for MIL-STD-1553B data bus onboard spacecraft**	First issue, 15 November 2008	**Y**
to satisfy specific requirements at system and mission level	**E-ST-50-14C**	**Spacecraft discret interfaces**	Second issue, 31 July 2008	**Y**
To use the CAN Network for spacecraft on-board communications	**E-ST-50-15C**	**CANbus extension protocol**	First issue, 01 May 2015	**N**
To define the interface services and to specify their corresponding network protocol elements for spacecraft using the Time-Triggered Ethernet data network	**E-ST-50-16C**	**Time-Triggered Ethernet**	First issue 30 September 2021	**N**
--	**E-AS-50-21C**	Adoption Notice of CCSDS 131.0-B-4, TM Synchronization and Channel Coding	First issue Revision 1, 13 January 2023	**N**
--	**E-AS-50-22C**	Adoption Notice of CCSDS 132.0-B-3, TM Space Data Link Protocol	First issue Revision 1, 13 January 2023	**N**
--	**E-AS-50-23C**	Adoption Notice of CCSDS 732.0-B-4, AOS Space Data Link Protocol	First issue Revision 1, 13 January 2023	**N**

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Description	ECSS Standard	Title	Issue, Date of publication	Applicability
--	**E-AS-50-24C**	Adoption Notice of CCSDS 231.0-B-4, TC Synchronization and Channel Coding	First issue Revision 1, 13 January 2023	**N**
--	**E-AS-50-25C**	Adoption Notice of CCSDS 232.0-B-4, TC Space Data Link Protocol	First issue Revision 1, 13 January 2023	**N**
--	**ECSS-E-AS-50-26C**	Adoption Notice of CCSDS 232.1-B-2, Communications Operation Procedure-1	First issue, 1 March 2021	**N**
To distinguish between the various protocols	**E-ST-50-51C**	**SpaceWire protocol identification**	First issue, 05 February 2010	**Y**
--	**E-ST-50-52C**	**SpaceWire - Remote memory access protocol**	First issue, 05 February 2010	**Y**
--	**E-ST-50-53C**	**SpaceWire - CCSDS packet transfer protocol**	First issue, 05 February 2010	**Y**
Complex system and subsystem activities are foreseen. To be used for Space Segment only.	**E-60-10C**	**Control performance**	First issue, 15 November 2008	**N**
	E-ST-60-20C	**Star sensor terminology and performance specification**	First issue Revision 2, 15 May 2019	**N**

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Description	ECSS Standard	Title	Issue, Date of publication	Applicability
	E-ST-60-21C	**Gyro terminology and performance specification**	First issue, 15 February 2017	**N**
	E-ST-60-30C	**Satellite attitude and orbit control system (AOCS) requirements**	First issue, 30 August 2013	**N**
Complex system including Ground Segment and Operations for definition phase.	**E-ST-70C**	**Ground Systems and Operations**	Second issue, 31 July 2008	**N**
To identify the on-board functionality for OBCP execution and the ground functionality for OBCP preparation and subsequent control.	**E-ST-70-01C**	**Spacecraft on-board control procedures**	First issue, 16 April 2010	**N**
For the design of on-board functions of space segments in order to ensure operability in-flight	**E-ST-70-11C**	**Space segment operability**	Second issue, 31 July 2008	**Y**
To define the monitoring and control data in order to allow a customer to perform space system integration, testing and mission operations.	**E-ST-70-31C**	**Ground systems and operations - Monitoring and control data definition**	Second issue, 31 July 2008	**Y**
To define language and procedures for space	**E-ST-70-32C**	**Test and operations procedure language**	Second issue,	**N**

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Description	ECSS Standard	Title	Issue, Date of publication	Applicability
system testing and operations.			31 July 2008	
to satisfy specific requirements at system and mission level	**E-ST-70-41C**	**Telemetry and telecommand packet utilization**	Second issue, 15 April 2016	**N**

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Series ECSS "U" – Sustainability

Description	ECSS Standard	Title	Issue, Date of publication	Applicability
The key space debris mitigation requirements shall be considered	**ECSS-U-AS-10C**	**Adoption Notice of ISO 24113: Space systems – Space debris mitigation requirements**	First issue-Rev.2 09 February 2024	**Y**
To select planetary protection requirements	**ECSS-U-ST-20C**	**Planetary protection**	First issue, 01 August 2019	**Y**

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5. SECOND LEVEL TAILORING"

The Second Level Tailoring process is in charge of the Contractor who, within the PDR, shall provide a compliance status for each ECSS standard made applicable by ASI throughout the present document.

Compliance status could be:

- C (Compliant): This means that the entire standard is considered fully applicable as is
- NA (Not applicable): This means that the standard is considered fully not applicable and a rationale for this assumption should be provided and approved by ASI
- PC (Partially Compliant): This means that at least one or more reqs of the standard are deemed not applicable or applicable with modifications

In this latter case, Contractor shall provide for each requirement of each ECSS standard its level of applicability, depending on the project characteristics:

A= Applicable without change/ Applicabile senza modifiche
MR= Applicable with modification / Applicabile con modifiche
NA = Not Applicable (deleted) / Non Applicabile
NR= Additional/New Requirement / Requisito supplementare

The following table shows an example of the required output:

Example:

ECSS-Y-XX Req. /paragr.	Requirement Description	Applicability	Differencies
2.3.1	< *Requirement description*>	**A**	
2.3.4	< *Requirement description*>	**NA**	Not applicable, <*to be justified*>
4.5	< *Requirement description*>	**MR**	To write modified requirement
5.6	< *Requirement description*>	**NR**	To write text of the new requirement

This process is developed by the Contractor in conjunction with ASI and the final outcome shall be approved by ASI.

The Contractor shall repeat the Tailoring process (First and Second Level) with its own Subcontractors and require application of the Tailoring process at all level of the supply chain.

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	UNIT/NAME	SIGNATURE	DATE
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APPROVED	SQA – Rita CARPENTIERO		

Document change log

Date	Reason for change / Page-paragraphs affected	Revision
01/10/2024	First Issue	A

ATTACHMENTS:

Annex A: "Deliverables"

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1. SCOPE

This document establishes the top-level Product Assurance Requirements applicable to "**VIREO**" project throughout the phases B2 to E.

The Contractor's PA program shall ensure that, for **"VIREO"** 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 with Program Management and Engineering.

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 Contractor during the whole life cycle of the project. The Contractor shall be responsible to tailor the PA requirements to his sub-Contractors and Suppliers, according to their contributions, through the process explained in **ECSS-S-ST-00C** and ASI document **[AD 3]**. It is under the responsibility of the Contractor to ensure the PA requirements suitable tailoring and implementation throughout the whole contractual supply chain.
The present document, is an applicable document for "Capitolato tecnico del progetto VIREO" **[AD2]** and shall be complied by the Contractor during the project execution.

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2. DEFINITIONS

All the definitions, contained into the contractual documents, will be applicable togheter with the definitions from the relevant ECSS standards.

3. DOCUMENTS

The PA requirements are based on **ECSS** series "Q" documents that, following the required tailoring process in accordance with the specific "**VIREO**" project objectives, complexity, needs and constraints, will be set up, documented by the Contractor and finally agreed with ASI.
The ECSS standards shall be applicable documents to the extent they have been made applicable to **"VIREO"** by the process of first level tailoring performed by ASI (provided in **[AD5]**) and to the extent that their applicability has been negotiated, through the process of tailoring of second level performed by the 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] "Attività industriali fasi B2/C/D/E1 strumento VIREO per la missione SBG/TIR, ASI document n° DC-UOT-2024-103, Rev. A

[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 Assicurazione del Prodotto ASI document n° OP-UQT-2024-001

[AD5] Progetto "VIREO" - "ECSS First step Tailoring" ASI Document n° DC-SQA-2024-013

[AD6] Istruzione Operativa 'TAILORING PER "SPACE ENGINEERING – SOFTWARE e "SOFTWARE PRODUCT ASSURANCE"', ASI document n° OP-QTA-2012-0040

[AD7] SBG-TIR Joint Safety and Mission Assurance Implementation Plan (SMAIP), ASI/JPL document n° D-107468

3.2 Reference Documents

Reference documents are those documents used to provide clarification and integration in support of the applicable documents. Although the following

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reference documents do not form part of the Contract and are not identified in the Contract they do integrate Product Assurance requirements for **VIREO.**

[RD01] "Sistemi di Gestione per la Qualità" UNI EN ISO 9001:2015

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4. PA REQUIREMENTS

To fulfil the **"VIREO"** 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.

This Program is part on an international partnership between ASI and JPL. Therefore, in addition to the tailored ECSS requirements, the Contractor must organize its PA program also considering the SMA/PA requirements and guidelines made applicable with SMAIP document **AD7**.
Each partner will implement its own product assurance program in accordance with its institution's PA assurance requirements and processes, but SMAIP will serve to align the Contractor's PA activities togheter with JPL's SMA activities when a common management approach must be adopted.

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 **"VIREO"** Program's specific **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 will be accomplished for **"VIREO"** 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.

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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]**.

VIR-PAR-001 'Product Assurance Plan
The Contractor shall prepare, implement and maintain a **"VIREO"** specific **PA Plan**, made applicable throughout the whole Program life cycle and to be submitted to ASI for approval.

Required output:

Delivery schedule	Output
PDR, CDR Update as required by **AD2**	**Product Assurance Plan** (PA Plan)

ASI reserves the right to:

a. access all documents and records made for the **"VIREO"** project, including the physical access to all Contractor's and/or sub-Contractors (suppliers) facilities where activities are carried-out or documents, equipment, materials are stored;
b. perform or participate in any audit, survey, inspection, review, test, etc. relevant to the **"VIREO"** 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.
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 provide a dedicated and detailed PA report/section to ASI.

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VIR-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 and shall provide as a minimum the status of following topics:

- qualification
- critical items
- dependability
- safety
- EEE parts
- Radiations
- Materials and processes
- SW
- Alerts
- Audits and relevant actions follow up
- Non-conformances and waivers
- Open points and main problems

PA progress report can be issued as a dedicated document or as a part of the Program Progress Report.

Required output:

Delivery schedule	Output
as required by applicable SoW	**PA Progress Report** (could be delivered as part of Program Progress Report)

4.3 Quality Assurance

The Contractor shall prepare, implement, maintain and control a Plan for all QA activities. This plan could be part of the overall PA Plan. QA requirements are made applicable to the **"VIREO"** Program by **[AD5].**

VIR-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	Output

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as for PA Plan	**Quality Assurance Plan** (QA Plan)

4.4 Audits Plan

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

- verify the implementation and effectiveness of the PA/QA Program for "**VIREO**" project
- 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 "**VIREO**" project

The audits shall be planned according to the level of risks of the **"VIREO"** 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 **"VIREO"** 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.

VIR-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 **"VIREO"** 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 **"VIREO"** project.

VIR-PAR-005 'Audit Report'
The Contractor shall issue for each audit a specific report, to be made available to ASI upon request

Required output:

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Delivery schedule	Output
First issue at KOM and update as required	**PA/QA Audit Plan**
as required/generated	**Audit Report**

4.5 Non-Conformance 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.
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.

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

VIR-PAR-006 'Non conformance management'

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.
3. If required by ASI, Contractor shall use ECLIPSE eNCTS electronic tool for NCR management and sharing with ASI

VIR-PAR-007 'Non conformance classification'

1. NCs shall be classified as MAJOR and MINOR as specified by the ECSS-Q-ST-10-09C
2. Non conformances that have impacts on the JPL partner interfaces will be jointly shared, dispositioned and approved by both partners (ASI and JPL) and classified as MAJOR (also called SIGNIFICANT)
3. NCs that will meet the above-mentioned requirement are:
    a. NCs with impact on a requirement with shared ownership (ASI/JPL)
    b. NCs impacting common schedule or safety
    c. NCs affecting Fit/Form/Function at external interfaces with JPL payload
    d. NCs identified after delivery of the payload (during I&T phases)

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VIR-PAR-008 'Request for Deviation/Waiver management'
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 approval.

Required output:

Delivery schedule	Output
As PA Plan, updated as necessary	**Non-conformance control 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	**Waiver/Deviation requests/ justifications process procedure,** could be part of PA Plan
As required/generated	**RFW/RFD sheets**
As required/generated	**NRB MoMs**

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 **"VIREO"** project, 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 **"VIREO"** project PA requirements. (ECSS-Q-ST-10C Annex B).

Appropriate Qualification and Testing Plan(s) shall be foreseen, developed, maintained 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 **"VIREO"** project reviews are specified in **[AD2].**

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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.

VIR-PAR-009 'Qualification Plan'
The Contractor PA function shall ensure that the qualification programme is defined, planned, implemented and the qualification results recorded, evaluated and documented.

VIR-PAR-010 'Qualification Status List'
The Contractor PA function shall ensure that a Qualification Status List of the programme items is maintained in conformance with ECSS-Q-ST-10 C Annex B.

VIR-PAR-011 'Equipment Status Qualification Review EQSR'
EQSR shall be performed, completed and their relevant results made available with an EQSR status report no longer than PDR review.

VIR-PAR-012 'Qualification heritage'
If Contractor wishes to take advantage of qualifications, obtained in the frame of other programs, these must be completed, and the related results made available for approval to ASI, by the CDR of VIREO.

Required output:

Delivery schedule	Output
Could be part of another document (Design, Development, Verification Plan, …)	**Qualification Plan**
First at PDR (as a minimum, updated at major Design Reviews)	**Qualification status List**
PDR	**EQSR report**

4.7 Dependability

The objective of Dependability program (Reliability, Availability and Maintainability - RAM) is to ensure a successful **"VIREO"** project by using the available technical, managerial and financial resources.

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The Contractor shall identify, substantiate, prepare, maintain and implement at various levels an appropriate Dependability program - as integral part of the overall PA tasks - to fulfil Requirements and constraints (Programmatic and Management, Technical, PA). This program shall be based upon a **Dependability Plan** showing how the Contractor plans perform the Dependability tasks in conjunction with other PA and Engineering tasks during all **"VIREO"** project phases.
Dependability discipline requirements are made applicable to the **"VIREO"** Project by document **[AD5]** and are tailored to the specific Program's needs and constraints**.**

VIR-PAR-0013 'Dependability' Plan
The Contractor shall develop, maintain and implement a dependability plan for all project phases in conformance with the ECSS-Q-ST-30C Annex C.

VIR-PAR-0014 'FMEA Analysis'
The Contractor shall perform a FMEA analysis according to ECSS-Q-ST-30-02.

VIR-PAR-0015 'Reliability Prediction'
The Contractor shall provide Reliability prediction in accordance with the Annex E of ECSS-Q-ST-30C to optimize the reliability of a design against competing constraints.

VIR-PAR -0016 'Maintainability'
In case of maintenance operations were required, they will be described in the item user manual and traced in the relevant item logbook.

VIR-PAR -0017 'Availability Analysis'
The Contractor shall perform availability analysis in order to assess the availability of the system, according to ECSS-Q-ST-30-09C.

VIR-PAR -0018 'Worst case analysis (WCA)'
Worst case analysis shall be performed on electrical equipment in conformance with ECSS-Q-ST-30C, Annex J, to demonstrate that it performs within specifications.

VIR-PAR -0019 'Part stress analysis'
Part stress analyses shall be performed at part level to verify that the derating rules have been implemented according to ECSS-Q-ST-30-11C.

VIR-PAR -0020 'Radiation analysis report'

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The Radiation analysis report is aimed to document in a single place all baseline information (data, assumptions, methods and techniques) used for the radiation analyses, and the results obtained.

Required output:

Delivery schedule	Output
as part of the PA plan	**Dependability Plan** prepared according to Annex "C" of ECSS-Q-ST-30C
PDR, CDR, updated according to the contract/SoW	**FMEA Analysis** as prescribed by ECSS-Q-ST-30-02C, Annex C
PDR, CDR, updated according to the contract/SoW	**Reliability Prediction**, according to the requirements of ECSS-Q-ST-30C, Annex E
PDR, CDR, updated according to the contract/SoW	**Availability Analisys,** according to the requirements of ECSS-Q-ST-30-09C
PDR, CDR, updated according to the contract/SoW	**Worst case analysis**, according to the requirements of ECSS-Q-ST-30C, Annex J
PDR, CDR, updated according to the contract/SoW	**Part stress analysis'**, according to the requirements of ECSS-Q-ST-30-11C
PDR, CDR, updated according to the contract/SoW	**Radiation analysis report,** according to ECSS-Q-ST-60-15C, Annex B

4.8 Critical Items Control

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.

VIR-PAR -0021 Critical Items List'
The Contractor shall establish and maintain a Critical Items List till FRR, according to ECSS-Q-ST-10-04C Annex A.

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Required output:

Delivery schedule	Output
PDR, CDR, QR, AR	**Critical Items List** prepared according to ECSS-Q-ST-10-04C Annex A

4.9 EEE Components Control

The objectives associated with EEE Components control program is to ensure that the Equipment (S/S, units, components) to be developed will satisfy the performance/reliability requirements during the intended life-time of the **"VIREO"** Project, by an appropriate evaluation, selection, procurement and control process.

VIR-PAR -0022 'Component Control Plan/Compliance matrix to ESCC-Q-ST-60C'
The Contractor shall define a component control plan to control the selection, approval, procurement, handling in a schedule compatible with requirements contract and in a cost-efficient way or in alternative provide a compliance matrix to ECSS-Q-ST-60C. This CCP/Compliance matrix could be part of the overall project PA plan.

VIR-PAR -0023 'Declared Component List'
The Contractor shall issue a DCL in an editable electronic format, identifying all component types needed in conformance with its DRD in Annex B of ECSS-Q-ST-60C.

Required output:

Delivery schedule	Output
PDR	**Component Control Plan (CCP)/Compliance matrix to ESCC-Q-ST-60C** (as prescribed by ECSS-Q-ST-60C)
PDR, updated according to the contract/SoW	**Declared Component List (DCL)** (as prescribed by ECSS-Q-ST-60C, Annex B)

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

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intended lifetime of the **"VIREO"** 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 **"VIREO"** System Dependability requirements.

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

A breakdown of MMPP lists and suitable examples are given in **ECSS-Q-ST-70C,** DRD in Annex "A", "B", "C". These lists shall be consolidated up to subsystem level (as a minimum).

VIR-PAR-0024 'Declared Process List'
The Contractor shall establish and maintain a declared processes list in conformance with Annex C of ECSS-Q-ST-70C.

VIR-PAR-0025 'Declared Material List'
The Contractor shall establish and maintain a declared materials list in conformance with Annex A of ECSS-Q-ST-70C.

VIR-PAR-0026 'Declared Mechanical Parts List'
The Contractor shall establish and maintain a declared mechanical parts list in conformance with Annex B of ECSS-Q-ST-70C.

VIR-PAR-0027 'Cleanliness and Contamination Control Plan'
The Contractor shall establish and maintain a Cleanliness and Contamination Control Plan in accordance with ECSS-Q-ST-70-01C Annex B

Delivery schedule	Output
PDR, CDR, QR, AR	**Declared Process List (DPL)**
PDR, CDR, QR, AR	**Declared Material List (DML)**
PDR, CDR, QR, AR	**Declared Mechanical Parts List (DMPL)**
PDR, CDR, QR, AR	**Cleanliness and Contamination Control Plan (CC Plan)**

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4.11 Safety

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

- Flight, ground personnel and the general public,
- The launch vehicle, associated payloads, 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.

VIR-PAR-0028 '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.

Required output:

Delivery schedule	Output
as part of the PA plan	**Safety programme plan**

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.

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.

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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.

VIR-PAR-0029 '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	
As per PA Plan	**Software PA Plan** prepared according to Annex "B" of ECSS-Q-ST-80C

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5. ANNEX "A"- PA DELIVERABLE DOCUMENTS.

Outputs N.	Deliverable title
1	Product Assurance Plan
2	PA Progress Report (could be part of Programme Progress Report)
3	Quality Assurance Plan (could be part of PA Plan)
4	PA/QA Audit Plan
5	Audits Report
6	Non-conformance control procedure (could be part of PA Plan)
7	Non-conformance reports
8	Waiver/Deviation requests
9	Qualification Plan
10	Qualification Status List
11	EQSR Report
12	Critical Items List
13	Dependability Plan (could be part of PA Plan)
14	FMEA/FMECA
15	Reliability Prediction
16	Availability Analysis
17	Worst case analysis
18	Part stress analysis
19	Component Control Plan/Compliance matrix to ECSS-Q-ST-60C (could be part of PA Plan)
21	Declared Component List (DCL)
22	Declared Process List (DPL)
23	Declared Material List (DML)
24	Declared Mechanical Parts List (DMPL)
25	Cleanliness and Contamination Control Plan
26	Safety Programme Plan (could be part of PA Plan)
27	Software PA Plan (could be part of PA Plan)

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